DETAIL PROJECT REPORT

VISHWAKARMA YOJNA: VIII
AN APPROACH TOWARDS RURBANISATION
HANSAPORE Village

NAVSARI District

PREPARED BY

STUDENT NAME	BRANCH NAME	ENROLLMENT NO
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S.S AGRAWAL INSTITUTE OF ENGINEERING & TECHNOLOGY

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Mr. Chintan B. Naik
Mrs. Komal A. Pal

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/Diploma Engineering successfully submitted

Detail Project Report for,

VILLAGE: HANSAPORE

DISTRICT: NAVSARI

Under

VishwakarmaYojana: Phase-VIII

In partial fulfillment of the project offered by

GUJARATTECHNOLOGICALUNIVERSITY, CHANDKHEDA

During the academic year2020-21.

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

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College Name:	**S.S AGRAWAL INSTITUTE OF ENGINEERING AND TECHNOLOGY**
College Stamp:	

ABSTRACT

It is the project that helps us to know about real inside the field work. It also helps us to know about the difference between the book knowledge and real work on side. Vishwakarma yojna is one of the activities towards rurbanisation by government of Gujarat. Under this yojana, the towns are overviewd and this undertaking was distinguished and chosen for usage. This include difficult work, numerous studies visit to the village and do review on his particular village.

Hansapore village is a village that develops near the edge of two beautiful lakes. Hansapore is located in jalalpur taluka and navsari district. It is situated 8.2 km away from sub-district headquarter and 9 km away from district headquarter navsari. This village has its own historically important. Gujarat state highway number six is passing through this village. The geographical area of hansapore village is 410 hectare.

In natural language in village is Guajarati. The whole area of village covered by agriculture. The main occupation of village is farming (70%) and job (20%) and shopkeeper (10%). In village 75% income are agricultural and 25% income are dairy, shopkeeper and worker. The hansapore village has population of 2250 of which 1136 are male while 1114 are female as per population census 2011

In this project our main aim is to identify the problems and find their solution as per current and future need of population. Selection of infrastructure facility has been made based on the most recent need of people as well as for modernization of village by keep in touch with environment.

India is one of the fastest developing countries in the world. In India about 70% people live in rural areas. So, it is very important to redevelop urban areas with proper planning and good aesthetics to meet the future requirement of population of country. So, there is a huge scope in the field of urban development.

Key Words: rurbanaization, rejuvenation of natural water bodies, modern village, solid and water waste management

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

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We express our sincere thanks to **DDO, TDO, Sarpanch, Talati and staff members of Ahmadabad** District for providing us with requisite data whenever we approached them. Especially our thanks are to all villagers and stake holders for their support during Survey.

We are also thankful to our **Prof**. **Kalpan M. Desai Principal**, faculties of our colleges for their encouragement and support to complete this project work.

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ABBREVIATIONS

SHORT NAME/SYMBOL	FULL NAME
DDO	District Developer Officer
TDO	Taluka Developer Officer
PHC	Primary Health Centre
CHC	Community Health Centre
PMGSY	Pradhan Mantri Gram Sadak Yojna
NH	National Highway
SH	State Highway
PT	Public Trasport
GDP	Gross Domestic Product
PPP	Public Private Partnership
IAY	Indira Awas Yojana
NGO	Non-Governmental Organization
ATM	Automated Teller Machine
LCD	Liquid Crystal Display

Chapter 1:- Ideal village visit from your district of Gujarat state.

1.1 Background & Study Area and location

CHIKHLI village has stated as iconic village by Sansad Adarsh Gram Yojna in 11 October 2014.This village starts its journey of progress is so simple because of the villagers are calm and sober. This village shows awareness towards physical development as well as Education of people. People of this village believe that ideal and

(Figure 1: map of chikhli village)

Smart village is made by smart people. For satisfy this condition, sarpanch of this village on its own, comes to ground to develop awareness about neatness in people of village. CHILKLI village have local, NRI and resident of inter-state people. People of this village are living in very peaceful manner. This village having very proud history. Local business and agriculture is the main profession of village. Still this village is waiting for industrial development. Education, Drinking water, Road and electricity are the main concern of this village. Young generation is more attracted towards mobile, laptop and computer and computer technology these days. If banks and finance institutions proved loan and other financial support to the villagers, these villagers see the real development. Medical and health services have to be improved.

- **Study Area And Location**

Taluka Name	**Chikhli**
District	**Navsari**
State	**Gujarat**
Language	**Gujarati,Hindi,English**
Lok Sabha Constituency	**Navsari**
Parliament Mp	**C. R. Patil**
Assembly Consistency	**Gandevi Assembly Consistency**
Assembly Mla	**Nareshbhai Patel**
Sarpanch Name	**Ankit Patel**
Elevation/Altitude	**19mtr Above Sea Level**
Latitude	**20.3491 N**
Longitude	**76.2653 E**
Std Code	**02634**

Pin Code	**396521**

(Table 1:- Study Area and Location of CHIKHLI Village)

1.2 Concept: Ideal Village, normal village

- An ideal Indian village will be so constructed as to lend itself to perfect sanitation. It will have cottages with sufficient light and ventilation built of a material obtainable within a radius of five miles of it. The cottages will have courtyards enabling householders to plant vegetables for domestic use and to house their cattle. The village lanes and streets will be free of all avoidable dust. It will have wells according to its needs and accessible to all. It will have houses of worship for all, also a common meeting place, a village common for grazing its cattle, a co-operative dairy, primary and secondary schools in which industrial education will be the central fact, and it will have Panchayats for settling disputes. It will produce its own grains, vegetables and fruit.

1. **House:** The residence /house in an ideal village are very neat and clean. The owners of these houses look to the house sanitation and house-drainage. The houses have sufficient windows to let in air and light.
2. **Agriculture**: People of an ideal village are good farmers and good in nature. They grow food crops and seasonal crops etc. Now they improved method of farming for production of crops.
3. **Educational facilities:** There are Primary schools and High schools in an ideal village. Primary education is free and compulsory.
4. **Medical facilities**: In an ideal village, there are clinical facilities for villagers and animals. Hence, there are lots of dispensaries.
5. **Other facilities:** We can find post-office, public library, playground, garden, walking area, riverfront etc there.
6. **People:** People of an ideal village are very neat and clean. They have a sense of discipline and collaboration. They have a spirit of service and let go.
7. **Conclusion:** An ideal village makes all possible provision for development of her people. It is our main duty that we should develop every village of India to much higher level. The idea of an ideal village will certainly help us in discharge our duty.

1.2.1 Objectives

A model village project has the following important objectives:

- The development of model villages, called ideal /smart villages, through the implementation of existing schemes, and certain new initiatives to be designed for the local context, which may vary from village to village. Creating models of local development which can be example of other villages.
- Prevent distress migration from rural to urban areas, which is a common phenomenon India's village due to lack of opportunities and facilities that guarantee a decent standard of living.
- Make the model village a "hub"that could attract resources for the development of other villages in its vicinity.
- Provide easier, faster and cheaper access to urban markets for agricultural produce or other marketable commodities produced in such villages.

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

Chikhli as an ideal village.

- Chikhli village, which is located some 28 km from Navsari city.
- The villagers enjoy all the facilities that one living in the city does.

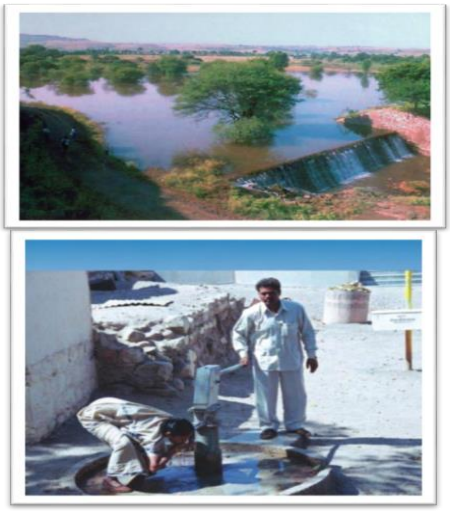
- The road of village has well in condition.
- The road has not been laid with government money, but the fund for it was raised through various ingenious schemes by the villagers.

(Figure 2: chikhli village)

➢ **Case studies of ideal village from Outside Gujarat**

1. Hiware-Bazaar, Maharashtra

- This is a village located in the rain shadow region of the sahyadri mountain range in Maharashtra's ahmednagar district. Till the 1980s, farming in the village was largely rain fed, and farmers were forced to migrate seasonally to surrounding areas for work.
- From the 1990s onwards, things began to change. The village panchayat adopted a holistic focus on a variety of activities, with community groups responsible for various aspects of the village economy and social development.



(Figure 3: hiware bazar)

- Women thrift groups, milk dairy society and youth clubs are examples of such community-based organization. The village panchayat also focused on family planning and reforestation, for which awareness programmes and drives have frequently been organized in the village. The village gram sabha also launched a watershed development programme, and an annual water audit is being conducted in the village since 2004 for more efficient and equitable management of water resources. It has also contributed to greater agricultural productivity.
- Today, the village is considered a model for community-led, multisectoral growth of rural parts of the country.

2. Punsari

- The village with Wi-Fi, CCTVs, AC classrooms and more
- Punsari, located in Gujarat, puts most metros to shame.

(Figure 4: punsari village)

- Funded by the Indian government and the village's own funding model, Punsari is no NRI-blessed zone. The village also boasts of a mini-bus commute system and various other facilities. Believe it.

3. Kathewadi

The village that has transformed itself in to a model village.

- Kathewadi is a small Indian village in the state of Maharashtra. Kathewadi is not at all different from any other small Indian villages. But now, Kathewadi has been transformed in to a model village, after it has been adopted by the Art of Living Foundation in Dec 2008.
- This is the same village where once both rich and poor were addicted to alcohol. Surprisingly with the help of Art of Living, alcoholism plunged down to zero percentage. All the families in the village are associated with the Self Help Groups. They started a daan peti (donation box) scheme which in turn let them to setup and maintain a shop without a shopkeeper. The money saved from alcoholism, SHGs and the daan peti scheme gave them sufficient economic independence to build toilets for each of the 110 households.
- 70% alcoholism to 0% alcoholism, a shop with no shopkeeper, Zero toilets to 110 toilets, apaved road and that too without any external funding!! Well, Kathewadi has transformed itsimage in many aspects.

1.2.3 The Idea of a model village/smart village

The village has for long been viewed as a convenient entry-point for understanding Indian society. At the beginning of the 20th century Mahatma Gandhi had emphatically declared: “The soul of India lives in its villages”.

In his reckoning, the village represented ‘authenticity’, for Jawaharlal Nehru it was center of backwardness, and for B R Ambedkar the village was a place of oppression where the institution of caste presented itself in its most brutal and inhuman form. Notwithstanding their differences on the nature of the Indian village, there are many ways in which the three great visionaries seemed to agree. ‘Village’, for them, represented the real India.

Indeed, the Indian village had a pan-Indian structure. Even after 70 years of Independence, in the wake of urbanization, villages are at the core of the economy, society and politics. Professional sociologists and social anthropologists regard a

village as India in microcosm, ‘an invaluable observation center’ where one examines the ‘real’ India, its social organization and cultural life. By studying a village, one can generalize on the social processes and problems that are witnessed in large parts of the country.

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

- **Ancient History Civil concept**

In the history of technology and ancient science during the growth of the ancient civilizations, ancient technological advances were produced in engineering. These advances stimulated other societies to adopt new ways of living and governance. The characteristics of Ancient Egyptian technology are indicated by a set of artifacts and customs that lasted for thousands of years. The Egyptians invented and used many basic machines.

- **Roman Aqueduct in Pont Du Gard, France**

Such as the ramp and the lever, to aid construction processes. The Egyptians also played an important role in developing Mediterranean maritime technology including ships and lighthouses. The history of science and technology in India dates back to ancient times. The Indus Valley civilization yields evidence of hydrograph, and sewage collection and disposal being practiced by its inhabitants. Among the fields of science and technology pursued in India were metallurgy, astronomy, mathematics and Ayurveda. Some ancient inventions include plastic surgery, cataract surgery, Hindu-Arabic numeral system and Wootz steel. The history of science and technology in China show significant advances in science, technology, mathematics, and astronomy. The first recorded observations of comets and supernovae were made in China. Traditional Chinese medicine, acupuncture and herbal medicine were also practiced.

- **Architecture and material culture**

Estimated to be older than the port-city of Lothal, the city of Dholavira has a rectangular shape and organization, and is spread over 22 ha (54 acres). The area measures 771.1 m (2,530 ft) in length, and 616.85 m (2,023.8 ft) in width. Unlike Harappa and Mohenjo-daro, the city was constructed to a pre-existing geometrical plan consisting of three divisions – the citadel, the middle town, and the lower town.

The acropolis and the middle town had been furnished with their own defence-work, gateways, built-up areas, street system, wells, and large open spaces. The acropolis is the most thoroughly fortified and complex area in the city, of which it appropriates the major portion of the southwestern zone. The towering "castle" stands is defended by double ramparts. Next to this stands a place called the 'bailey' where important officials lived.[14] The city within the general fortifications accounts for 48 ha (120 acres). There are extensive structure-bearing areas which are outside yet integral to the fortified settlement. Beyond the walls, another settlement has been found. The most striking feature of the city is that all of its buildings, at least in their present state of preservation, are built of stone, whereas most other Harappan sites, including Harappa itself and Mohenjo-daro, are almost exclusively built of brick. Dholavira is flanked by two storm water channels; the Mansar in the north, and the Manhar in the south.

- **Reservoirs**

One of the water reservoirs, with steps, at Dholavira Bisht, who retired as the Joint Director-General of the ASI, said, "The kind of efficient system of Harappans of Dholavira, developed for conservation, harvesting and storage of water speaks eloquently about their advanced hydraulic engineering, given the state of technology in the third millennium BCE."

- **Hemispherical constructions**

Seven hemispherical constructions were found at Dholavira, of which two were excavated in detail, which were constructed over large rock cut chambers. Having a circular plan, these were big hemispherical elevated mud brick constructions. One of the excavated structures was designed in the form of a spoked wheel. The other was also designed in same fashion, but as a wheel without spokes. Although they contained burial goods of pottery, no skeletons were found except for one grave, where a skeleton and a copper mirror were found. A necklace of steatite beads strung to a copper wire with hooks at both ends, a gold bangle, gold and other beads were also found in one of the hemispherical structures.

➢ **Ancient start history of electrical concept**

- **The baghdad battery**

In 1938 the Director of the National Museum of Iraq, Wilhelm König, discovered a number of curious terracotta pots in the archives. Each one was approximately 13 cm in height with a capped 3.3 cm opening at the top. Each pot contained an open-ended copper cylinder and inside this was a small iron rod. These artefacts strongly resembled simple galvanic batteries and in 1940 König published a scientific paper proposing that these objects may well have been used to generate electrical current which could have been used for electroplating objects with either gold or silver. Mainstream archaeologists continue to doubt this theory even though reproductions using lemon juice as an electrolyte have been proven to work and no other sensible explanation exists for the iron and copper contents. The pots are likely to have been created during the Sassanid Period (224 AD – 640 AD). The debate continues. Discovered in the archives of the National Museum of Iraq in 1938. Believed to have been originally excavated in 1936 in the village of Khuyut Rabbou'a. Capable of generating between 0.75 and 1.1 volts.

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

➢ **Physical & Demographical growth**

The village is home to 7025 people, among them 3556 are male and 3469 are female. 85% of the whole population are from general caste, 10% are from Schedule

caste and 6% are schedule tribes. Child (aged under 6 years) population of Chikhli village is 8.89%, among them 53% are boys and 47% are girls. There are 1218 Households in the village.

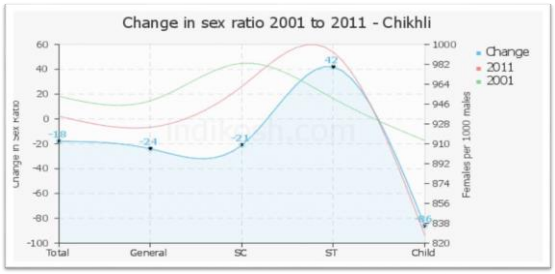
TOTAL	MALE	FEMALE	CHILDREN
7025	3556	3469	631

(Table 2:- Physical and Demographical Growth)

- **Economical profile**
  - Most people have their own business and other have own farm. A minor person
  - Depend on job. Chikhli has 37% (1013) population engaged in either main or marginal works.
  - 47% male and 26% female population are working population. 40% of total male populations are main (full time) workers and 6% are marginal (part time) workers. For women 19% of total female populations are main and 8% are marginal workers.

- **Social scenario**

As of 2011 census there are population of children with age of 0-6 is 631 which is 8.98% of total population of chikhli. In chikhli census town, female sex



(Figure 5: sex ratio of chikhli village)

ratio is of 976 against state average of 919. Moreover child sex ratio in chikhli is around 984 compared to Gujarat state average of 890.
(Figure 5: sex ratio of chikhli village)

- **Infrastructural facilities**

  - Infrastructural facilities like water supply, sanitation facility, solid waste collection, road as well as light facility available in village.
  - Wide roads–Road is essential component of transportation. It provides door-to-door type facility.

(Figure 6:- Infrastructural Facilities)

- In chikhli, prosperity of village is shown in neatness of their roads. By using several government grants and by collecting public fund, in whole area of village,

there is wide road network provided for interaction between places. Also provide block & R.C.C. at near house.

-

➢ **Physical infrastructure facility**

- All internal roads are made up of cement concrete.
- An approach road are made up of cement concrete or bituminous road.
- Footpath is also available.

(Figure 7:- Door-To-Door solid waste collection)

- For solid waste collection door to door collection system is provided by Gram panchayat.
- Overhead tank is also available varying capacity about 50000 liter in perfect condition.

(Figure 8:- Overheaded Watertank)

➢ **Social infrastructure facilities**

- In educational facility village have up to college level in which include governments Aanganwadi, primary school, Secondary and higher secondary school.

(Figure 9:-Images of Social Infrastructure of Chikhli)

- In health facilities in village have primary health station, hospitals and many private clinics

1.4 SWOT analysis of ideal village

Strength	Weakness	Opportunities	Threat

Transportation facilities	Biogas plant	Demand for agriculture	Low repayment habit
Sanitation facilities	Hydropower electricity	NGO intervention	Job insecurity
Irrigation facilities	Geothermal power plant	Expansion of public transportation	-
Housing condition	-	High standard urbanization	-

(Table 3: SWOT analysis)

1.5 Future prospect of Development of the ideal village:

Regarding the future prospects however which of the place solar system is uses possible more and more because day to day the electrical appliances uses in more amount and electrical energy uses in more amount. Another renewable energy like as wind energy, hydro energy and etc. In future underground wiring system will be construct so look as beautiful and another fault occurring in the line in few time compare to overhead line structure. They have to focus on waste water treatment plant and solid waste treatment plant. They have to maintain the public toilet. Developed green building concept, and eco-friendly technique.

1.6 Benefits of visits of ideal Village:

After visits we are learnt many of the things regarding which problems are affect to villagers and which of the general facilities are available and which of the facilities general requirement isn't fulfill to villagers, how to save environment, how to uses more and more amount to renewable energy source. We know a new thing about SWOT analysis and other many systems in the village. To know the design of structure, location of structure and concept of planning and source management etc. Their facilities like piped drainage system , WBM road , RCC road , gardening , use of latest technology in smart way , Solid waste management , Electricity system etc. are tremendous and provide us to face actual condition of system or structure. We also know the maintenance system of village, their problem solving technique, their regularity, and concentration in work. We also knowing from visit how to interact with people and govt. authority, and representation of our idea against sarpanch, talati, villagers. Visit is also providing us live and practical knowledge like doing internship at site.

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

- **Civil aspects:**

A 'Smart Village/Ward' encompasses sustainable and inclusive development of all sections of its Community, so. The 100 per cent achievement of the following basic amenities, they enjoy a high standard of

living. Homes for all -with access to toilet, safe-drinking water, and regular power. Skills and Village Enterprise development with bank and market linkages gave more flexible access to youth. Has functional solid/liquid waste management system.

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

- **Electrical aspects:**

The aspects of Smart villages based are:

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

Chapter 2:- Literature Review – (Civil & Electrical Concept)

2.1Introduction: Urban & Rural village concept

Introduction:

Rural development has a wider view of rural society and its change. There are various aspects dealing with rural areas and its societies, which have been changing since long by many factors. The main characteristic features of society are based on the changes in economic, social, cultural, religion, believes, attitudinal, organizational and even political changes, besides the technological alterations.

Urban & Rural village concept

- **Urban: -**

An Urban Conclave Is a Human Settlement with High Population Density & Infrastructure of Built Environment. Which Are Made Through Urbanization and Are Categorized by Urban Morphology as Cities, Towns, Conurbation or Suburbs. The Conception of Early Predecessors of Urban Areas During the Urban Revolution Led to The Creation of Human Civilization with Modern Urban Planning, Which Along with Other Human Activities Such as Exploitation of Natural Resources Leads to Human Impact On the Environment. Urban Areas Are Created and Further Developed by The Procedure of Urbanization. Urban Enclaves Are Measured for Various Purposes Including Analyzing Population Density & Urban Sprawl. For the Census of India 2011, the definition of urban area is as follow.
All places with a municipality, corporation, cantonment board or notified town area committee, etc.

At least 75 per cent of the male main working population engaged in non-agricultural pursuits; A density of population of at least 400 persons per sq. km. The first category of urban units is known as Statutory Towns. These towns are notified under law by the concerned State/UT Government and have local bodies like municipal corporations, municipalities, municipal committees, etc., irrespective of their demographic characteristics.

- **Rural: -**

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 persons in the panchayat.

2.2Importance of the Rural development

- Improvement in the quality of life of rural people is the important agenda of rural development programmed.
- In India – a country where the number of people living in rural areas, rural development programmed is necessary aspect.

- Rural development implies both the economic betterment of people as well as greater social transformation.
- The basic objective of all rural development endeavors / programmes has been the welfare of the millions.
- With time and experience, it is realized that accelerated and meaningful development can be achieved, people's participation has become the keyword in rural development programmes.
- To provide the rural people with better prospects for economic development.
- Rural development is a national necessity and has considerable importance in India.

2.3Ancient Villages / Different Definition of Rural Urban Villages

Villages in Ancient India:

There is sufficient evidence to suggest that the village was one of the important settlements in ancient India. The Rig Veda talks about the gram to which various families owed their allegiance. Valmiki's Ramayana talks of two types of villages – the ghosh and the gram. The ghosh was smaller than the gram and was also known as vraja, or brij (signifying a cattle farm). Both types of villages had their officials, called the mahattar. There is also a reference to a senior official called gramani or gramik.

The Mahabharata talks of different types of settlements, for example, ghosh or brij (cattle farm), palli (small hutments), gram (villages around the forts or durgs), kharvata or pattan (towns), and pur, puri, nagar (cities of different types). The villages were linked with one another, culturally, socially and administratively.

The administrator of ten villages was called dashi; of 20 villages, vinshati; of 100 villages, shati, and of over 1,000 villages, sahasra gramadhipati. This is a clear indication of the interlink-ages between the villages. Kautilya's Arthashastra suggests that river, hill, forests, ditches, tanks, bunds or trees demarcated village boundaries. He prescribed that villages should be situated at distances of one or two krosha (in Rajasthan, it is spelt as Koss, which is the equivalent of two miles or 3.219 km) from each other so that in times of need, one village could go to the help of the other.

Difference between Villages in Ancient India and Villages of today

Mahatma Gandhi is often quoted as having said: "Real India lives in its villages." The fact that in the early decades of the 20th century, India's urban segment constituted only 11 per cent of the total population gave strength to his argument. It was the villages in which 89 per cent of the population lived. That made India an agricultural country.

The development of Village India, for Gandhi, was the development of India. Illiteracy, ignorance, and poverty characterized the vast population of rural India. Gandhi organized mass movements to draw attention to the problems of the rural people, and also to involve the peasants in the freedom struggle. Social scientists also became interested in studying rural problems, particularly the deteriorating rural economy.

The growing rural discontent also worried the British Government. It felt the need to investigate the actually existing conditions. S.J. Patel, in his book Agricultural

Laborers in Modern India and Pakistan, talks about the growth of village studies: With the end of the First World War, the beginnings of an agrarian crisis was accompanied by the entry of peasants into the political arena, as exemplified during the Champaran and Kaira campaigns led by Gandhiji. As a result, the cultivator of the soil began to attract considerable attention from students of Indian society. G. Keatings and Harold Mann in Bombay, Gilbert Slater in Madras, and E.V. Lucas in the Punjab initiated intensive studies of particular villages and general agricultural problems.

The results of these investigations evoked great interest and stressed the necessity for still further study. Economists and social anthropologists later joined the movement of village studies. In the 1950s, several studies of individual villages were undertaken. In 1955, four major publications came out, three of which were anthologies of articles written by social anthropologists/sociologists on the villages studied by them, and the fourth one was a full-length monograph – the very first and by an Indian social scientist.

- Rural Area Is Also Known as "Country Side" Or "Village" In India. It Has a Very Low Density of Population in Rural Areas, Agriculture Is the Chief Source of Livelihood Along with Fishing Cottage Industries, Pottery, Etc.
- According to The Planning Commission, A Town with A Maximum Population of 15,000 Consider Rural in Nature. In These Areas the Panchayat Takes 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 & Allied Activities

Rural areas have low population density and large amount of undeveloped land. Agricultural activities are more in rural areas.
Rural areas are large and isolated areas of and open country with low population density.

United states census(2000 census) defines rural areas as comprising open country and settlements with fewer than 2500 residents areas designated as rural can have population densities as high as 999 per square mile as 1 person per square mile.
United States development of agriculture (2002 form bill) defines rural areas as any area other than a city or town that has a population of greater than 50,000 inhabitants and the urbanized areas contiguous and adjacent to such town or a city.

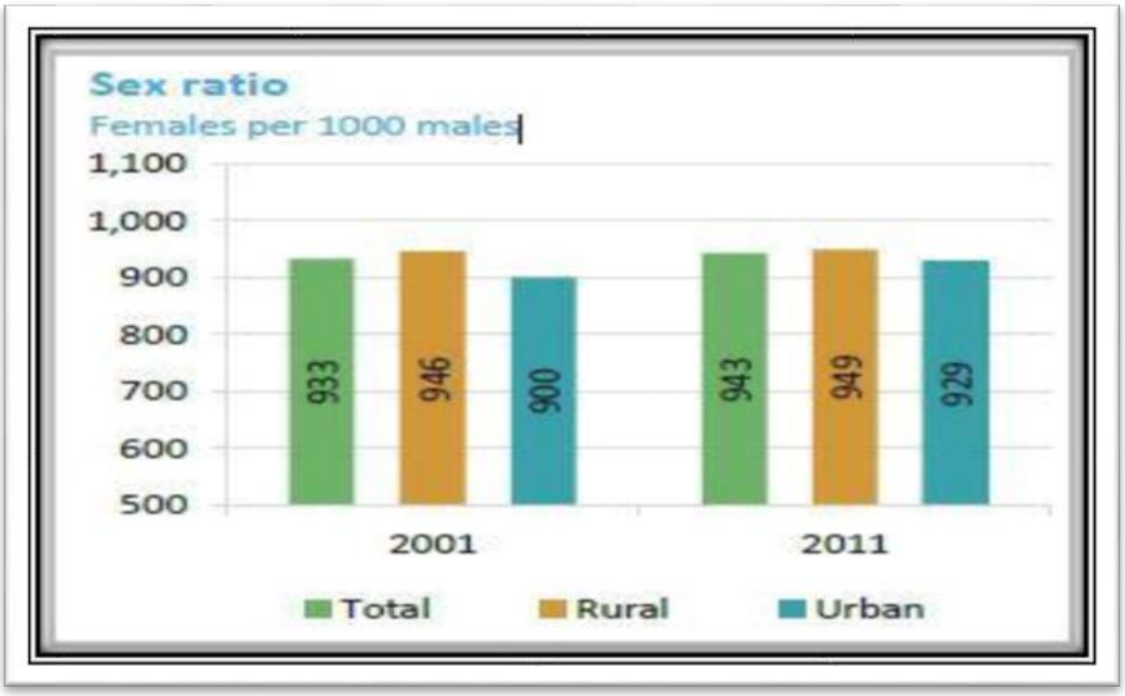
National geographic society defines A rural area is an open swath of land that has few homes or other buildings and not very many people.

2.4 Scenario: Rural / Urban village of India population Growth

	2001	**2011**	**Difference**
India	102.9	121.3	18.1
Rural	74.3	83.3	9.0

Urban	28.6	37.7	9.1

(Table 4: India Population Growth as Per Census 2011)



(Fig 10: Sex Ratio in India)

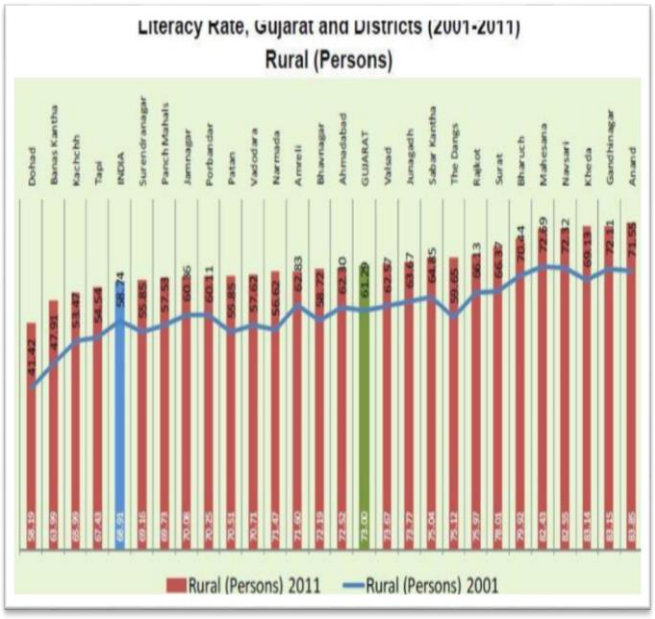
2.5Scenario: Rural / Urban village of Gujarat as per Census 2011

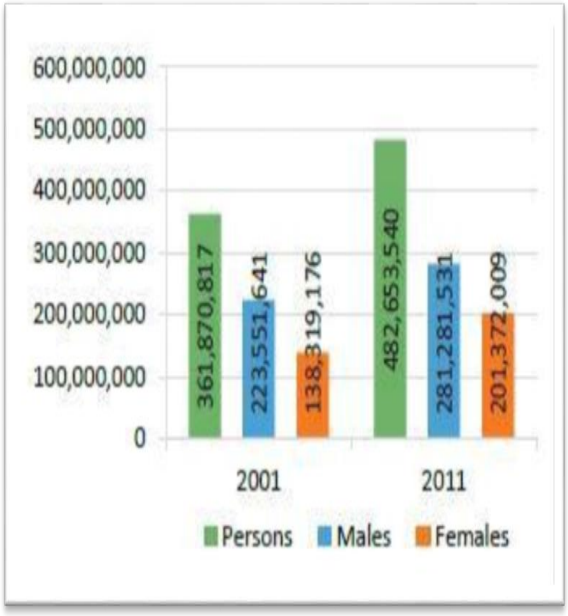
As per the Census 2011 out of total population of Gujarat, 42.6% people lived in urban regions while 57.4% in rural areas. The total figure of population of urban population was25, 745,083 out of which 13,692,101 were males while remaining 12,052,982 were females. In rural areas of Gujarat, male population was 17,799,159 while female population was 16,895,450.

The average sex ratio in urban regions of Gujarat was 880 females per 1000 males. Also the Child (0-6 age) sex ration of urban areas in Gujarat was 852 girls per 1000 boys. Thus the total children (0-6 age) living in urban areas of Gujarat were 2,952,359 which is 11.47% of total urban population. Similarly the average sex ratio in rural areas of Gujarat was 949 females' per1000 males. The Child sex ratio of rural areas in Gujarat was 914 girls per 1000 boys.

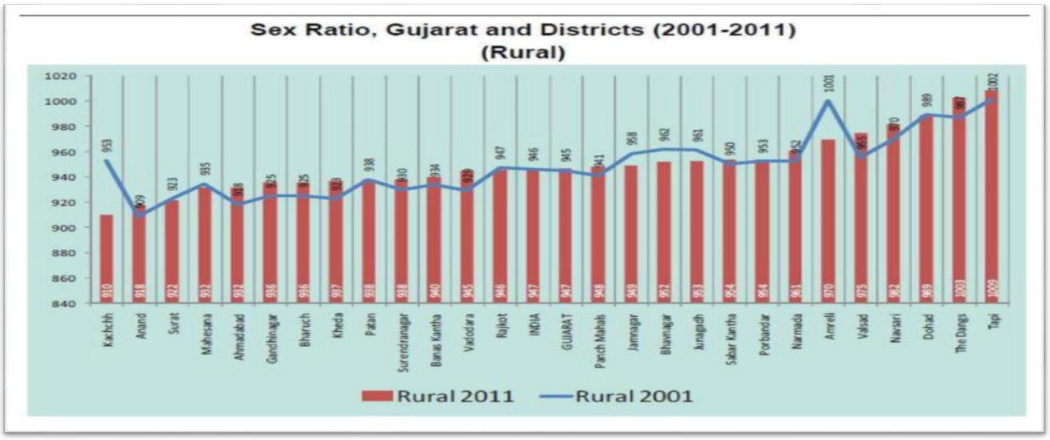
		Total	**Rural**	**Urban**
Population	**person**	1210193422	833087662	377105760
	Males	623724248	427917052	195807196
	females	586469174	405170610	181298564

(Table 5: Gujarat Population Growth as Per Census 2011)





(Figure 11: Literacy Rate of Gujarat as Census 2001 to 20011)
(Figure 12: literacy rate of india as census 2001 to 2011)



(Figure 13: Sex Ratio in Gujarat)

2.6 Rural Development Issues - Concerns - Measures

- The Process of Change in Rural Area Is Very Slow & The Problems Are More or Less Age Old in Recent Years the Process of Change Has Been Accelerated and So New Problems Are Also Cropping Up.
- The Major Problems Consists of the Agriculture, The Ownership of the Land, The Lake of Cottage Industries, Lake of Education Social Evils, and Death of Animals, Wealth, And Bad Wealth and So On.
- These Problems Are the Results of Traditional and Conservationism of the Rural Society.
- The Problems of Village May Be Studied Under the Following Heads.

- The Problems Concerning Agriculture, Cottage Industries, Population of Animal Wealth & Animal Husbandry, Health, Education, Status of Women, Child Marriage, Unemployment, Land & Less Labour, Untouchability & Castism.

Various Measures for Rural Development

- **Circulating Area:** Adequate Circulating Area (Free Area for Users to Move Inside the Toilet Block) Should Be Provided. Usually It Is 2-3m Wide Depending Upon the Land Area Available. Circulating Area Should, As Far as Possible, Be Kept Open to The Sky for Fresh Air and Sunlight. In Places Which Are Subjected to Snowfall or Heavy Rains. The Circulating Area Should Be Covered. Wherever It Is Not Possible to Keep the Circulating Area Open to The Sky, Adequate Lighting and Ventilation Arrangements Should Be Provided.

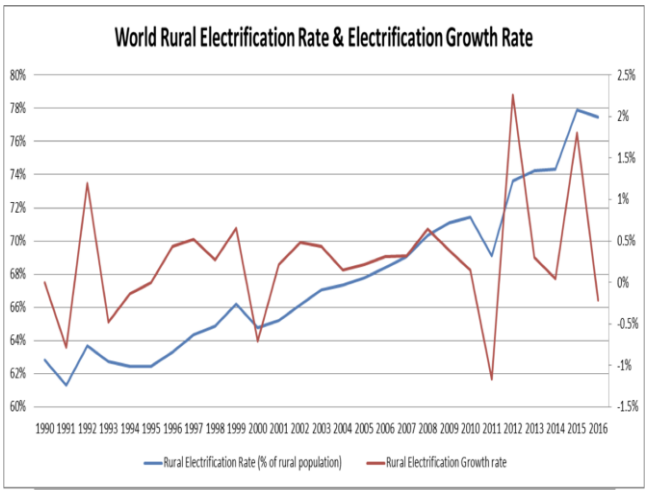
- **Superstructure:** Superstructures Should Be Well Ventilated and Designed with Materials And Specifications Suitable for A 30 Years Life Superstructures Should Provide Convenience

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

- There is a drastic change in the life style scenario of the rural people due to lack of facilities, amenities and social equality.
- As a result there is a lot of migration from rural areas to urban areas resulting in increase of population, socio-economic fluctuation and environmental pollution.
- Due to such migration, the rural areas being deserted and the occupation is decreased resulting in now economic growth.
- Infrastructure development has key role to play in both economic growth and poverty reduction.
- The government has launched many schemes for development of rural infrastructure, but did not achieve the desired goal.
- The paper proposes a public private partnership (PPP) concept to address the problems in infrastructure and improve the lifestyle of the rural people. The present investigation at Chandragudem village.
- The existing infrastructure and proposals in village were gathered by interacting with villagers. Further survey carried was carried out in chandragudem village covering all categories of citizens to understand their needs in way to make their life comfortable.
- The present paper proposes the public private partnership (PPP) opportunities for selected village that can develop the infrastructure.

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

Rural electrification is the process of bringing electrical power to rural and remote areas. Rural communities are suffering from colossal market failures as the national grids fall short of their demand for electricity. As of 2017, over 1 billion people worldwide lack household electric power – 14% of the global



(Figure 14: World Rural Electrification Rate & Electrification Growth Rate)

Population. Electrification typically begins in cities and towns and gradually extends to rural areas, however, this process often runs into obstacles in developing nations. Expanding the national grid is expensive and countries consistently lack the capital to grow their current infrastructure. Additionally, amortizing capital costs to reduce the unit cost of each hook-up is harder to do in lightly populated areas (yielding higher per capita share of the expense). If countries are able to overcome these obstacles and reach nationwide electrification, rural communities will be able to reap considerable amounts of economic and social development.

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

Social and economic benefit

- **Education**

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

- **Productivity and efficiency**

In addition to improved education, rural electrification also allows for greater efficiency and productivity. Businesses will be able to keep their doors open for longer and generate additional revenues. Farmers will have access to streamlined modern techniques such as irrigation, crop processing, and food preservation. In 2014, rural communities in India gained more than US$21 million from increased economic activity driven by recent additions of electricity.

- **Job creation**

When expanding the electrical grid, there is a demand for thousands of jobs ranging from business development to construction. Projects to spread electricity create a

wealth of job opportunities and help to alleviate poverty. For example, India set a target of 175GW of clean energy to be installed by 2022 to increase electrification throughout the country. An estimated 300,000 jobs will need to be created in order to reach these lofty goals.

- **Healthcare improvements**

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

Additional benefits

- Reduce isolation and marginalization through telephone lines and Television
- Improve safety with the implementation of street lighting, lit road signs.
- Reduce expenses on expensive fossil fuel lamps i.e. kerosene

2.9 Other Projects / Schemes of Gujarat / Indian Government

- Integrated Wasteland Development Project Scheme (1992)
- Pradhan Mantri Adarsh Gram Sadak Yojna (Pmagsy)
- Bharat Nirman Yojna
- Rajiv Awas Yojna
- National Rural Health Mission
- Jawaharlal Nehru National Urban Renewal Mission (Jnnurm)
- Atal Pension Yojana (2015)
- Bachatyojana (2009)
- Central Government Health Scheme (1954)
- Deendayal Upadhyay Gram Jyotiyojana (2015)
- Deendayal Upadhyay Grameen Kaushalyojana (2015)
- Pradhanmantri Kaushal Vikasyojana (2015)
- Indira Gandhi Matritvasahyogyojana (2015)
- Indira Awaasyojana (2006-07)
- Provision Of Urban Amenities To Rural Areas (2004)
- Public Private Partnership (1990)
- Identification Of Infrastructure Needs And Urban Amenities
- Mord Scheme
- Non-Mord Scheme

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

3.1 Introduction: Concepts, Definitions and Practices:

- **Definition:**
  The meaning of smart village is all the necessaries facilities is developed in the village and no need to moves in city for any kind of requirement.

- **Concept:**

- **Integration:** Energy, transport and information and communication technologies (ICT) seen as parallel and interdependent factors for smartness in urban areas.

- **Smart Governance:** This aspect is the backbone of smart solutions. Smarter governance is enabled through more informed decision making and participation of disparate opinions and agendas towards overall betterment of cities and communities.

- **Innovation and Technologies:** World over, technologies are enabling smarter solutions. Technology innovation is helping better collection, processing and analysis of data through conventional and crowd/social media methods. Interpreting 'Smart Cities' in the Indian context, following prima-facie impressions emerge.

- **Energy:** Although not within the urban local jurisdiction, energy is very much an urban concern. While fossil fuel fed mechanized transport remains the biggest head in energy consumption in cities. Increasing and inefficient electricity usage is also a cause of concern.

- **Traffic and Transport:** As discussed above, transport is a major concern from energy and carbon perspectives. Moreover, mobility is the basic need for any urban economy. Time lost due to traffic congestion has a direct impact on the overall efficiency of any city, including that of the businesses and economic activities.

- **Internet and Communication Technologies:** ICTs help cities connect better to their citizens, enabling better feedback and cross fertilization of ideas. Technological solutions help model and analyses urban issues, incorporating multiple factors and generating desired ends and not the other way around. Solutions that have multiples co-benefits. However, pursuing technologies for the sake of technology introduction is never fruitful.

(Figure 15: smart city concept)

Practices:

Gujrat International Finance Tech City (GIFT):

- Gujarat International Finance Tech-City or GIFT is an under-construction city in the Indian state of Gujarat which is about 12 kms from Ahmedabad International Airport. It will be built on 500 acres (2.0 sq.km) of land. Its main purpose is to provide high quality physical infrastructure (electricity, water, gas, district cooling, roads, telecoms and broadband), so that finance and tech firms can relocate their operations there from Mumbai, Bangalore, Gurgaon etc. where infrastructure is either inadequate or very expensive.
- It will have a special economic zone (SEZ), international education zone, integrated townships, an entertainment zone, hotels, a convention center, an international techno park, Software Technology Parks of India (STPI) units, shopping malls, stock exchanges and service units.

- **GIFT aims at providing transportation network, which ensures accessibility, easy & fast mobility, and zero road accidental deaths. This would be achieved by:**
  1. using a multimodal mix of Transport systems (MRTS/LRTS/BRT, etc.) for both inter region (Ahmedabad, Airport, Gandhinagar and the City) and intra-city.
  2. Using walk-to-work concept as part of urban planning with a nodal split of 10:90 between private and public transport.
  3. Use of electric Personnel Rapid Transport systems within the City. In future, City will be linked with Ahmedabad BRTS, operated by Ahmedabad JanMarg Ltd.

  Currently, two commercial towers, each of 29 floors each are under construction, while the work on a third residential tower of 33 floors will start soon. Tendering for the next bunch of towers is going on.
  .
  GIFT is conceptualized as a global financial and IT services hub, a first of its kind in India, designed to be at or above par with globally benchmarked financial centers such as Shinjuku, Tokyo, Lujiazui, Shanghai, La Defense, Paris, London Dockyards etc.

Project Phases:

- **First Phase:** As of now, proposed GIFT city's land leveling work is finished. Two commercial towers, each of 29 floors are under construction
  They are slated to be completed by 2012 end.
- **Second Phase:** The second phase's construction of roads and bases of buildings - 2011-2013.

- **Third Phase:** The third phases planned period for construction and commencement - 2013-2017.

3.2 Vision-Goals, Standards and Performance Measurement Indicators:

A **smart city** is an urban area that uses different types of electronic data collection sensors to supply information used to manage assets and resources efficiently. This includes data collected from citizens, devices, and assets that is processed and analysed to monitor and manage traffic and transportation systems, power plants, water supply networks, waste management, law enforcement, information systems, schools, libraries, hospitals, and other community services. The smart city concept integrates information and communication technology (ICT), and various physical devices connected to the network to optimize the efficiency of city operations and services and connect to citizens. Smart city technology allows city officials to interact directly with both community and city infrastructure and to monitor what is happening in the city and how the city is evolving.

– For city dwellers and non-profit citizen organizations by enabling them to understand the development and progress of SSC with respect to ICT's impact.

– For the development and operation of SSC organizations, including planning units, service providers, operation and maintenance organizations, among others by helping them to fulfil the tasks of sharing information related to the use of ICTs and their impact on the sustainability of cities.

– For evaluation and ranking agencies, including academia by supporting them in the selection of relevant KPIs for assessing the contribution from ICT in the development of SSC.

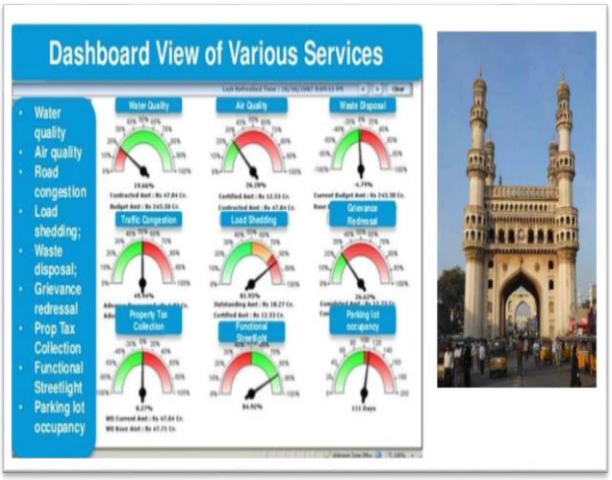
It is based on the following principles;

- **Comprehensiveness**: The set of indicators should cover all the aspects of SSC and be aligned to "ICT and its impact on the sustainability of cities" The indices should reflect the level of general development in a certain aspect.
- **Comparbility**: The KPIs should be defined in a way that data can be compared scientifically between different cities according to different phases of urban development, which means the KPIs must be comparable over time and space.
- **Availability**: The KPIs should be quantitative and the historic and current data should be either available or easy to collect.
- **Independence**: The KPIs in the same dimension should be independent or almost orthogonal i.e., overlap of the KPIs should be avoided as much as possible.
- **Simplicity**: The concept of each indicator should be simple and easy to understand the calculation of the associated data should be intuitive and simple.
- **Timeliness**: The ability to produce KPIs with respect to emerging issues in SSC construction or stage or development.

➢ The emerging and sustainable cities initiative (ESCI)
  - was created by the Inter-American Development Bank (IDB) in 2010

➢ In response to rapid and largely unregulated urbanization in the Latin American and Caribbean region,
  - It addresses three dimensions of sustainability:

- Environmental sustainability and climate change,
- Urban sustainability
- Fiscal sustainability and governance

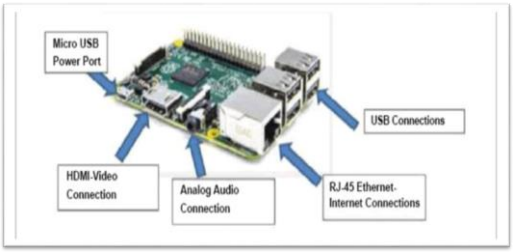


The purpose of building smart cities is to make the lives of the residents easier and safer. Technology can be used as an instrument to protect lives and improve services and businesses processes; furthermore, it can be used to protect Personally Identifiable Information (PII) and cities critical infrastructures, such as transportation, hospitals, power

(Figure 16: Smart City Dash Board Hyderabad)

Plants, and water treatment systems. Technology can be used to reduce crimes by geographically spotting areas with high crime rates, identifying specific crime patterns, or by detecting gun sounds and reporting it to law enforcement immediately many of these services are achieved by using sensors. Sensors are small measurement devices that can be integrated with electronics to detect certain sounds, smells, or levels of variations. Sensors can be passive or active. Passive sensors do not necessarily take action; they simply collect data, and they are used mainly to measure weather conditions, such as wind speed, ground Ozone levels, or the sun's ultraviolet levels. Active sensor devices, on the other hand, use electronics to process data and take action. For example, the traffic lights or parking sensors, using electronics, calculate the collected data and then take action based on meeting certain threshold. Raspberry Pi, a credit-card sized computer, is used in many sensor devices. It uses Linux or Windows 10 IoT Core operating systems illustrate the components of it.

- The network of physical devices or "things" that work collaboratively by collecting, exchanging and processing data is known as the Internet of Things. Cities remotely control these sensors through



(Figure 17: raspberry pi)

wired or wireless networks. The Internet of Things can be used to improve the ability to plan. For example, water smart meters can be used to collect information to better understand water issues, such as water leaks. City officials can use smart meter data to target water conservation campaign to areas where water is being abused. Data will also allow city officials to focus on improving infrastructure in areas where water leak is experienced the most.

- Transforming cities to be resilient technologically is another method that can be used to protect lives and improve cities. A technologically resilient city focuses on the economy, society, infrastructure, mobility, strategic planning, and healthy relationship with the residents. Mobility is defined as the ability to perform services using mobile devices from anywhere at any time. Building a sustainable technological infrastructure that provides reliable communications and mobility is one attribute of a resilient city. Cities face stresses and shocks, such as unemployment, inefficient public

transportation, earthquakes, floods, terrorist attacks, or cyber-attacks. These stresses and shocks weaken the infrastructure of the city. Resilient cities demonstrate many qualities and attributes that allow them to withstand and adapt more readily to shocks and stresses. Resilient cities can enhance their capability by reflecting on their past experience and lessons learned, in order to inform safer future decisions and to be protected from stresses and shocks. Emergency preparedness, awareness training, Internet lines redundancy, and data backup are considered attributes of a resilient city. Figure 2 illustrates the component of a Smart City and how technology can be integrated with many sectors to enhance services.

- In order to build a smart and secure city, technology can certainly play a critical role, but technology alone is not enough-the city's employees and the community have an equally important role to play. The city officials need to empower the public by engaging them in the decision-making process. Cities need to value their citizens' feedback by encouraging them to participate and contribute to solving problems; moreover, local citizens must be fully aware of the community challenges and must be engaged in shaping the budget allocations, local taxes, etc. A 2014 study conducted by the Inter-American Development Bank concluded that citizens' engagement around budget process led to improvement and satisfaction in creating measurable tax collection.

- The Chief Technology Officer (CTO) or Chief Information Officer (CIO) is typically the title of the individual that leads the smart city initiatives. The role of a city CIO is to lead the city's efforts to develop creative and effective technology solutions to address challenges. The CIO is expected to collaborate with residents and elected officials to design effective solutions. Effective solutions may include the use of technology to increase the capacity of existing infrastructure and services, integrate approaches, and involve citizens through committees and commissions to discuss issues impacting the community. For example, the city of Cupertino created teens, adults, and senior's commissions to address community challenges. The city CIO is expected to create and foster productive work teams, identify best practices, enhance services delivery, and implement citizens focused initiatives-after all, it is all about the citizens. In short, CIOs must study their communities, know what is needed to meet their citizens' needs, plan and execute related initiatives, and continue improving service delivery methods.

- Electronic government (e-government) is defined as the use of technology to provide government services to the public. The goal of e-government is to improve the government service delivery methods and enhance citizens' involvement in public services. E-government can help stimulate economic growth, promote effective natural resource management, and promote social engagement. Local cities and counties are responsible for initiating technological programs to help communities tackle local challenges and improve services. Cities' leaderships, represented in Mayors, the board of supervisors, and CIOs must be visionary and have the desire, the ability, and the capability to build a safe and secure smart environment.

- Local governments that are thinking about embarking smart city initiatives need to start by developing a roadmap. The top three components to develop a roadmap for a smart city are studying the community, developing a smart city policy, and engaging

the community through e-government and a solid citywide Wi-Fi infrastructure. Figure 3 illustrates the three-step roadmap process.

- 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 the residents who are the principal stakeholders in the city. People love to live in cities that are convenient, liveable, vibrant, and connected, so they can get anywhere whenever they want. Knowing the ages of the citizens, their educational background, their hobbies, the city attractions, the businesses, and the resources of the community are all key steps in getting to know the community and why there is a need to build a smart city-Geographic Information System (GIS) tools can be used to achieve this step. GIS is an essential economic development tool that many cities use for planning, analyses, and building lively communities that attract businesses and residents; furthermore, people expect and demand their governments to provide a wide range of services. The government and the citizens' relationship are a supply and demand type of a relationship; the more services the citizens demand, the more services the government is obligated to deliver-as long as the citizens are willing to pay of course. Figure 4illustrates the Citizens-Governments relationship-the figure expresses that the citizens' demands for services are kept in balance by the transfer of funds (taxes) from the citizens to the government.
- 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. A project

(Figure 18: the Citizen –Government Relationship)

charter needs to be developed to give the CIO the appropriate power, money, and resources to get the job done. It is the CIO's responsibility to develop and provide direction on how to use technology to make it easier for citizens and business to interact with the government, save money, and create real economic opportunities.

- 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. One goal of engaging the citizens is to build trust and make them part of the solution. Open data through the use of mobile applications is one way to establish such an engagement-mobility is a gateway to building a civic engagement, as it allows the public to connect to the city's infrastructure to perform services whenever they want from wherever they are. Cities are developing new ways in engaging the public with the government to find solutions to challenges. For example, the City of Palo Alto, California developed a mobile application that allows the citizens to report problems, such as broken light, or water

damage. The city of Boston worked with local universities to create applications that allow the public to automatically detect and report the issue to the local city. The local city in return generates a service request and when the issue is resolved, a notice gets sent back to the person informing them that the problem has been resolved. The city of Cupertino is relying on sports events to initiate civic engagements. The city is hosting the big bunny 5K race (3.1 miles) to encourage the residents to be healthy, positive, and connected. The city is using the money for charities that focus on bringing clean water worldwide. Such an engagement can be used to build trust with the public. By increasing engagement, the city is creating an opportunity for the residents to know each other. This is a brilliant way to get people to start caring about each other and their city.

- Another method to engage the citizens is by granting access to high-speed Internet and building Wi-Fi wireless infrastructure citywide. Affordable and reliable Internet connectivity needs to be available and accessible from anywhere in the city. Open Wi-Fi has economic, social, environmental, educational, and safety benefits. Free Wi-Fi is a beneficial economic development tool that can be used by tourists and travelers. Free Wi-Fi also makes it appealing to residents to be outside in public places, which in return stimulates the economy; furthermore, it benefits emergency services as Wi-Fi networks are used to aid rescue workers. Wi-Fi is even used by federal agencies for emergency and border patrol purposes. For example, Department of Homeland Security funded a free Wi-Fi service along Interstate 19 in Arizona, which is used by the community and federal agencies for emergency services. Open Wi-Fi is simply a win-win solution, as it supports the growth of new businesses, virtual learning, and mobile entertainment; in addition, the city can make a use of its wide wireless infrastructure to build the internet of things.

3.3 Technological Options:

1. 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 planned, adjusted.

2. Smart energy:

Smart energy systems will monitor and control energy usage to more efficiently manage and conserve energy. Cisco estimation that cities that run on information can improve their energy efficiency by 30 percent within 20 years. By using renewable energy source, manage water supply and have a waste management system, cities can reduce pollution and use less energy.

3. Smart Mobility:

Smart mobility strives to find more sustainable transport option. Deloitte reported that an average American is stuck about 34 hours in traffic every year. With rapidly growing cities. New transportation solutions need to be developed to keep mobility dynamic. This could save US government for about 124 billion dollars every year. Walking, cycling and combined mobility are a few of solutions that partially could mobility are a few of the solutions that partially could solve the problem. B conducting big data drives projects, information can be gathered to identity driving and movement patterns and minimize the accident probability. Finding new and improved solutions will reduce costs and have a positive environmental impact. Last, but not least, a huge bonus is the improvement health effect some of the solutions bring.

4. Smart public services:
By connecting city residents and authorities using innovative communication technology, cities can become safer, cleaner and the general city standard will improve. If residents have the possibility to report trash or infrastructure problems, authorities can act fast to solve problems they otherwise would not be aware of it.

3.4 Road Map and Safe Guards:

- Smart maps are critical tools to accelerate progress toward India's social and economic development agenda. Maps answer the basic questions that come up in our daily lives – for citizens, for businesses, and for governments. Maps help us search for places we are interested in, pinpoint their locations, optimize routes to get there, understand surrounding neighbourhoods better, and communicate better with others. When maps cannot answer these questions, we rely on other sources that may be costly, time-intensive, or incomplete. Smart Maps use cutting edge technology to enable users to quickly and effectively achieve their day-to-day and long-term goals. Smart maps capture detailed data for a broad range of inputs; present data in a user-friendly, intuitive format; are dynamically maintained in real time; and allow individuals to add additional information, creating a platform for innovation.

- Smart maps have a range of applications across sectors and regions of India, but hold particular promise to help achieve the Government of India's ambitions around Smart Cities. India will see the greatest migration to cities of any country in the world over the next 35 years, with over 400 million new inhabitant fooding into urban areas. Infrastructure will grow too: from 2007 and 2013, India's road network expanded by one quarter, while the number of total businesses increased by one-third. As India's cities continue to grow, even painstakingly compiled maps will be outdated within a year or two. Cities have the greatest density of Internet users, the most infrastructure and road information to capture, are changing at unprecedented rates, and are driving India's social and economic growth.

- Smart Cities is a particularly pertinent lens through which to understand the value of smart maps. We find that smart maps can help India gain upwards of USD $8 billion in savings and value, save 13,000 lives, and reduce 1 million metric tons of carbon emissions a year, in cities alone. The broader economic and social benefits of smart maps for citizens, businesses, and the government are likely many times greater. To arrive at these estimates, we analyzed the value of a set of nine high-potential uses of maps in Indian cities.

- For each of these use cases, we assessed the current base case scenario without Smart Maps, identified a realistic improvement based on cross-country comparisons of

(Figure 19: Road Map for Development of a Smart City)

map improvements, and finally estimated the value that would accrue to Indian citizens, businesses, and government as a result. Smart Maps are even more important for India than for other countries. First, India has the second-largest population in the world and the seventh-largest land area. Simply put, there is an enormous amount of data that our maps must capture, and we need advanced technology to do this effectively. Second, this gap in map coverage will expand further as India's cities continue to grow at a rapid pace and development accelerates.

- Third, India has an extremely diverse population. With over 100 languages spoken across the country and a wide array of cultures, maps must respond to a variety of user needs. While the quality and features of map have improved significantly over the years, maps need to be updated faster and have better coverage of local features and businesses to make them as helpful as possible for users. With the second-largest Smartphone market in the world and one of the fastest-growing internet economies, India is in a unique position to tap into the value of Smart Maps. India needs a policy framework that encourages scalable solutions and unleashes the latent value that maps hold for Indian users. A mapping policy that encourages innovation and scalable solutions can help the private sector create a world-class mapping and GIS industry that benefits Indian citizens, businesses, and government.
- Online and digital maps have improved signifcantly in India but need a lot more innovation and functionalities to serve Indian users and keep pace with a fast changing urban landscape.
- Maps have come a long way. From being a basic tool for identifying addresses and roads, they now shape myriad ways of understanding and communicating with our environment. In India, the quality and features of maps have improved signifcantly over the years. However, in a dynamically changing and complex landscape like India, continuous innovation is needed to drive locally-relevant and effective solutions. Smart Maps go far beyond providing a simple view of what the world around us looks like or the distance between point A and point B. They cover a broad range of detailed data, allow users to interact with information easily and intuitively, are built to update quickly and correctly as our environment evolves and changes, and form a platform for new and innovative applications. Whether it is informing commuters of real-time traffic restrictions, offering tailored suggestions about points

of interest based on previous user behavior, or enabling businesses to add their own details to reach more consumers, Smart Maps fundamentally enrich our daily interactions. Their universal reach and intuitive user interface allow all users, even those with limited digital experience, to access all types of information quickly and effortlessly.

- **What defense a Smart City?**

- Fundamentally, a Smart City is one that unifes data from a wide range of sources – embedded sensors, public services, citizen reports, telecom companies, and more – to inform decision-making by policymakers, businesses, and citizens.

- **Smart Cities are the future of India**

- Indian cities will grow faster than those of any other country in the coming years. By 2050, India will add over 400 million urban inhabitants, while China will see an increase of 290 million inhabitants over the same period.8 By 2030, seven Indian cities will have a population of over 10 million; in 2011, only Mumbai and Delhi had populations over 10 million. This amounts to a 37% increase in India's urban population. Cities will generate over 70% of the GDP and 70% of new jobs by 2030, driving a four-fold growth in per capita incomes nationwide. Indian cities are projected to require 700-900 million square meters of new commercial and residential space by 2030, or the size of a new Chicago every year.9 Overall, 2.5 million square meters of roads and 7,400 kilometers of metros and subways must be added to India's urban expanses.

- This is 20 times the capacity that has been added over the last decade. To complement this rapid and inevitable growth, the government has set an ambitious goal to develop "100 Smart Cities." This plan was supported by a public investment of over $1.2 billion in the 2014- 2015 fiscal year, with additional funding from private investors.10 Several top technology companies including Cisco and IBM are already working alongside the government to upgrade India's technology systems. Not surprisingly, the government's report on Smart Cities asserts, "to accommodate this massive urbanization, India needs to find smarter ways to manage complexities, reduce expenses, increase effciency and improve the quality of life."11 In India, the Smart Cities push is drawing attention to the larger, critical need for better, more thoughtful urban growth and development. In this study, we focus on the potential that Smart Maps hold to help address this need.

- **Learning from Brazil in 2013,** Rio de Janeiro won the Smart City Expo World Congress "Best Smart City of 2013" for its use of maps to monitor and deploy city resources. The city has set up an Operations Centre with a Smart Map that analyzes 60 different data layers, populated with data gathered from sensors around the city. Information on weather forecasting, traffic and transport, utilities, security, and emergency information is visualized in real-time to inform more efficient deployment of government resources. This and other tools have reduced emergency response times by 30%.

Smart Maps + Smart Cities = Big Benefits

- Smart maps increase the everyday effectiveness of users in little ways that add up to huge economic benefits for citizens, businesses, and government.

The value of Smart Maps is far broader than just the direct benefits of the geospatial industry, which contributes over three billion US dollars in direct revenue to India's GDP.15 Accurate and real-time road and traffic updates can help commuters select

the fastest routes, save time, and reduce fuel consumption and carbon emissions. Precise information on roads, traffic conditions, road restrictions, and landmarks can help ambulances find patients faster, shaving critical minutes off their response time. When users are able to find local businesses on maps, they not only save time and money they would have otherwise spent attempting to physically find what they are looking for, but also gain access to a wider choice of products and vendors. Businesses, on the other hand, gain new customers and increase revenues.

3.5 Issues & Challenges:

- Having recognized that cities are the engines of growth and are drawing a million people every minute from rural areas, the Government has introduced the 'Smart City Challenge', handing over the onus of planned urbanization to the states. In the approach to the Smart Cities Mission, the objective is to promote cities that provide core infrastructure and offer quality of life to citizens, a clean and sustainable environment and application of 'smart' solutions. Those states that measure up to the guidelines and nominate cities could get funding of Rs 100 crore per year per city for the next five years. The funding is a golden chance for states to rejuvenate their urban areas but the Smart Cities Mission still has its own challenges to face. Here are the top 10:

1. **Financing smart cities:**

- The high-power expert committee (hpec) on investment estimates in urban infrastructure has assessed a per-capita investment cost (price) of rs 43,386 for a 20-year period. Using an average figure of 1 million people in each of the 100 smart cities, the total estimate of investment requirements for the smart city comes to rs 7 lakh crore over 20 years (with an annual escalation of 10 per cent from 2009-20 to 2014-15). This translates into an annual requirement of rs 35,000 crore. One needs to see how these projects will be financed as the majority of project need would move through complete private investment or through ppps (public-private partnership).

2. **Retrofitting existing legacy city infrastructure to make it smart:**

- There are a number of latent issues to consider when reviewing a smart city strategy. The most important is to determine the existing city's weak areas that need utmost consideration, e.g. 100-per-cent distribution of water supply and sanitation. The integration of formerly isolated legacy systems to achieve citywide efficiencies can be a significant challenge.

3. **Financial sustainability of ULBs:**

- Most ULBs are not financially self-sustainable and tariff levels fixed by the ULBs for providing services often do not mirror the cost of supplying the same. Even if additional investments are recovered in a phased manner, inadequate cost recovery will lead to continued financial losses.

4. **Availability of master plan or city development plan:**

- Most of our cities don't have master plans or a city development plan, which is the key to smart city planning and implementation and encapsulates all a city needs to improve and provide better opportunities to its citizens. Unfortunately, 70-80 per cent of Indian cities don't have one.

5. Three-tier governance:

- Successful implementation of smart city solutions needs effective horizontal and vertical coordination between various institutions providing various municipal amenities as well as effective coordination between central government (MoUD), state government and local government agencies on various issues related to financing and sharing of best practices and service delivery processes.

6. Technical constraints of ULBs:

- Most ULBs have limited technical capacity to ensure timely and cost-effective implementation and subsequent operations and maintenance owing to limited recruitment over a number of years along with inability of the ULBs to attract best of talent at market competitive compensation rates.

7. Dealing with a multivendor environment:

- Another major challenge in the Indian smart city space is that (usually) software infrastructure in cities contains components supplied by different vendors. Hence, the ability to handle complex combinations of smart city solutions developed by multiple technology vendors becomes very significant.

8. Providing clearances in a timely manner:

- For timely completion of the project, all clearances should use online processes and be cleared in a time-bound manner. A regulatory body should be set up for all utility services so that a level playing field is made available to the private sector and tariffs are set in a manner that balances financial sustainability with quality.

9. Reliability of utility services:

- For any smart city in the world, the focus is on reliability of utility services, whether it is electricity, water, telephone or broadband services. Smart cities should have universal access to electricity 24×7; this is not possible with the existing supply and distribution system. Cities need to shift towards renewable sources and focus on green buildings and green transport to reduce the need for electricity.

10. Capacity building programme:

- Building capacity for 100 smart cities is not an easy task and most ambitious projects are delayed owing to lack of quality manpower, both at the centre and state levels. In terms of funds, only around 5 per cent of the central allocation may be allocated for capacity building programs that focus on training, contextual research, knowledge exchange and a rich database. Investments in capacity building programs have a

multiplier effect as they help in time-bound completion of projects and in designing programs, developing faculty, building databases as well as designing tool kits and decision support systems. As all these have a lag time, capacity building needs to be strengthened right at the beginning.

3.6 Smart Infrastructure - Intelligent Traffic Management:

- -The key aim of CSIC is to transform the future of infrastructure and construction through smarter information. The Smart Infrastructure paper is the result of a collaboration with a number of our Industry Partners to demonstrate the value of Smart and identify the steps required to realize the full potential for the UK. We hope this paper will be the start of a bigger conversation.

3.7 Cyber Security:

Cyber security or information technology are the techniques of protecting computers, networks, and data from unauthorized access or attacks are aimed for exploitation

Description:
Major areas covered in cyber security are:
1) Application Security **2)** Information Security
3) Disaster recovery **4)** Network Security

Application security encompasses measures or counter-measures that are taken during the development life-cycle to protect applications from threats that can come through flaws in the application design, development, deployment, upgrade or maintenance. Some basic techniques used for application security are:
a) Input parameter validation,
b) User/Role Authentication & Authorization,
c) Session management, parameter manipulation & exception management, and
d) Auditing and logging.

Information security protects information from unauthorized access to avoid identity theft and to protect privacy. Major techniques used to cover this are:
a) Identification, authentication & authorization of user,
b) Cryptography.

Disaster recovery planning is a process that includes performing risk assessment, establishing priorities, developing recovery strategies in case of a disaster. Any business should have a concrete plan for disaster recovery to resume normal business operations as quickly as possible after disaster.

Network security includes activities to protect the usability, reliability, integrity and safety of the network. Effective network security targets a variety of threats and stops them from entering or spreading on the network. Network security components include:
a) Anti-virus and anti-spyware,
b) Firewall, to block unauthorized access to your network,
c) Intrusion prevention systems (IPS), to identify fast-spreading threats, such as zero-day or zero-hour attacks,

d) Virtual Private Networks (VPNs), to provide secure remote access.

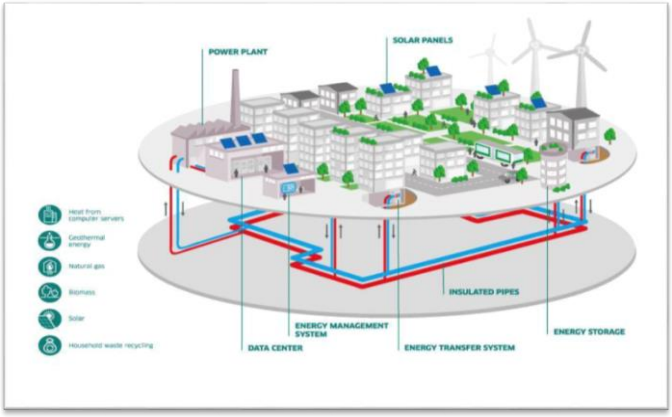
3.8 Retrofitting- Redevelopment- Greenfield Development District Cooling:

A heating network generates and distributes heat in the form of hot water and superheated steam using one or more generating units. They generally uses a range of different primary energy sources for heat generation, including natural gas, locally-generated energy and renewable in the form of household waste incineration, biomass (wood, etc.), biogas, solar, geothermal and heat recovered from wastewater.

A heating network has four main component parts:

- One or more heat generating units,
- A primary pipeline network that transfers the heat to the delivery points,
- Heat exchanger substations installed in connected buildings,
- A secondary pipeline network that distributes the heat in the form of hot water from the delivery points (substation) to the radiant sources in individual homes or offices.

A cooling network is a centralized system that provides chilled water to supply an air conditioning system. In practice, it includes chilled water production and distribution facilities to provide cooling services to all connected buildings. Operating as a closed circuit, the cooling network



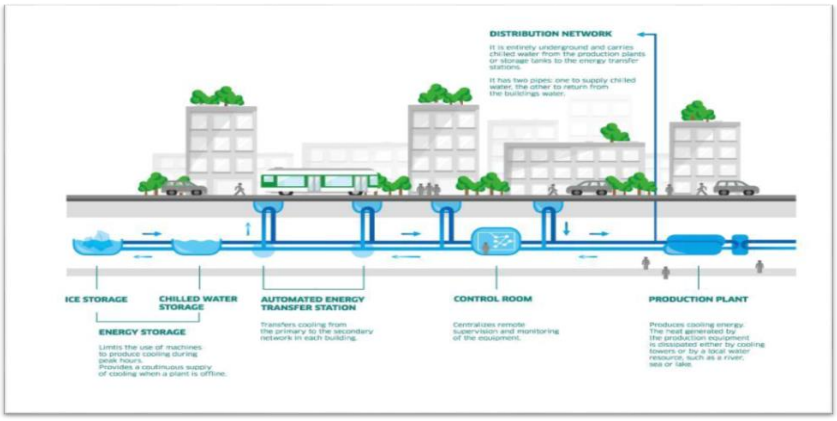
(Figure 20: District Cooling & Heating)

Always includes two pipelines: one supplying chilled water to users, and the other returning the water to the production plants.

The presence of a water source close to the network can make it possible to dispense with the need for a cooling tower at the production plant. Known as free cooling, this technique is used by CLIMESPACE, which abstracts around 50 % of its Paris cooling network needs from the river Seine.

Compared with a traditional air conditioning system, this network:

- consumes 35 % less electricity,
- emits 50 % less CO2
- greater than 50 % energy efficiency
- 65 % less water consumption.



(Figure 21: District Cooling & Heating)

3.9 Strategic Options for Fast Development:

The strategic components of area-based development in the Smart Cities Mission are city improvement (retrofitting), city renewal (redevelopment) and city extension (Greenfield development) plus a Pan-city initiative in which Smart Solutions are applied covering larger parts of the city. Below are given the deions of the three models of Area-based smart city development.

Retrofitting will introduce planning in an existing built-up area to achieve smart city objectives, along with other objectives, to make the existing area more efficient and liveable. In retrofitting, an area consisting of more than 500 acres will be identified by the city in consultation with citizens. Depending on the existing level of infrastructure services in the identified area and the vision of the residents, the cities will prepare a strategy to become smart.

Redevelopment will effect a replacement of the existing built-up environment and enable co-creation of a new layout with enhanced infrastructure using mixed land use andincreased density. Two examples of the redevelopment model are the Saifee Burhani Upliftment Project in Mumbai (also called the Bhendi Bazaar Project) and the redevelopment of East Kidwai Nagar in New Delhi being undertaken by the National Building Construction Corporation.

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

- Effectiveness of water utilities and lead to unacceptably high levels of water loss. The urban water and sanitation services sector needs systemic responses to address these interconnected problems, which have hugeramifi captions for other development imperatives for India as well.

- The analysis and recommendations in this report are the result of an approach which harnesses the collective wisdom of a diverse group of actors. Between December 2012 and July 2013, the Council on Energy, Environment and Water (CEEW) went beyond the usual “public versus private” discourse and convened five roundtable discussions to deliberate on the challenges facing the urban water and sanitation sector. Participants included water utility managers from different parts of the country, government

representatives, and private water companies, financing institutions, credit rating institutions, civil society organisations, think tanks, senior academics, architects, planners, lawyers and government officials. I was a participant in one of these roundtables and I have followed their progress even when I could not attend personally.

- The dialogues, undertaken with a spirit of continuity, focused on five themes: challenges in water utility management, roles of the private sector and civil society, role of water regulators, improving water data and metrics, and prospects for capacity building. The dialogues avoided having parallel discourses on PPP contracts, regulation and water utilities, on the one hand, and the demands for access to water for all and equitable pricing strategies, on the other. Instead, the deliberations focussed on innovations across the entire chain of consumers of urban water and sanitation services, from large establishments (public buildings, commercial places) to affluent households to lower income localities and shanty areas. And the discussions covered not only what the public sector could do or private companies wish, but also the role of civil society and communities in the delivery of services, in making regulation more effective, in collecting data and in building capacity at a local level.

    - These report summaries the overall diagnoses of the challenges in each of the five thematic areas as discussed by the participants and outlines broad recommendations. Each of the five key challenges have been analyzed in detail through research issue briefs circulated by CEEW before each meeting as well as in the proceedings of the meetings. In addition, this report also includes short essays contributed by several participants in the dialogue. These personal reflections, together with the research briefs, proceedings and recommendations, offer diverse perspectives and yet suggest ways forward. That these perspectives and recommendations emerged from a mix of stakeholders is very reassuring, suggesting that it is possible to find common ground among those who are normally (and wrongly) perceived to be at odds with each other's approaches. Even on issues where a consensus is yet to emerge, these deliberations help to widen an understanding of the challenges and should stimulate a healthy debate.

    - There are a lot of procedural, policy and technological innovations underway in India's urban services, not least in water and sanitation. My own writings have sought to capture these cases. Some are referred to here as well. But they neither always get due attention, nor do we learn from cases across the country and try to apply the lessons in other regions.
      I congratulate the researchers for preparing this report which, I am sure, will serve as an important reference document for different stakeholders in their endeavour towards providing an adequate and safe drinking water and proper sanitation facility for the urban population in India.

    - Urban water and sanitation lie at the core of healthy, vibrant and resilient cities. We need more such initiatives to convene, on a neutral platform, the different parties interested in solving problems rather than simply finding fault with others. The network of concerned stakeholders that has emerged as a result of these dialogues should continue its engagements, include even more stakeholders and, in turn, must spur implementation of ideas and innovations.

3.11 Initiatives in village development by local self-government:

- Initiatives and Policies of Local Self Governments to achieve Energy Efficiency NS Prasanna Kumar, IAS Managing Director, KREDL Scope for Energy Savings in Urban Local Bodies.
- Grama Panchayaths/ Taluk Panchayaths/ Zilla Panchayaths are gross root level institutions, basically these PRIs monitors and plans schemes, there is a well-developed strong network.
- Adequate and specific budget provisions need to be created under the provisions of the KPR Act, 2003 for various energy conservation initiatives, PRIs can make their own byelaws also.
- Capacity Development Programs are required on energy conservations for these PRIs
- GPs are licensing authorities for rural area they can impose/insist energy conservation requirements based on the local needs
- GPs pay huge electricity bills to DISCOMs, these bills are mostly related to street lights and water supply bills, 40% of energy can be saved in this area.
- There is an immediate need to replace the street lights with efficient LED systems.
- There is a need to replace the old water pumps and motors with efficient systems Scope for Energy Savings in Urban Local Bodies
- Town Panchayaths and city corporations require regular energy audit supports.

- Technical support staff needs to be stregthened in each Urban Local Bodies and a dedicated Energy Conservation Unit need to place at least in bigger urban local bodies.
- The ULBs are the competent authorities to enforce all energy saving measures in their jurisdiction; they need an enforcement unit with statutory powers.
- DPCs can initiate more proactive measures in energy conservation. Initiatives for Urban Local Bodies.
- ULBs are more efficient to organize massive Energy Conservation Campaigns
- ULBs can sell/promote energy efficient appliances to urban and rural households
- Kitchen ventilators and windows can be distributed to the poor rural households
- Urban Local Bodies can take up plantation works in the vacant lands
- ULBs can constitute energy watch committees IEC campaigns for Energy Savings in Urban Local Bodies PRED, builds infrastructures to PRIs, amendment to PWD SORs is initiated, capacity development initiative undertaken for PWD and PRED KLAC also builds infrastructures for PRIs, initiated training and capacity development for design modification to comply ECB Initiated implementation of ECBC for Govt. buildings, Policy initiatives.
- Slum Board,
- Karnataka Housing Board
- Rajiv Gandhi Rural Housing Corporation
- Urban & Rural Engineering Colleges
- Karnataka Health Restructured Development System
- Sarva Shikshana Abhiyan SSA
- MMS

3.12 Smart Initiatives by District Municipal Corporation:

- Once called the dirtiest city in India, Surat achieved a remarkable transformation in less than two years after the plague of December 1994 owing to improved municipal management and strong leadership.

(Figure 22: Smart initiatives by Municipal Corporation)

- Following the outbreak of the plague in the outskirts of the city, the Surat Municipal Corporation (SMC) launched a seven-point action plan that involved the government, NGOs, civil society, and private sector.

The action plans

1. Operation Clean-Up:
In May 1995, with a new elected government in place and a new CEO in charge, a major drive was launched for slum improvement and solid waste management (SWM). Simultaneously, the city administration was totally revamped, staff and equipment redistributed, and contracting for solid waste collection and street cleaning initiated.

2. SMC's initiatives:
Surat Municipal Corporation (SMC) worked to implement an integrated system through rehabilitation of existing sanitary staff, asset utilisation and superior technologies. SMC implemented part of the system through JNNURM funds and part with public-private partnership (PPP). The SWM project aimed to reinforce primary and secondary collection, transportation, and development of transfer stations (TS) and sanitary landfill site. SMC pioneered 'time place movement' wherein collection vehicles move in accordance with the time schedule with areas of coverage and number of units allotted. The 6 TS handle the entire 1,400 TPD of waste generated in Surat.

3. Administrative revamping:
To improve SWM, the six zones of the city were further subdivided into 52 sanitary wards, each with one sanitary inspector, two sanitary sub-inspectors, and three mukadams (supervisors). Micro-level planning ensures equitable distribution of manpower, machinery and finance. Sweepers were posted round the clock at nuisance spots, and such locations cleaned at least twice a day.

4. PPP for SWM:
Solid waste collection and transportation has been contracted out in two zones. In the central and west zones, contractors deploy their own vehicles and labour; they are paid per MT of

waste transported. In the other zones, contractors hire vehicles from the government and only labour charges are paid to transport waste to the disposal site. As part of the street-sweeping and scraping contracts, all major roads are now cleaned twice—by the contractor's staff at night and corporation sweepers during the day.

5. SWM monitoring system:

To monitor progress, the Daily Activity Report documents each action taken and resources deployed on an everyday basis across the city.

6. Enforcement:

SMC started to enforce strict hygiene and sanitation standards in eating houses, sweetshops, fruit, and vegetable shops. Fines for littering were instituted. An 'administrative charge' is now levied on all establishments that fail to adhere to public health standards.

7. Slum improvement:

Nearly 40 per cent of Surat's population lives in slums. Streets were paved with Kota stone to facilitate cleaning and public toilets constructed with the assistance of two NGOs, Sulabh and Paryavaran. In the majority of slum pockets, residents voluntarily donated a part of their dwelling to widen the main streets. Paved surface drains were constructed and community water hydrants provided.

The results: The collection efficiency of Surat has improved from 40 per cent in 1995 to 97 per cent at present, while house-to-house collection coverage has improved to 92 per cent. Three-fourths of the slums are now paved and 41 toilet complexes constructed. SMC generates close to 1,400 TPD of waste of which 400 TPD is currently treated in its waste treatment plant developed and managed in partnership with a private agency. On the anvil are a 600 TPD waste-to-energy plant and a 400 TPD integrated waste treatment plant through PPP mode.

Today, Surat is hailed as the second cleanest city in India.

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

The Digital India (DI) mission was launched in July, 2015 by our honourable Prime Minister Narendra Modi, with an aim to transform India. DI's goal is to digitally empower society by infusing digital technologies into the public service ecosystem with the use of Information Technology and to make India adept at emerging technologies to transform the country into a leading knowledge economy.

Since DI focuses on a tech-enabled societal transformation, the overarching mission works in-tandem with multiple departments under several ministries; each individual program stands on its own, but also is part of the larger vision. DI efforts are laid down to achieve results in two key focus areas:

- Governance and services on demand – DI aims to integrate processes and information across departments and jurisdictions seamlessly so to help provide real-time services to citizens both – on online and mobile platforms, digitally enable processes for businesses, creating a digitally enabled cashless economy and creating cloud-based repository for easy access for the citizens as well as better planning and decision-making with the help of GIS.

- Digital empowerment of citizens – Provide digital literacy and digital services to all citizens through universally accessible digital resources and services in several Indian languages and introduction of collaborative digital platforms, availability of all documents and certificates online and availability of all entitlements through cloud.

Funding: Rs 3, 958 crore for 2020-21

- Rs 6,000 crores allocated in 2020-21 budget for BharatNet, Dept of Telecommunication (DoT)

- Rs 3000 crore allocated in 2020-21 budget for development of Skill India programme, Ministry of Skill Development and Entrepreneurship (MoSDE)

- INR 8000 crore allocated in 2020-21 budget for the National Mission on Quantum Computing and Technology, Ministry of Science & Technology (MoST)

SMART Cities

The Smart Cities Mission under the Digital India umbrella promotes conceptualisation and realisation of cities that have a strong basic infrastructure and promote sustainable. safe and inclusive development for its residents by availing clean, sustainable environment via application of 'Smart' solutions. As part of the initiative 99 cities have been selected to address issues of pollution, increasing crime rates, congestions, poor living standards by creating better administrative and infrastructural systems through new technological.

AI can play an important role in converting 'Smart Cities' into 'Intelligent Cities' by making sense of the large amount of data that new technologies would generate to apply predictive intelligence and create better solutions. NITI Aayog has discussed the use of AI in smart cities in the following areas:

- Smart Parks and Facilities – AI-enabled monitoring and automated, remote-controlled systems such as pavement lighting, park maintenance, etc will aide in improved safety and accessibility and savings.

- Smart Homes – While smart meters are already being installed at large scale for monitoring electricity and water consumption, AI can be introduced to other domestic functions such as smart rooftops, water saving applications for optimal use of water consumption in domestic chores

- AI driven service delivery – As per citizen data, rationalisation of administrative personnel on the basis of predicted service demands, analysing migration trends AI will be implemented in applications like predictive service deliver and chat-bots for grievance redressal

- Crowd management – In the 2019 Kumbh Mela, AI was used to experiment with crowd management to predict crowd behaviour with over 1,000 CCTV cameras to monitor movements across 32 sq. kms. Similar AI solutions along with Big Data analysis can be deployed across urban areas for better prediction and response management.

- Intelligent safety systems – Potential crime incidents and the general safety of residents can be attempted to be averted with the use of state-of-art surveillance systems which are integrated to AI-enabled smart command centres. Social Media intelligence platforms that gather information from networking sites can also help in promoting public safety by predicting potentially threating activities against public safety. Surat has reported 27% drop in criminal rates after implementation of AI-enabled safety systems.

- Cyber Attacks – AI technologies can be used to secure online platforms and protect sensitive data by identifying vulnerabilities and deploying remedial measures to reduce such exposure.

Budget
Rs 6,450 crore for 2019-20

3.14 How to implement other Countries smart villages projects in Indian village context (Regarding Environment, Employment):

In line with the described global initiatives and tendencies towards smarter and more sustainable communities, the European Union has also taken a holistic and integrative approach towards those objectives.

The first step specifically connected to Smart Villages was made in 2016 when the Cork Declaration has been proposed (Cork, Ireland), under the name A Better Life in Rural Areas. The declaration has very openly addressed some concerns about the state of the rural areas, specifically rural exodus and youth drain and thus paved the way for further orientations of future policies, including Smart Villages agenda. Through the ten points of addressing problematic of rural spaces, one of the main conclusions was that investment in rural areas is necessary, especially in the sense of encouraging of their identification processes, acknowledging their potentials for (economic) growth and ensuring that they will become attractive places for people of all ages to live in and work at. Particular attention has also been paid to overcome the digital divide between rural and urban spaces and developing the Potential of digitalization in rural areas.

In the following year, 2017, the European Commission launched EU Action for Smart Villages with the purpose to initiate some reflections on the villages of the future. Besides some funds and policies that have already existed before (e.g., Common Agricultural Policy, Rural development policy, EU Cohesion Policy), some new ones have been proposed: European Innovation Partnership for Agriculture (EIP-AGRI) that is directed towards development in the field of forestry and food production and The European Network for Rural Development (ENRD).

In order to promote Smart Villages, the plan proposed 16 actions suggesting organization of some workshops/seminars/conferences, thematic groups, new platforms (e.g., Smart specialization platform agri-food), setting up new offices (like Broadband Competence Offices), and very importantly, also suggesting some projects on SMARTA (Smart Rural Transport ‘Areas’) and Smart Eco-Social Villages.

The latter was specifically focusing on connectivity and digital solutions, but, more broadly, it was aimed at exploring some basic features of Smart Eco-Social Villages and identifying best examples that could be used in rural communities by decision makers in order to build future strategies. Very recently, in April 2018, another declaration was accepted: Bled Declaration (Bled, Slovenia).

The Declaration acknowledges "that the rural digital economy, if developed in an innovative, integrated and inclusive way, has the potential to improve the life-quality of rural citizens and, thereby, contribute to tackling the current depopulation of- and the migration from—rural areas". The Declaration proposed some actions to reach better conditions for developing farming enterprises and a new service sector; the two are addressing the rural Youth Drain, and will be providing the opportunity for the youth to return back home after finishing their studies and pursue white-collar jobs to further their specialization in their local area. By creating synergies between some technological achievements (precision farming, digital platforms—e-learning, e-health, e-administration etc., shared economy, circular economy, bio based economy, rural tourism, social innovation), the Declaration called for some Smart Villages to become a role model for further developments already in the following year, 2019. The Smart Village Network has also been established in 2018. It connects villages and associations across Europe enabling them the exchange of information and experiences and therefore making their voices lauder and stronger. Currently Slovenian member is Ptuj, small town in the north-eastern part of Slovenia and University of Ljubljana which is part of the network support.

Chapter 4: About HANSAPOR VILLAGE

4.1 Introduction:

4.1.1 Introduction about Hansapor Village details:

India is predominantly a land of villages. A major portion of the Indian population (around 72% of population) resides in villages because Indian economy is an agrarian economy. Today, there are more than six lakh villages in India.

An Indian village reflects the real picture of India. Mahatma Gandhi said that real India lives in village. As a matter of fact, is the very epitome of India's progress after the attainment of Independence? The government of free India paid much attention to the lifting of the standards of Indian villagers. An Indian village is still confronted with various problems that range from lack of education to improper sanitation.

No doubt, during the last ten Five Year plans, much has been done to uplift Indian villages. There are some villages in Punjab, Uttar Pradesh and Haryana which have all facilities, institutions, amenities needed for a comfortable life. However, the majority of them are still afflicted by the evils of ignorance and illiteracy.

(Figure 23: satellite view of hansapore)

An Indian villager is a rough diamond. He still sticks to the superstitions, customs and conventions of old era that have become obsolete and irrelevant in this modern era of science and technology.

Huts with thatched roofs and mud-packed walls are still a common sight in Indian villages. We still have undetailed roads, leading to and coming from the village. Its surroundings are green because of the crops and other vegetation. The streets are usually narrow with an open drainage system. During the rainy season, the entire village, because of poor sanitary conditions, gets flooded.

Outside the village, there is a pond where cattle drink water. There are some big and shady trees on the outskirts of the village where village people, farmers and others take rest during their leisure. Under these shady trees, they hold discussions and enjoy the slow pace of life. Some take their lunch under these trees.

There is also a well outside the village, from which villagers draw water for drinking. The scene at the village well in the mornings and evenings is worth watching. The village belles, dressed in their lovely colourful costumes with pitchers on their heads, come to take water from the well. To watch them chatting and talking while coming and going is an

alluring sight. The village school consists of two or three rooms where only one teacher teaches all the classes. The students of the school are ill-clad and rough. They sit on the floor.

An Indian village generally lacks amenities like police station, post office, health-centre and the rural dispensary. So, all of these features make an Indian village a rough and tough place. The village is run by the 'panchayat'- a group of elders, and everyone respects their decision.

Just as every dark cloud has a silver lining, Indian villages have their merits as well. People enjoy the pollution free air. The open fields with lush-green crop present a beautiful sight. The diet is very nourishing, milk, curd and other foods are abundantly available. The villagers have sound health. They live in the bosom of nature. The cool and fresh breeze of the morning, the scenes of sunrise and sunset with the farmers going to their fields along with their cattle and the tinkling of the bells tied round the necks of the cattle producing charming music are the sights, scenes and sounds that are very attractive and enchanting. But an Indian village needs improvements in many fields. After Herculean efforts on the part of the villagers and the administration, it can become an ideal dwelling place.

4.1.2 Justification/ need of the study:

The need of the study is to provide the basic requirements of people in the village and for rurban development of the village. For this purpose, the information of the village is collected based on different categories such as education, water facilities, drainage facilities, transportation facilities, primary health care, bank facilities, public toilets, community hall and other amenities.

65% of the population of the country lives on agriculture which contributes only 15 % to the country's gdp. If we compare this with china which has a similar sector contribution to the gdp, only 30% of people depend on agriculture whereas in country like usa just 2% of the people are dependent on agriculture. Rurbanisation addresses this concern and imbalance by providing alternate jobs to rural masses dependent upon agriculture.
So, it is very important to develop rural area compare to urban one.

4.1.3 Study Area (Broadly define):

village	Hansapore
Taluka name	**Jalalpor**
District	**Navsari**
State	**Gujarat**
Language	**Gujarati, Hindi, English**
Elevation/Altitude	**14mtr above sea level**

Telephone code	**02637**
Assembly constituency	**Jalalpore assembly constituency**
Lok sabha constituency	**Navsari parliamentary constituency**
Pin code	**396450**
Post office	**Hansapore**
Lattitude	**20.9486937 N**
Longitude	**72.8973212 E**

(Table 6: Study Area Hansapore)

4.1.4 Objectives of the study:

Following are the various objectives of study;

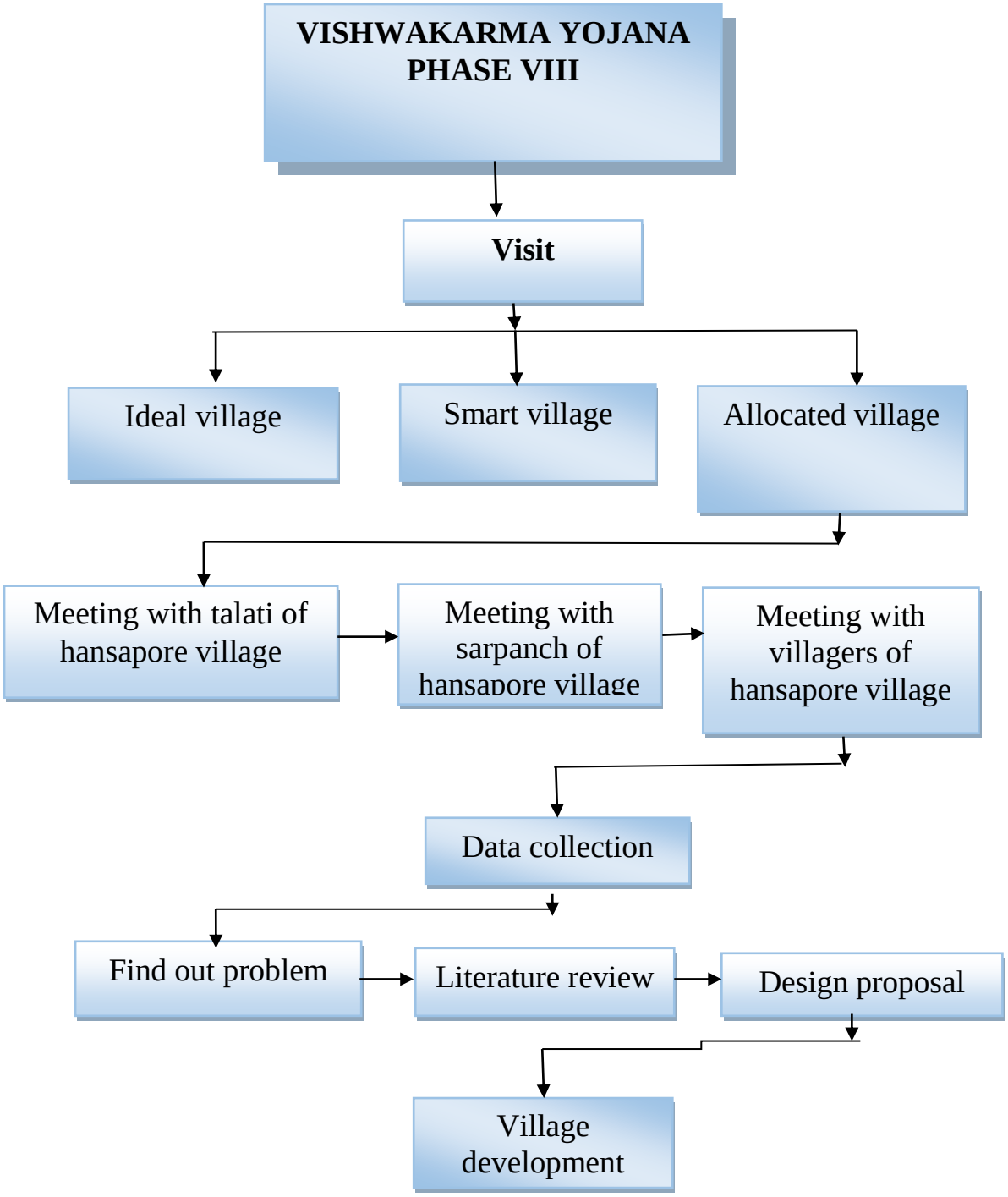
- To Provide Insufficient Basic Physical Infrastructure Facilities Like Water Supply, Transportation, Sewerage and Solid Waste Management Etc.
- To Provide Insufficient Social Infrastructure Facilities Like Health and Education Facilities and to Ensure Proper Delivery of Facilities to Village Dwellers.
- To Promote Integrated Development of Rural Areas with Provision of Quality Housing, Better Connectivity, Employment Opportunities and Supporting Physical and Social Infrastructure.
- To Provide Internal Roads Within Village Settlement & Efficient Mass Transportation Systems Between Clusters of Villages to Improve Connectivity.
- To Identification Sanitation Facilities That Are Needed to Be Improve Like Sewerage and Drainage Line, Dumping Facilities, Electricity Connections.

4.1.5 Scope of Study:

- There is huge scope of village development in future like, agricultural growth, economic and social infrastructure, village planning, public health, education and functional literacy, etc.

- Rural development has more important in India today than in the earlier period of development of the country. It enhanced rural production and productivity, greater socio-economic equity, and aspiration, balance in social and economic development.

4.1.6 Methodology frame work for development of your village

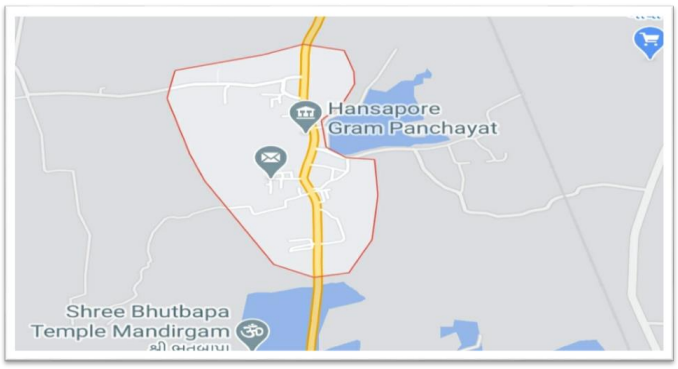


4.1.7 Survey from allocated village

- There are many methodology for development of village related to civil but commonly used method is survey and planning keep in view to people review.

4.2 Hansapore village study area profile

Hansapore is a village in Jalalpore Taluka in Navsari district of Gujarat State, India. It is located 7 KM towards South from district headquarters Navsari, 305 KM from State capital Gandhinagar. Navsari, Valsad, Surat, Pardi are the nearby Cities to Hansapore.



(Figure 24: study area of hansapore)

4.2.1 Study area location with brief history land use detail

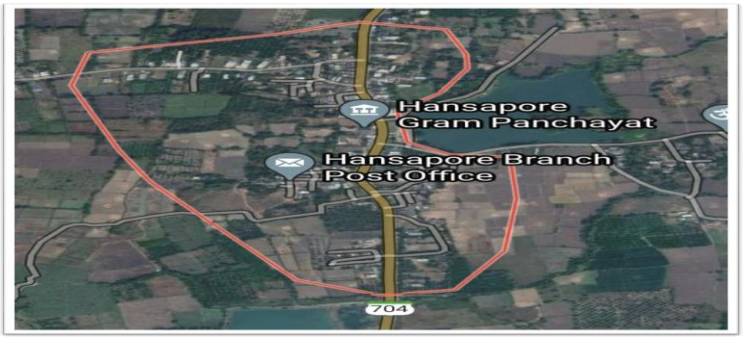
- Brief history:
  Hansapore village has some old mandir and it has some old superstation about this mandir, in village most of people are farmer and other has job in city.

- Land use:
  The main use of land in this village is for agricultural activities and residence purpose.

- Official language of hansapore:
  The main language of hansapore is Gujarati and 98% people speak Gujarati in hansapore village.

- Nearest city/town to hansapore:
  Hansapore's nearest town or city is:
  - Eroo (2 KM)
  - Bhustad (2 KM)
  - Ethan (3 KM)
  - Kalthan (4 KM)
  - Abrama (4 KM)

4.2.2 Base location map, land map, gram tal map:



(Figure 25: Map of hansapore village)

4.2.3 Physical & demographical growth:

Particular	Total	Male	Female
Total number of house	565		
Population	2250	1136	1114
Child (0-6)	177	86	91
Schedule caste	245	199	126
Schedule tribe	757	382	375
Literacy	85.91%	90.76%	81.04%
Total worker	1015	709	306

(Table 7: Physical & Demographical Growth)

4.2.4 Economic generation profile:

- Most of the people are depend on agriculture.Minor people depend on job.
- In hansapore village 1015 total worker and in this 709 male worker and 306 are female workers.
- Main worker in hansapore is 844 and marginal worker is 171 in marginal worker 85 is male and 86 is female.

4.2.5 Actual problem faced by villagers and smart solution

- The main problem faced by the villagers is low quality of drinking water, they don't have proper solid waste management system in village, open type drainage line, also don't have street light in some area.

4.2.6 Social scenario

Particular	Total	Male	Female
Total no of house	565	-	-
Population	2250	1136	1114
Child (0-6)	177	86	91
Schedule caste	245	119	126
Schedule tribe	757	382	375
Literacy	85.91%	90.67%	81.04%
Total worker	1015	709	306

Main worker	844	-	-
Marginal worker	171	85	86

(Table 8: Social Scenario)

(Figure 26: Open Gutter Line in Hansapore Village)
(Figure 27: Solid Waste Disposal at Road Side in Hansapore)

4.2.7 Migration reasons/trends

- Major reason for migration is employment but it is not a only reason for migration people also migrate from village due to higher education and marriage in outside of the village.

4.3 Data Collection

4.3.1 General (method of data collection)

- Base line survey
- Techno Economic survey
- Participatory survey
- Questionnaire survey

Base line survey is a benchmark for any intervention during and post implementation of any development programme. A detailed baseline survey was undertaken which involved household census survey, Bio-physical survey and Village level data collection from Sarpanch.

This gave in the details of the demographic profile of the village, the literacy percentage, SC/ST population, number of BPL household, cattle population and net consumption rate in the village, average milk production of the cattle and various schemes running and their benefits Biophysical survey was undertaken to identify various natural resources available in the village.

4.3.2 Primary detail of survey

Primary survey is done in order to collect the basic information about various facilities available in the village.

In this survey data is collected by various means like house to house means door to door survey, by interviewing people, school teachers, shop keepers, and other public.

Accuracy of this data is not sufficient means that data based on primary survey is not reliable or very accurate. Variances in the data happened due to different views of people.

We Survey the infrastructure facilities available in village lilke gram panchayat building, school building, water supply system, solid waste management, Water tank, Drainage line, Aaganwadi etc.

4.3.3 Average size of house-geo-tagging of house

- In hansapore village there are mainly two group of people who live in pucca type house while other group of people live in kutcha type house so there is large variation in the size of house.
- The average size of house in hansapore is 25-30 square metres.

4.3.4 Number of human being in one house

- The average number of human in one house in hansapore village is approximately 4-5.

4.3.5 Material available locally in the village and material out sourced by the villagers

- In hansapore village daily usage product like spices, soaps & detergents, vegetables etc. are easily available in village.

4.3.6 Geographical details

Sr. no	Description	Information
1	Area of village (approx.) in hector	410
2	Forest area	-
3	Agriculture land area in hector	311
4	Residential area in hector	98
5	Distance to the nearest railway station	0.5

(Table 9: Geographical Detail of Hansapore)

4.3.7 Demographical detail-cast wise population details/which ID proof using by the villagers

- There are many occupational groups in village but major three occupation are agriculture, job and labors.

4.3.9 Agriculture detail/ organic farming/ fishery

- The farmers usually used traditional methods for agricultural activities.
- They do fishery in pond available in village.

4.3.10 physical infrastructure facilities-manufacturing hub/ware houses

- The village has three and one overhead tank
- There is no manufacturing hub in village
- State highway is passing through village
- The village has one aagadvadi, one primary school, post office

4.3.11 Tourism development available in the village for attracting the tourist

- They don't have any site for develop as tourisms.

4.4 Infrastructure Facilities

- State high way pass through village
- Some internal road made of paver block some made of R.C.C
- In village they have one aaganwadi and one primary school
- The village have one overhead tank

(Figure 28: Bus Station of Hansapore)

- In village they have 3 pond and many villagers have private bore well
- Hand pumps are available in village
- They also have irrigation channel
- In village they have 3 bus stop

(Figure 29: Aangadvadi of Hansapore)
(Figure 30: Internal Road of Hansapore)
(Figure 31: Primary School Of Hansapore)

4.4.1 drinking water/water management facility

- The village have one overhead water tank which are utilized for daily consumption of people.
- Many people used their own bore wall.
- The village also has hand pump and pond.

(Figure 32: Overhead Water Tank of Hansapore)

- From the over hand water tank is well connected through the pipe line to provide water at every house.
- In this village people are mainly use their own water purifier machine for drinking and some use direct form well

(Figure 33: Pond of Hansapore)

4.4.2 Drainage network/sanitation facility

- In hansapore some part of drainage line is closed and some part of drainage line is open.
- In this village there are no any arrangement for drain of rain water through drainage line.

(Figure 34: Open Drainage Line of Hansapore)
(Figure 35: Main Hole of Gutter Line in Hansapore)

- **Sanitation facility:**

Sanitation facility	Details	Remark

Public latrine block	Not available	Required
Solid and liquid waste collection system	Not available	Require
Dump of garbage	Available	On ground
Solid waste collection system	Not available	Required
Drainage line	Available	Open

(Table 10: Sanitation Facility in Hansapore)

4.4.3 Transportation and road network

- In hansapore village some internal road some made of paver block and some are made of R.C.C
- Hansapore is connected with state highway which made of bitumen and in good condition.

(Figure 36: Internal Road of Hansapore)

(Figure 37: state highway)

4.4.4 Housing condition

- In hansapore there are 565 total house in this 565 house 50% is pucca and 50% are kutchha house

4.4.5 Social infrastructure facilities, health, education, community hall, library

- **Health facilities**

Description	**Details**	**Remarks**
ICDS (aagadvadi)	1	Adequate
Sub-center	1	Adequate
PHC	1	Adequate
CHC/RH	Not available	Required

Govt.hospital	Not available	Required
Govt.dispencary	Not available	Required
AYUSH health facility	1	Adequate
Sonography/ultrasound facility	Not available	Required

(Table 11: Health Facility)

(Figure 38: PHC & AYUSHMAN BHARAT Facility at Hansapore)

- **Education facility**

Description	Details	Remarks
Aagadvadi/playgroup	1	Adequate
Primary school	1	Adequate
Secondary school	Not available	Required
Higher secondary school	Not available	Required
ITI/vocational training center	Not available	Required

(Table 12: Education Facility)

(Figure 39: Aagadvadi at Hansapore)
(Figure 40: Primary School at Hansapore)

- **Community hall**

  In hansapore they have a community hall next to aagadvadi but community hall not in good condition

(Figure 41: Community Hall at Hansapore)

- There is no library in hansapore.

4.4.6 Existing condition of public building and maintenance of existing infrastructure

- The condition of existing building is good but community hall, aagadvadi, gram panchayat, dudh mandli, need some maintenance.

4.4.7 Technology mobile/ Wi-Fi/ internet use detail

- In hansapore 90% people use smart phone and use their own internet and at some houses they have personal Wi-Fi at home.

4.4.8 Sport activity as gram panchayat

- During winter villager organise night wallyball tournament
- During summer vacation they organise cricket tournament

4.4.9 social-cultural facilities, public garden/park/playground/pond/other recreation facility

Description	Details	Remark
Public garden	Not available	Required
Public library	Not available	Required
Community hall	Available	Poor condition
Pond	Available	Good condition
Recreation center	Not available	Required
Assembly polling station	Not available	Required
Cinema/video hall	Not available	Required
Birth and death registration office	Available	Maintenance required

(Table 13: Social Cultural Facility)

(Figure 42: Pond at Hansapore)
(Figure 43: Birth and Death Registration Office Hansapore)

4.4.10 Other Facility

- Electricity
  - There is 24/7 electricity is available in residential area of hansapore village
  - In village less than 50% people use solar penal for electricity
  - In hansapore electricity is supply by D.G.V.C.L
  - Generally the power cut occur on Monday.

4.4.11 Any Other Facility

- Post office is available in village.
- There is no general market for villagers so they sell their vegetable to APMC market or at Eru Charasta market
- Panchayat Building is available but requires maintenance.
- The Village also has Milk Co-operative society through this villagers can sell their milk directly and get instant money.
- There is lake of some facilities like Pharmacy/medical shop, Agriculture Co-operative Society, etc. in this village.

(Figure 44: Post office at hansapore)
(Figure 45: Dudh Mandali at Hansapore)

4.5 Electrical Concept

4.5.1 Renewable energy source planning particularly for village

- A village is a rural area so there were Renewable energy facilities is not available.
- So we can develop renewable energy like Solar panel, solar streetlight, solar water heater etc.

- Solar power harvests the energy of the sun through using collector panel to create conditions that can then be turned in to kind of power.

4.5.2 Irrigation facility

- The electrical facilities is the most important facilities in irrigation system. Most of the farmers have borewell and well in their field so the electricity is the most important for them but some villagers use fuel for irrigation system.
- Irrigation Channel and Borewell are main source of irrigation.
- People also used pond water for irrigation.
- Farmer in the village is mostly adopt surface irrigation method.

4.5.3 Electric facility with area

- In hansapore village electricity is provided by D.G.V.C.L. in hansapore village electric supply provided by the eru subdivision of DGVCL.
- In some area they don't have proper electricity because some people don't have connection so we provide solar street light in this type of area

4.6 existing institution like-village administration-detail profile

4.6.1 Bachat mandala

- This yojana doesn't exist in hansapore village

4.6.2 Dudh mandala

- Milk co-operative society is available in this village they collect the milk from villagers and pay them.

4.6.3 Mahila mandali

- In hansapore village there are various types of yojana running like balika samriddhi yojana, mahila protsahan yojana, and janani suraksha yojana.

4.6.4 Plantation for air pollution

- In this village or nearby they don't have any industry and air quality of this village is good and they also surrounded by farming land too many trees so they don't need to extra plantation

- And in hansapore village too many farmers have amba vadi and chiqu vadi so they improve the air quality index

4.6.5 Rain water harvesting-waste water recycling

- There is no arrangement for collection of rain water and waste water in village.

4.6.6 Agricultural development

- In hansapore village 90% farmers use traditional method for farming very less number of farmer use modern technology for farming.
- Navsari agricultural university play major role for agricultural development in hansapore village.

4.6.7 Any other

- In village various types of govt. scheme is running but the most highlighted scheme are Pradhan mantri Avas and Sardar Avas yojana

Chapter 5: Technical Option with Case Study

5.1 Concept (Civil)

- As a civil engineer our main aim to deal with the most urgent need of the people in order to make their life comfortable and easy by best infrastructure facility and other facility like drainage line work, water storage work etc.

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. 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 minimised 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 minimise 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.

5.1.2 Soil liquefaction

(Figure 46: soil liquefaction)

Soil liquefaction occurs when a saturated or partially saturated soil substantially loses strength and stiffness in response to an applied stress such as shaking during an earthquake or other sudden change in stress condition, in which material that is ordinarily a solid behaves like a liquid. In soil mechanics, the term "liquefied" was first used by Allen Hazen in reference to the 1918 failure of the Calaveras Dam in California. He described the mechanism of flow liquefaction of the embankment dam as If the pressure of the water in the pores is great enough to carry all the load, it will have the effect of holding the particles apart and of producing a condition that is practically equivalent to that of quicksand… the initial movement of some part of the

material might result in accumulating pressure, first on one point, and then on another, successively, as the early points of concentration were liquefied.

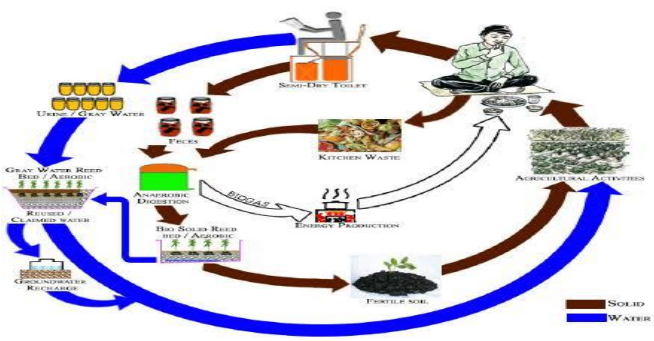
The phenomenon is most often observed in saturated, loose (low density or uncompacted), sandy soils. This is because a loose sand has a tendency to compress when a load is applied. Dense sands, by contrast, tend to expand in volume or 'dilate'. If the soil is saturated by water, a condition that often exists when the soil is below the water table or sea level, then water fills the gaps between soil grains ('pore spaces'). In response to soil compressing, the pore water pressure increases and the water attempts to flow out from the soil to zones of low pressure (usually upward towards the ground surface). However, if the loading is rapidly applied and large enough, or is repeated many times (e.g. earthquake shaking, storm wave loading) such that the water does not flow out before the next cycle of load is applied, the water pressures may build to the extent that it exceeds the force (contact stresses) between the grains of soil that keep them in contact. These contacts between grains are the means by which the weight from buildings and overlying soil layers is transferred from the ground surface to layers of soil or rock at greater depths. This loss of soil structure causes it to lose its strength (the ability to transfer shear stress), and it may be observed to flow like a liquid (hence 'liquefaction').

Although the effects of soil liquefaction have been long understood, engineers took more notice after the 1964 Niigata earthquake and 1964 Alaska earthquake. It was a major factor in the destruction in San Francisco's Marina District during the 1989 Loma Prieta earthquake, and in Port of Kobe during the 1995 Great Hanshin earthquake. More recently soil liquefaction was largely responsible for extensive damage to residential properties in the eastern suburbs and satellite townships of Christchurch, New Zealand during the 2010 Canterbury earthquake and more extensively again following the Christchurch earthquakes that followed in early and mid-2011. On 28 September 2018, an earthquake of 7.5 magnitude hit the Central Sulawesi province of Indonesia. Resulting soil liquefaction buried the suburb of Balaroa and Petobo village in 3 meters deep mud. The government of Indonesia is considering designating the two neighborhoods of Balaroa and Petobo that have been totally buried under mud, as mass graves.

The building codes in many countries require engineers to consider the effects of soil liquefaction in the design of new buildings and infrastructure such as bridges, embankment dams and retaining structures.

5.1.3 Sustainable sanitation

Sustainable sanitation is a simple approach: the most basic principle is that it considers wastewater and excreta not as a waste, but as a resource, that sanitation has to be socially acceptable and should be as economically viable as possible.



(figure 47: sustainable sanitation)

5.1.4 Transportation infrastructure/system

About seventy percent of the population of India are living in the rural areas. Therefore developments in urban centres alone do not indicate the overall development of the country. Only with the improvement in transportation facilities in rural areas,there could be faster developments of these areas, resulting in overall development of the country. The fertilizers and the other inputs for agriculture and cottage industries could reach the rural population easily and then the products of the villages can be sold in nearest market resulting in economic growth.

THE IMPACTS OF RURAL ROAD CONNECTIVITY:

- Improved transportation services leads to improve access to market centres for the rural producers, better availability of farm inputs at reduced price.
- Better connectivity enhances employment opportunities in the non-agricultural sectors.
- Improved services with improved road connectivity, enhances access to education, health and financial services.
- Improve the connectivity of village people from major city roads by that all public services are improved.

5.1.5 Vertical farming

Vertical farming is the practice of producing food on vertically inclined surfaces. Instead of farming vegetables and other foods on a single level, such as in a field or a greenhouse, this method produces foods in vertically stacked layers commonly integrated into other structures like a skyscraper, shipping container or repurposed warehouse.

(Figure 48: vertical farming)

Using Controlled Environment Agriculture (CEA) technology, this modern idea uses indoor farming techniques. The artificial control of temperature, light, humidity, and gases makes producing foods and medicine indoor possible. In many ways, vertical farming is similar to greenhouses where metal reflectors and artificial lighting augment natural sunlight. The primary goal of vertical farming is maximizing crops output in a limited space.

Advantages

- It offers a plan to handle future food demands
- It allows crops to grow year-round
- It uses significantly less water
- Weather doesn't affect the crops
- More organic crops can be grown
- There is less exposure to chemicals and disease

Disadvantages

- It could be very costly to build and economic feasibility studies haven't yet been completed
- Pollination would be very difficult and costly
- It would involve higher labor costs
- It relies too much on technology and one day of power loss would be devastating

5.1.6 Corrosion mechanism, prevention & repair measure of RCC structure

Corrosion mechanism

Corrosion is a natural process that occurs when the steel rebar within reinforced concrete structures rusts. In scientific terms, concrete corrosion is defined as the "destruction of metal by chemical, electrochemical, and electrolytic reactions within its environment." It typically forms as the concrete ages. Corrosion is initiated when materials that are harmful to steel, such as CO2 and chloride from de-icing salt, start to penetrate concrete and reach the steel reinforcement. As an electrochemical reaction, electrons migrate from the anodic zone to the cathodic zone, releasing ferrous ions at the anode and hydroxide ions at the cathode. This will eventually lead to a potential difference between the anodic and cathodic areas at the surface of the steel reinforcement. This results in the creation of rust as a byproduct. Since rust occupies a larger volume than steel, it exerts internal pressure which causes the surrounding concrete to crack and become damaged. These cracks make their way to the surface of the concrete which causes even more CO2 and chloride to penetrate the concrete and speed up the process of corrosion.

Corrosion is responsible for up to 90% of damage to reinforced concrete structures.

Prevention & repair

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

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

Unfortunately, these traditional methods meant for tackling concrete corrosion have proven to be less effective than desired considering the current state of deteriorating infrastructure. Thick or dense concrete cover over reinforcing steel will help, but still leaves the concrete vulnerable to cracking and a whole new set of issues. Corrosion inhibitors provide only temporary protection. Cathodic protection is expensive and has its own downsides, and repair procedures often have short service lives and may be continuously reinstalled.

The constant repair of reinforced concrete infrastructure results in high lifecycle costs over the structure's required service life. Overall, the shortfall of traditional corrosion preventative measures is they do not adequately prevent or counteract the development of corrosive conditions in the concrete.

Water is one of the three required elements for corrosion to occur. Water also acts as a carrier for chloride ions, which is the leading cause of deterioration of the passive layer that would otherwise protect the rebar. Hence, the critical factor in the corrosion of steel reinforcement, as well as concrete deterioration all together, is the penetration of water and waterborne chlorides into concrete.

Therefore, the first line of defense against corrosion in reinforced concrete is to prevent the penetration of water. It is important to use concrete with low permeability and to use an appropriate amount of concrete cover for the application.

5.1.7 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.

- Instead of direct through the sewage in the river/lake it is good to treat sewage water before drain off the water in to the river/lake.
- The major aim of waste water treatment is to remove as much of the suspended solids as possible before the remaining water, called effluent, is discharged back to the environment.
- For treat waste water we also provide some natural treatment like wetland or some natural plant at the end of the drainage line its cheaper than treatment plant

5.1.8 Technical Case Study on "Gujarat International Finance Tec-City (GIFT)

Gujarat's Strengths

- Traditional Business Community
- High Growth Economy-- >10 % over last five years
- Pool of Trained Manpower
- CAs
- Commerce Graduates
- Active Markets--Capital Markets Gujarat contributes 30% of stock marketcapitalization

Proactive Government

Need for finance city in India

Following sectors have been acknowledge as high growth for India:

- Financial services
- IT/ITeS
- BPO/KPO

As per McKinsey study by 2020

- The sector could provide a potential 10 million to 11 million jobs
- About 800 mm sq ft of office space
- GDP contribution could outperform at a rate of 15 to 20%

Opportunities are constrained

- Infrastructure bottlenecks
- Overcrowded cities

Solution: setting up self-sustaining cities

Financial service opportunities

- Gujarat has potential to access a large financial service opportunity

Sr. No.	financial service	Estimated no of jobs (Thousands)
1	Financial service operation	125-150
2	Financial service corporate center	100-125
3	Select product market	10-15

4	Capital markets & trading	2-4
5	IT for financial service	200-225
6	ITeS for financial service	75-100
	Total	500-600

(Table 14: financial service of GIFT)

- Gujarat international finance Tec-city company limited (GIFTCL) incorporated in June 2007
- 50:50 joint venture between
  - Gujarat urban development co. ltd. (GUDC) and
  - Infrastructure leasing and financial services ltd. (IL&FS)
- Share capital: Rs. 5 Cr and PDF of Rs. 40 Cr

Location of GIFT

GIFT city is located 12 km away from Ahmedabad and 8 km away from Gandhinagar. Area of GIFT city is 550 acres

(Figure 49: location of GIFT)

Master planning

- 30 building block
- 125 building
- 3 landmark above 350 mt
- 27 above 150 mt
- 46 building above 100 mt
- 3 school
- 200 bed hospital
- 4 hotels

(Figure 50: master plan of city)

Landmark building

(Figure 51: landmark location in map)

The GIFT real estate component comprises office, service and residential facilities

BUA component	Area (Million sq.ft.)	In %
Residential	20.94	23%
Commercial	54.05	60%
Hotel	2.05	2%
Retail	4.78	5%
Public building	7.49	9%
Recreational	1.02	1%
Total	91.2	100%

(Table 15: real estate components of GIFT)

Compared to the best CBD's of the world

	Paris	Tokyo	London	pudong	GIFT
Land use scale (sqkm)	1.6	1.6	1.05	1.7	2.04
Construction scale (sqm)	2.5 mm	1.6 mm	1.1 mm	4.5 mm	8.48 mm
Floor-area ratio	1.56	1.00	1.05	2.65	4.13
Greenbelt (sqm)	40000	120000	50000	363500	517821
Height (m)	200	250	250	490	405

(Table 16: comparison of world CBD's)

GIFT infrastructure development overview

- Core infrastructure
  - Site development
  - Landscaping

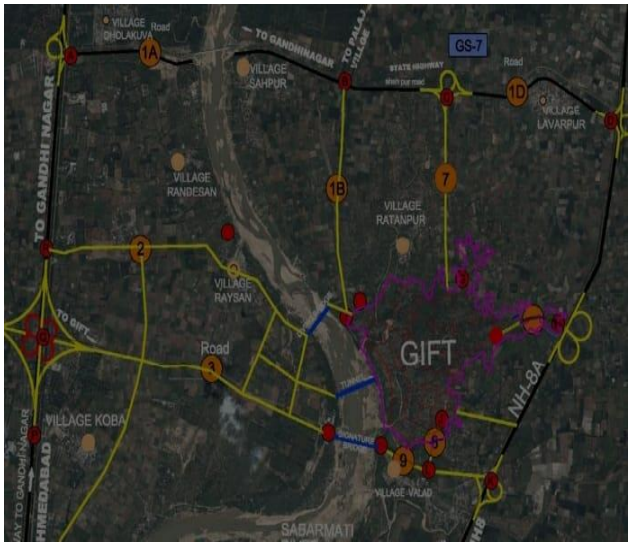
- Maintenance systems

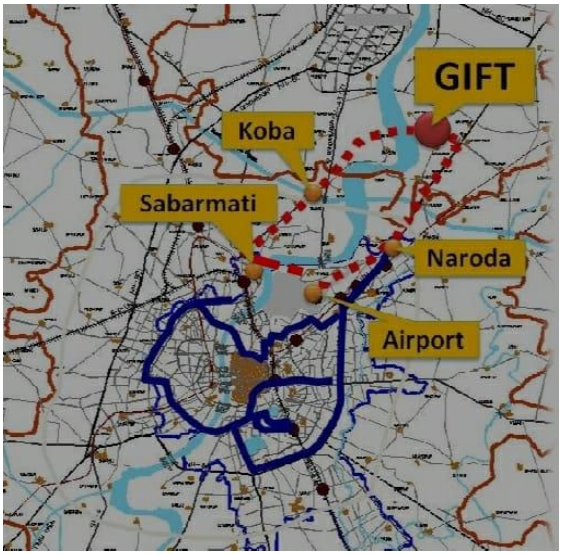
- Transportation & utilities
  - Road and transportation
  - Water system
  - Waste management systems
  - Power generation and distribution
  - District cooling system
  - ICT
  - Domestic gas distribution

Transportation connectivity

- Direct access from all directions
- Extension of BRTS to GIFT

MRTS plan





(Figure 52: external road connectivity)
(Figure 53: extension of BRTS up to GIFT city)

Transportation vision

- Segregation vehicular & pedestrian
- Modal split of 10:90 between private and public transport
- Walk to work concept
- Aiming zero fatal accident city
- Transit oriented development

Transport elements

- Surface roads (2/4 lane – 14 km)
- Recessed roads-underground (15.5 km)
- Intelligent transport system
  - 210 CCTV cameras
  - 96 HR cameras

Parking hubs

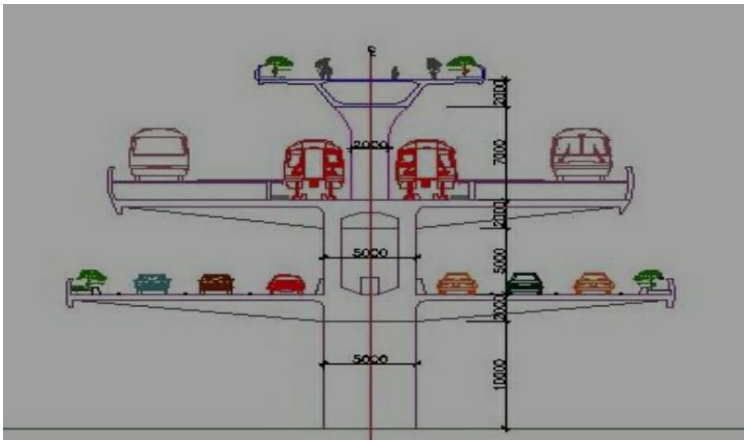
- GIFT building basements: total car park capacity 85000 cars
- 4 external parking hubs: total capacity of 30000 car

Logistic hub

- Serve to receive-store-distribute supplies to the city
- Area = 12 acre capacity: 800 ton
- Located at junction of NH8 & main arterial road to GIFT
- 3 lane entry/exit road with lay bye from NH8

Living bridge

- The 'living bridge' would have a length of 600 m, 8 lanes of divided carriageway with vertical segregation of public transportation and pedestrian walkway



(Figure 54: cross section through bridge)

PRT- personal rapid transport

Innovative technology

- Automatic personal transit service
- Intelligent vehicle
- Available on demand 24*7
- Dedicated guide-way network
- Nonstop travel direct to destination
- Station are offline

Water source, promenade and water front development

- Total water requirement: 20 MGD
- Water sources:
  - Narmada main canal
  - Recycling and reuse of wastewater
  - Rainwater harvesting
- GIFT master reservoir
- Concept of zero discharge city
- Perennial water front ensured through construction of three barrages on river Sabarmati

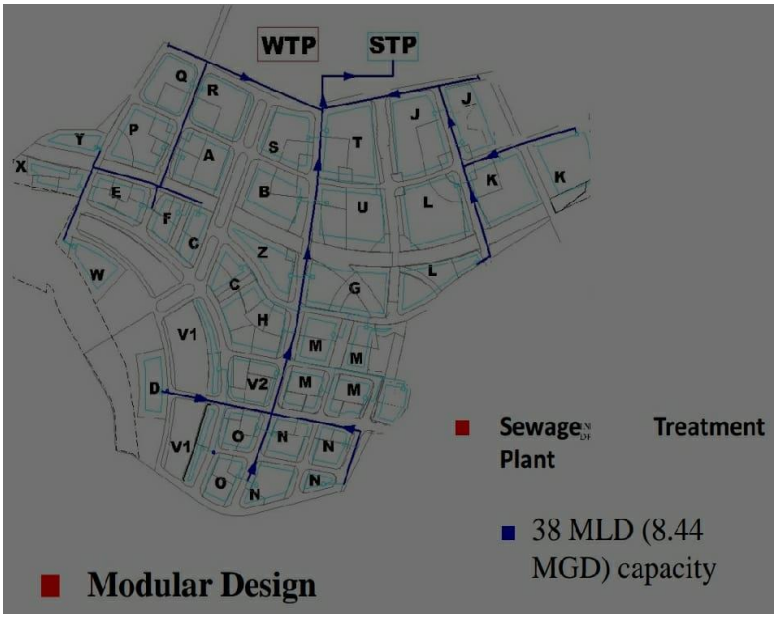
- Proposed landscaped promenade at river bank along GIFT

(Figure 55: water sources)

Sewage treatment

Concept of zero discharge city

- Stage 1: primary treatment
  - Screening and degrading
- Stage 2: secondary treatment
  - Includes biological process to remove organic matter and BOD



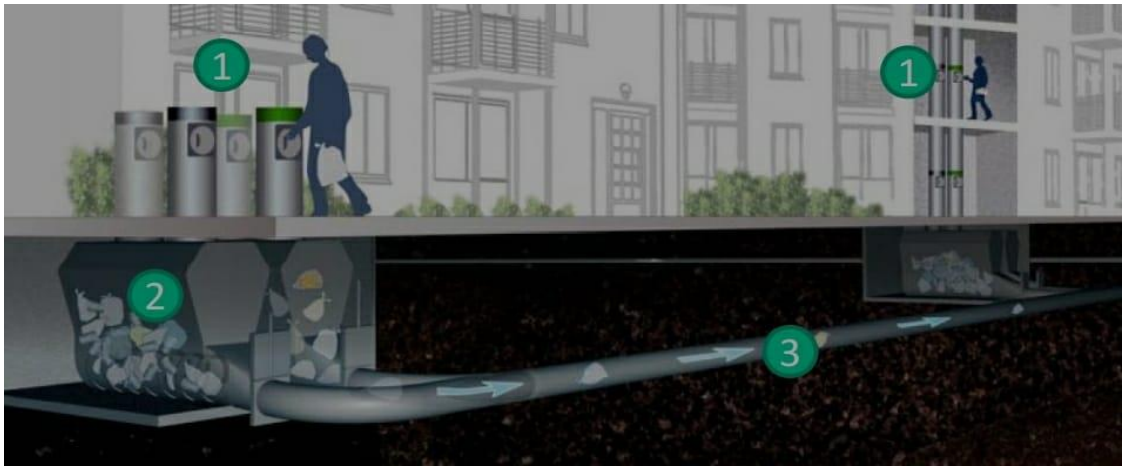
(Figure 56: sewage treatment)

- Stage 3: tertiary treatment
  - Polish the treated sewage after secondary treatment to bring the water quality up to the level of reuse
- Treated water would be used for flushing, landscaping and as make-up water for AC cooling towers

Solid waste management

- Projected waste quality of GIFT: 488 TPD

- Minimize impact on environment, human intervention, space requirement, impact on health hazard



(Figure 57: automatic waste collection and transportation system)

- The waste is thrown into a disposal chute
- Computer controlled access
- Waste sucked through pipes at a speed of 90 km/hr
- Plasma technology would be used for waste treatment

Power

- Planned captive power plant capacity- 1000 MW
- Underground cabling for power distribution within the area of GIFT
- Substation and distribution automation
- Indoor substation

District cooling

- Conventional AC system not required
- Efficiency through economies of scale
- Reduce maintenance costs
- Improves air quality and temperature control
- Reduce noise and vibration
- Total capacity: 3.25 lakh ton

(Figure 58: centralized air conditioning system)

Service trenches

- 7.5 km in length, 6.5 mt height and width varying from 24 to 36 mts
- Supply of services in a sub-surface regular grid
- Buildings to tap in the grid wherever required
- All services housed in various division of sub-surface ditch
- No service line aboveground

(Figure 59: integrated underground service trenches)

- Alternate sources & technology to be used for resources management water & power in particular

Information and communication technology

- GIFT occupants would have access to following ICT service
- Infrastructure
  - High speed fiber network
  - Diverse local and international connectivity
  - Pervasive wireless and mobile network
  - Data centers
- Platforms
  - Financial extranets
  - CUG to exchanges
  - Voice
  - Industry specific platforms
  - City e-portal
  - Sensor networks
  - IPTV internet gateway
- Services
  - Data
  - Voice
  - Wi-Fi
  - Tier-4 data centers
  - Business continuity
  - Security
  - High speed internet access
  - Monitoring

Construction work force development

- 20,000 worker can be employed during construction peak
- Specialized workforce required for
  - Construction of tunnel & underground roads
  - Construction of building having height of 300-400 mt
  - Specialized experts for survey, quality & lab testing
  - Installation of huge glass work/facades
- Meetings held with various stakeholders for skill set development of construction workforce
- State government to strengthen ITI's
- A separate institution to be set up for specialized construction work force

Project cost and structuring

- total estimate project cost: Rs. 70,270 Cr
- core infrastructure: Rs. 10,475 Cr
  - site development
  - landscape
  - roads
  - storm water draining
  - river training
- user pay utilities: Rs. 25,021 Cr
  - power generation
  - power distribution
  - waste management system
  - district cooling
  - gas system
  - ICT
  - Parking system
- Real estate: Rs. 34,774 Cr
  - Office
  - Commercial
  - Residential
  - Hotels

5.2 Concept (Electrical)

5.2.1 Programmable Load Shedding:

Electric utilities load shed when there is huge demand for electricity exceeding supply or if power generated is less than the consumers demand, the need to shed load is eminent in order to avoid total breakdown of equipment's used by power distribution companies as a result of overloading effect. So, this project is about automatic load management system for optimized and automatic load shedding.

Introduction to Load Management:

This design is focused on time management automatic load shedding system, its aim is to automatically switch ON/OFF different load distribution lines multiple number of times. This system is takes over the manual task of switching ON/OFF of power distribution lines with respect to time this way load is shared to different areas or regions with respect to time as it helps to define user load priority and groups.

The system uses real time clock (RTC) interfaced to an Arduino UNO ATMEGA328 series microcontroller, while the set time equals the real time, the microcontroller gives command to the corresponding relay to turn ON the load and then another command to switch OFF as per the program. Multiple ON/OFF time entry is the biggest advantage with this project.

Push button switches are being used in this project to set up the control and also used to enter the ON/OFF time. A liquid crystal display (LCD) is interfaced to the microcontroller for displaying every information needed to setup the device.

Areas of Application:

This Project can be used in:

1. Power distribution companies to shed load automatically, reduce downtime for critical loads, reduce spinning reserve requirements etc.
2. Implemented in factories to manage the ON/OFF time of different generator sets.
3. Our homes to switch ON and OFF different generator set.

4. Principle of Operation of Automatic Load Management System:

This project time management automatic load shedding system consist of 12v step-down transformer, bridge rectifier, voltage regulator, ATMEGA328 microcontroller, LCD, real-time clock and push button switches.

Once there is an AC supply to the 12v transformer, it passes through the bridge rectifier which converts the AC voltage to DC voltage and the lm705 voltage regulator regulates the voltage to 5volts maximum and it supplies voltage to the LCD, microcontroller, real time clock and relay unit, the LCD displays date and time and the middle push button switch is used as menu switch while the other two switch is used to adjust the real time and date, the load ON time and OFF time, the relay for load and the days it will be ON, while the LCD shows all the necessary information of Load Management System.

Once the set-time equals the real time the corresponding relay get energized and turn ON the load connected to it.

Hardware Design of Automatic Load Shedding Management System:

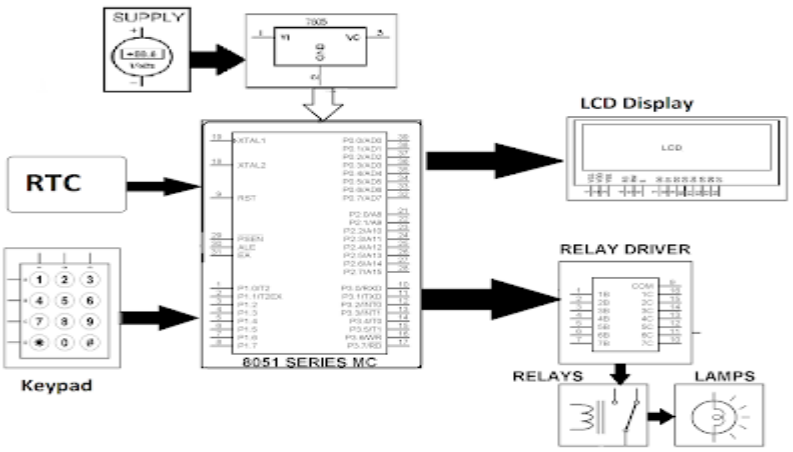
Components Used:

1. Resistors
2. Capacitors
3. Diodes
4. Voltage regulator 7805
5. Relay

6. Transformer
7. Integrated circuits
8. Liquid crystal display (LCD)
9. Push button switch
10. Real time clock DS12887 RTC

Design of Circuit:

Proteus electronic software was used in simulation of the circuit. This software allows for design moderations likewise other software's such as livewire etc. The entire circuitry is subdivided into Six Units as shown below:



(Fig 60: Block Diagram of Automatic Load Shedding Time Management System)

Power Supply Unit:

Power supply to this circuit is taken from any of these three source (public power supply, Generators or Inverter) and it is fed into the primary of a stepdown transformer within the power unit's circuitry which is being rectified and filtered. The filtered output powers the system thereby enabling other operations.

Microcontroller Unit:

The microcontroller unit is an essential part of the circuitry, here all the codes are compiled. This controls the activities of all other sections of automatic Load Management System such as:

Real Time Clock Unit:

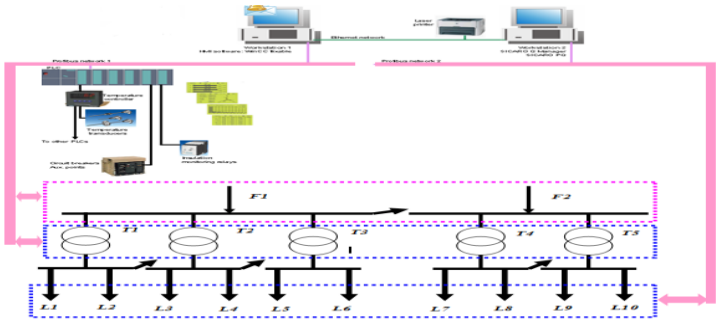
The real time clock is an electronic chip that provides the real timing for the circuit.

Digital Display Unit:

The digital display unit uses liquid crystal to show the operation and working of the circuit.

Relay Unit:

This unit receives signal from the microcontroller which controls the output(s) automatically for Load Management System.



(Fig 61. Complete Circuit Diagram of Automatic Load Management System)

Firmware Design:

The system control is done by the firmware. Its source code is written in assembly language and assembled using the Arduino Software IDE and burnt on to the Arduino microcontroller program memory.

5.2.2 Railway Security System using IoT:

In this project we are implementing a device system which can detects the fault in the railway track. Indian railways are the seventh largest railway system in the world .Till date there are many cases of rail derailment due to track damage. The main solution towards this project is automatic detection of crack in the railway track along with location sharing module. Internet of Things is used to update the information on the proposed method to the control station unit. The method employs the use of IR sensor for CRACK Detection and GPS receiver to locate the crack. A WIFI module is used to send Data to Cloud to notify the authorities about the fracture/crack which are embedded in autonomous railway track crack detection device.

Keywords: crack detection, IR sensor, location sharing.

India has 164 years of great history of railway network. Its length is 1, 19,630 Kilometers of total track & running route is 66,687 Kilometers with 7216 railway stations. In India billions of passengers travel by railways. So, it is necessary to provide required safety & reliability to railway network. According to newspaper 90% of railway accidents occur due to railway track fault. Generally the railway track fault is occurring due to natural calamities, any other mechanical damage etc. For reduction of railway accidents one of best approach would be to use an autonomous railway track fault detection device. By this we can reduce railway accidents and save millions of lives

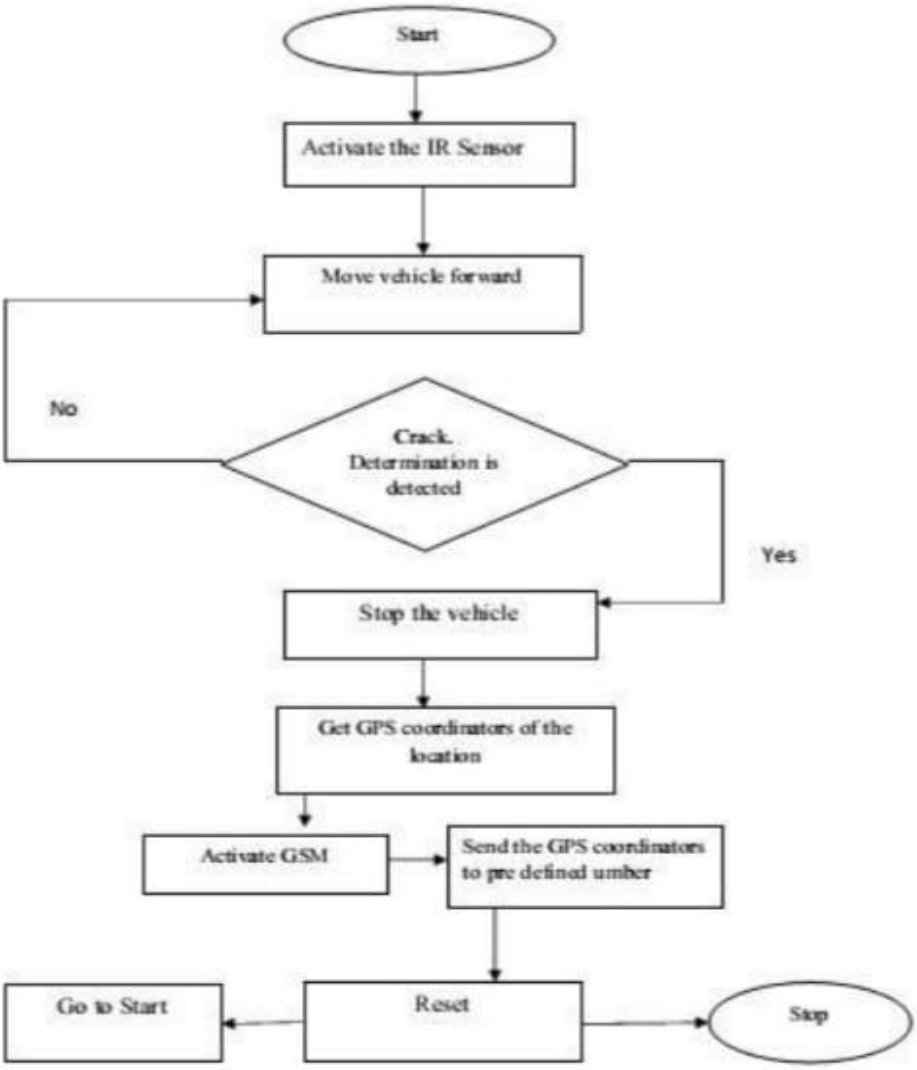
Function:

The main purpose of this autonomous vehicle is to find the detection of railway track fault and it is also useful for the railway maintenance department for inspection of railway track. We can also find fault location by using this device and location information is send to the predefined phone number of control station which is near by the vehicle. This will help in maintaining and monitoring of the railway track. The proposed system uses Infra-Red sensor, for sensing the presence of a gap in the railway tracks. The system employs an IoT based approach which has infinite functions. In this proposed system there are three modules

- Crack Detection system using IR sensors.
- Location sharing.

- Internet of Things.

Block diagram:



Conclusion:

Finally our project has an idea for the main purpose of autonomous vehicle with which it should be find the railway track fault detection system and it is also very useful for the railway maintenance department for inspection of railway track lines. And we can also find the fault by the location and for this the device used and also location information is send to the predefined phone number. So that this will help us in the maintenance and also in the monitoring of railway line. By using track detection model this device was required a very low power consumption and we can also say that it is a free energy vehicle.

5.2.3 Management through Energy Harvesting Concept:

Harvesting energy from non-conventional sources in the environment has received a lot of attention from researchers looking into how these alternative energy sources can be used for lower power applications. Although energy harvesting involves capturing and storing small amounts of energy, it's enough to power wireless sensors and other low-power applications.

There's a lot of wasted energy in the environment that could be used to power various circuits as a cheap source of power. When applied to wireless sensor networks and IoT devices, it is an eco-friendly solution that helps eliminate the need for network-based energy and conventional batteries, minimizes costs, and reduces the need for cables and batteries.

This makes it advantageous to applications in remote areas, underwater, and other hard to reach places where conventional batteries are not suitable. Industries that look to capitalize on this potential include those looking for both low-voltage and low-power applications such as what is used in medical equipment, consumer devices, portables, transportation, industrial controls, and the military.

Energy that can be harvested by scavengers could be byproducts of natural environmental phenomena (solar, wind, tide), industrial process, and the energy produced by every electronic device or gadget (heat and/or vibrations). During the Solar Power Devices, solar cells were used to capture light from the sun in order to produce energy.

This is also known as photovoltaic harvesting. Other methods that you can explore are thermoelectric (heat) harvesting, piezoelectric (vibration) harvesting, and RF/Electromagnetic Harvesting (excess energy from transmitted communication signals). Below are some common energy harvesting techniques?

Photovoltaic Harvesting:

Photovoltaic harvesting is the process of turning direct sunlight into electricity. It is the most popular form of harnessing the power of the sun. It is the process of turning direct sunlight into electricity. The photoelectric effect, the ability to create voltage and electric current in material upon exposure to light, was first observed

(Fig 62: Photovoltaic Harvesting)

in 1839 by French physicist Edmund Bequere. When he noticed that certain material produces small amounts of electric current when exposed to light.

In 1954, the first commercial photovoltaic cell was built by Bell Laboratories. It was a solar battery that was too expensive to be anything but a curiosity. The first serious use of the technology was to provide power aboard a spacecraft during the 1960s. When the energy crisis of the 1970s hit, it began receiving recognition as a power source beyond non-space applications. Today, increased efficiency and affordability has led this eco-friendly

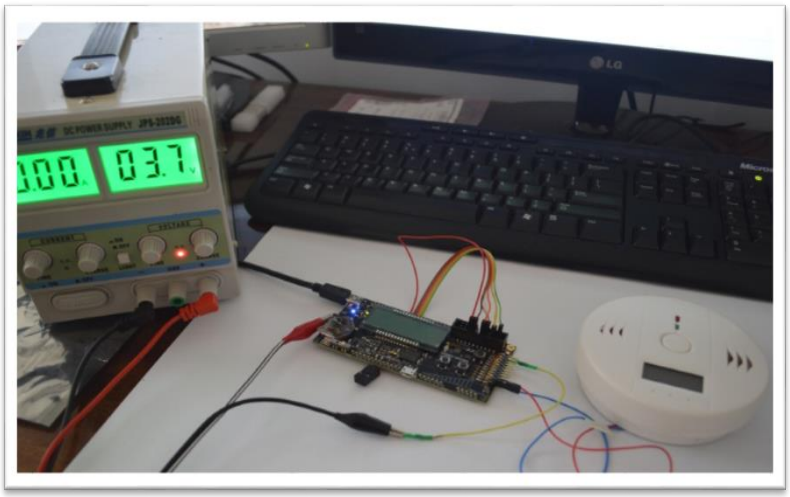
technology to be used in everything from powering electronics, cars, commercial buildings, and as a supplement to power grids.

A photovoltaic system works by using solar panels to capture photons from sunlight. Each panel has many solar cells made up of layers of different material. These solar panels each have many solar cells made up of layers of different materials. Semiconductors (usually silicone) are sandwiched between a negative conductor on the top and a positive conductor on the bottom. An anti-reflective coating ensures each cell captures as much light as possible. When photons are captured by the solar sels, they release the the outer electrons of atoms within the semiconductor. An electric current is created from the pathway between the negative and positive conductors.

This current is sent to wires that capture the DC electric current and leading to a solar inverter which beneath that is a semiconductor (usually silicone) sandwiched between a negative conductor on top and a positive conductor on bottom. Once the photons are captured by the solar cell, they begin releasing the outer electrons of atoms within then transforms it into the AC electricity.

Thermoelectric Harvesting:

Solar thermal energy is different from the type of energy you get from solar cells using photovoltaic technology. Solar thermal plants use the sun to heat a liquid (usually water) or a gas to a high temperature. Light from the sun is concentrated to create heat which is then used



(Fig 63: Thermoelectric Harvesting)

to run a heat engine. The heat engine turns a generator which produces electricity. As such, thermoelectric energy harvesting is dependent mainly on the operation of the thermoelectric generator (TEG). Thermoelectric energy harvesting, is of particular interest in the automotive and industrial industries, where large amounts of heat are wasted.

Piezoelectric Harvesting:

Piezoelectricity translates to "electrictity under pressure." Human motion, low-frequency vibrations, and acoustic sounds are all potential sources of piezoelectric energy harvesting. The piezoelectric effect converts kinetic energy in the form of vibrations or shocks into electrical energy. Piezoelectric generators (energy harvesters) offer a robust and reliable solution by converting normally wasted vibration energy in the environment to usable electrical energy. They are ideal in applications that need to charge a battery, super capacitor, or directly power remote sensor systems. Examples of piezoelectric energy harvesting include battery-less remote controls that produce energy from the force of a push of the

button, piezoelectric floor tiles that generate energy from the foot traffic, and in California there was an experiment funded to convert heavily trafficked roads to piezoelectric energy.

RF/Electromagnetic Harvesting:

The electromagnetic spectrum is an abundant source of free energy, photovoltaic harvesting is one example, and RF energy harvesting is another example. It's nothing new. One of the earliest examples of capturing ambient electromagnetic radiation

(EMR) dates to the beginnings of the 20th century, with an entirely RF powered radio called the crystal radio. RF is an abundance source of ambient energy for harvesting. Electromagnetic waves can come from satellite stations, wireless internet, radio stations, and

(Fig 64: RF/Electromagnetic Harvesting)

digital broadcasts. An RF harvesting system captures and converts electromagnetic energy into usable continuous voltage using an antenna and a rectifier circuit as its fundamental building blocks

Vibration Harvesting:

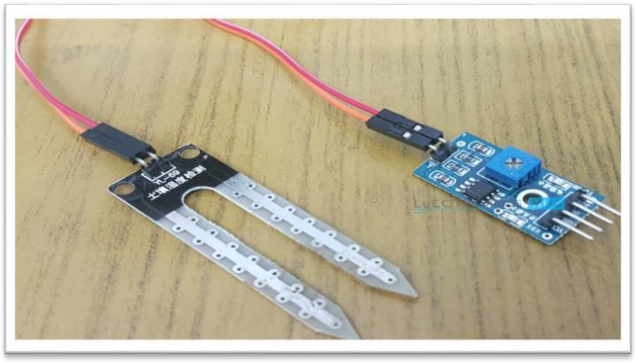
Vibration energy harvesting is a broad category that involves converting vibration energy to electrical energy. This is possible through several types of technology such as electromagnetic induction or piezoelectric. Typical applications that would benefit from this would be where sensors or measurement instruments are used to gather data and traditional power sources (batteries or cables) are too expensive or impossible to use. For example, a factory using a monitoring system to make sure pumps that supply machinery with water to cool them down, doesn't break down. Using vibration energy as a power source the monitor system can function hassle-free and immediately provide the operator with enough information to perform scheduled maintenance, rather than expensive unscheduled maintenance.

5.2.4 Moisture Monitoring System:

If we have a home garden or a backyard with turf, then we might probably know how much we need to take with watering the plants and turf.
Garden Sprinklers are one of the frequently used options for watering the lawn and for plants, well, the only option and the best one is manual watering.
But if we are planning to make an Automatic Plant Watering system, where the water supply either through sprinklers or drip irrigation system, then we have to consider the amount of Soil Moisture. By measuring the Soil Moisture in the garden, we can precisely control the amount of water to be supplied with the help of a simple mechanism involving a Water Pump and a Microcontroller. In this project, we will see you how to monitor the soil moisture of a small pot by Interfacing Soil Moisture with Arduino.

- A Brief Note on Soil Moisture Sensor:

The main component of the project (apart from the Arduino UNO) is the Soil Moisture Sensor. It consists of two parts: The main Sensor and the Control Board.
Sensor part of the Soil Moisture Sensor consists of a couple of conductive probes that can be used to measure the volumetric content of water in soil.



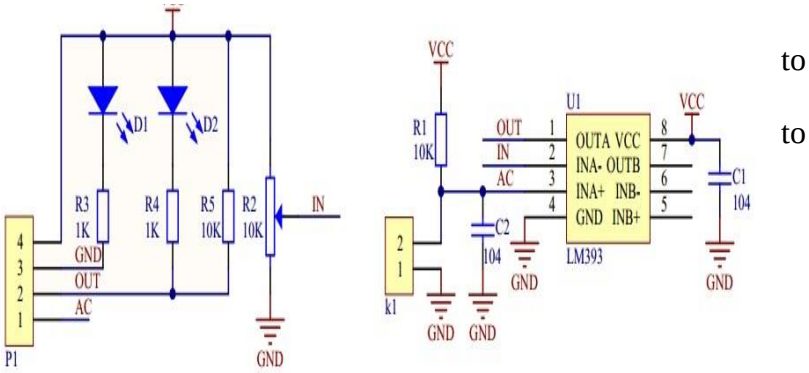
(Fig 65: Soil moisture sensor)

Coming to the control board, it is made up of LM393 IC, which is a voltage comparator. The board also consists of all the necessary components like connectors, LEDs, resistors etc. to measure the Soil Moisture.
Additionally, there is an option to adjust the sensitivity of the module with the help of a Potentiometer.

- Working of Soil Moisture Sensor:

The working of the Soil Moisture Sensor is very simple. It works on the principle of voltage comparison. The following circuit will be helpful in understanding the working of a typical soil moisture sensor

As we can see, one input of the comparator is connected to a 10KΩ Potentiometer while the other input is connected to a voltage divider network formed by a 10KΩ Resistor and the Soil Moisture Probe.

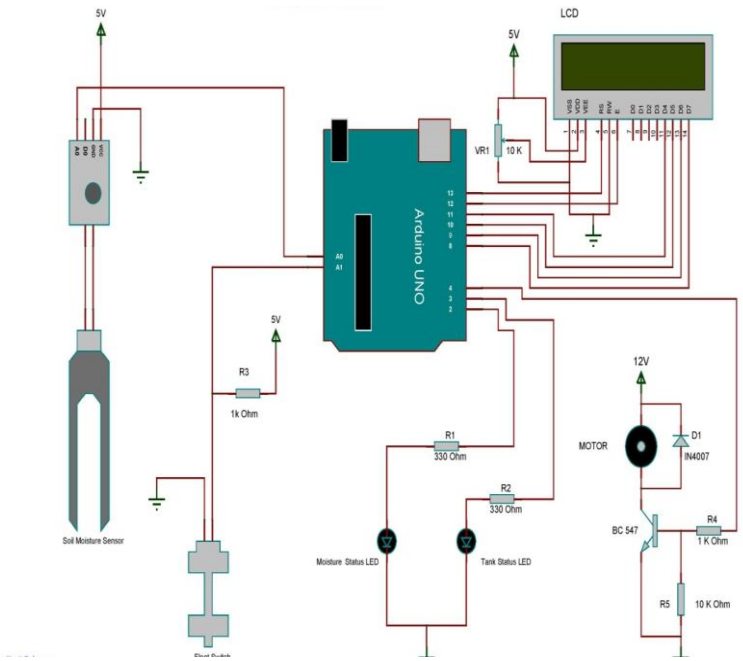


(figure 66: soil moisture sensor)

Based on the amount of water in the soil, the conductivity in the probe varies. If the water content is less, the conductivity through the probe is also less and hence the input to the comparator will be high. This means that the output of the comparator is HIGH and as a result, the LED will be OFF.

- Interfacing Soil Moisture Sensor with Arduino:

Now that we have seen how a typical soil moisture sensor works, let us take through the steps of Interfacing Soil Moisture with Arduino. The main advantage of this soil moisture module is that you can get the analog output from it. By using this analog signal and giving it to the Analog IN of Arduino, you can precisely calculate the percentage of moisture in the soil.



(Fig 67: Circuit Diagram of Interfacing Soil Moisture Sensor with Arduino)

Coming to the setup for testing the project, we have used to plastic cups filled with soil from my garden. The amount of water in each cup is more than the previous one.

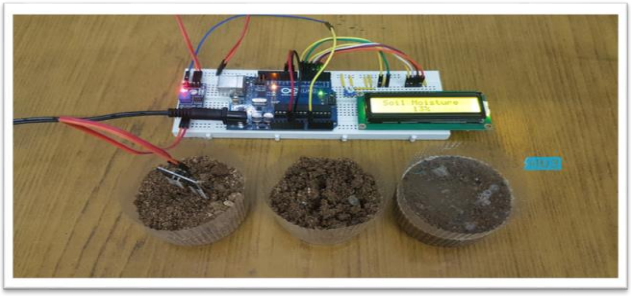
Components Required:

- Arduino UNO
- Soil Moisture Sensor Module
- 16×2 LCD Display
- 10KΩ Potentiometer (for LCD)
- Breadboard
- Connecting wires
- Power Supply
- Test setup with 3 cups of soil

➢ Circuit Design:

The design of the circuit is very simple. Connect the probe to the board and provide power supply to the board. Take the analog out pin from the board and connect it to Analog IN pinA0 of the Arduino.

To view the results, I have used a 16×2 LCD Display, where I have connected its data pins D4 – D7 to Arduino Pins 5 – 2. All the additional connections are mentioned in the circuit diagram.



(fig 68: soil moisture sensor circuit)

How to Measure Soil Moisture with Arduino

- Make the connections asper the circuit diagram and upload the code to Arduino.
- Place the soil moisture probe in a “dry” pot and check for readings. In my case, it was around 13%.
- Similarly, place the probe in other pots (after properly cleaning the probe) and check for readings.
- You can adjust the sensitivity of the sensor with the help of the potentiometer on the board of the sensor.

Applications:

- Home Gardens
- Lawns
- Interior Plants
- Office and low light plant setup

5.2.5 Home Automation using IoT:

Home automation is a topic which gaining popularity day by day, because of large advantages. One can achieve home automation by simply connecting home appliance electrical devices to the internet or cloud storage. The reason for this surge demand of network enabled home automation is reaching the zenith in recent days for its simplicity and comparable affordability.

Platforms based on cloud computing help to connect to the things surroundings everyone so that one can find it easy to access anything and everything at any time and place in a user friendly manner using custom defined portals. Hence, cloud act as afront end to access IOT. Here we are assuming a system which can control devices through wireless based network or cloud based approach. In project we use IOT based home automation system which goal is to develop a home automation system that gives the user complete control over all remotely controllable aspects of his or her home. The automation system will have ability to be controlled from a central host PC, the internet, and also remotely accessed via a packet PC with a windows mobile based application.

Keywords: Automation, IOT, Relay, Arduino

The home animation is control of home device form a central control point automation is today s facts where more things are being completed every day automatically. Usually the basic tasks of turning on or off certain device and beyond, either remotely or in close proximity. The concept of the RF-based system is to use the underlying wireless data network such as IEEE 802.11 (Wi-Fi). The popularity of wireless networks at home has increased in recent years, and the advanced computer technology has made the personal digital device to commonly have the capability to communicate through the wireless network. Hence, it is suitable to use RF-based location determation system to estimate location of the personal digital device in a home environment with high data rate transmission, supporting multimedia Application may be feasible in WLAN. One if the possible application is wireless network for home automation. Imagine a private home equipped with motion light temperature and other sensor actuators for opining the door dimming lights with a remote control as complex as setting up a network of items in your home (such as thermostat, security system lighting and appliances) that can be programmed using a main controller. The basic idea of home

automation is to employ sensor and control system to monitor dwelling andaccordingly adjust the various mechanism that provide heat ventilation lighting and other service. The automated "intelligent" home can provide a safer more comfortable and more economical dwelling.

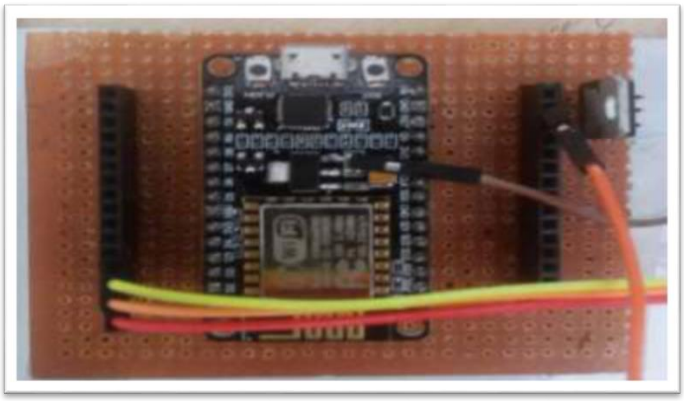
In an intelligent home automation system there are many possible solution for how and form where to control the automation system and single device a user interface can be a computer-based system a mechanical switch a single light a loudspeaker with a microphone or a some kind of personal remote controller using normal PC, laptop or table PC by standalone software or web-based user interface. In the near future all electronic appliances in a home will be networked.

The internet of things (IOT) is the network of physical objects or "Things" embedded with electronics, software, sensors and network connectivity, which enable these objects to collect and exchanging data. IOT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunity for more direct integration between the physical world and computer based system, and resulting in improve efficiency, accuracy and economic benefits.

Hardware description:

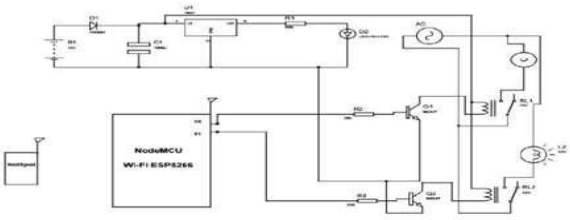
ESP8266: Presently ESP8266EX is a chip with which manufacturer are making wirelessly networkable micro-controller modules. More specifically, ESP8266 is a system-on-a-chip (Soc) with capability for 2.4Ghz Wi-Fi (802.11b/g/n, supporting WPA/WPA2), general purpose input/output (16 GPIO), inter-integrated circuit , Analog-to-digital conversion (10bit ADC),serial peripheral interface(SPI), I2S interfaces with DMA(sharing pins with GPIO), UART(on dedicated pins, plus a transit only UART can be enabled on GPIO2). It employs a 32 bit RISC CPU based on the tensilica Xtensa L106 running at 80MHz. it has a 64KB boot RAM. External Flash memory can be accessed through SPI.

The modules: Various vendors have consequently created a multiple of modules containing the esp8266 chip at their cores. Some of these modules have specific identifiers, including monikers such as "Wi07c" and "ESP-01" through "ESP-13", while other modules might be ill- labelled and merely referred to by a general description- e.g- "ESP8266 wireless transceiver". ESP8266 based modules have demonstrated themselves as a capable, low-cost, networkable foundation for facilitating end point IOT developments. ESPressif's official module is presently the ESP_wroom-02 [4]. The AI thinkers are succinctly labelled ESP-01 through ESP-13. NODEMCU boards extended upon the AI-thinkers modules. Olimex, ADAfruit, SPArkfun, WEmo.



(Figure 69: Circuit Connections of ESP Module 8266)

Design & Implementation:



In the project we embedded the ESP8266 Wi-Fi module with sugar cube relays to control devices wirelessly or from particular distance. Here we use hotspot configurations, that to achieve our

(Figure 70: Overall circuit diagram)

project goal, first of all we create a hotspot channel to connect other devices and so ESP8266 .Then when we configure the correct IP address which is generated by the software "Arduino.ide" for the other devices to connect. Remember the IP will be same cause the ESP module system is stable so the IP is always same. Here we use diodes in the circuitry of sugar cube relay arrangements to prevent
the damages of back EMF which is generated by the coil of relay's inner circuitry. The capacitors used to stable the charge for coil to stay in set state as shown in figure.

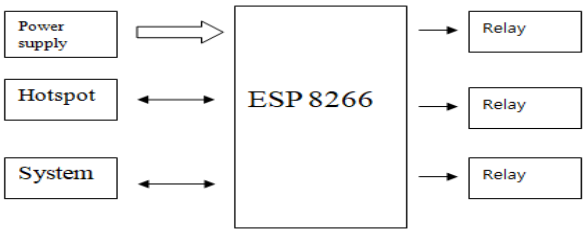
The Arduino Integrated Development Environment - or Arduino Software (IDE) – contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. Programs written using Arduino Software (IDE) are called **sketches**. These sketches are written in the text editor and are saved with the
File extension.

The editor has National Conference of Communication systems and Advance Computingfeatures for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right hand corner of the window displays the configured board and serial port.
The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor in figure.

Results:
After the successful connection to the server, the data of sensor are sent to the web server for monitoring of the system. The figure shows the web server page which will allow us to monitor and control the system. By entering the assigned IP address in the web browser this web server page will appear. The web server gives the information about the temperature in different places of the house and motion state in the house. It also gives the status of the various electrical appliances like light, fan etc which we can control remotely.

Conclusion and future work:

The next phase for the home automation market will occur based on few key improvements in the technology available in a



(Figure 71: Block diagram of application)

automation, such as improvements in wireless automation solutions as well as lowering of price points as the market begins to accept home automaton usage in larger volumes. Some

trends that we foresee for this phase of the industry are big companies like philips, Siemens & scheider will eventually bring out fairly mass market automation products with appealing user interface but at a lower price point today, and more people will be able to afford the products. Some foreign players will have niche in high and automation and focus fun the premium market.

Advantages

- Error probability reduced Ease of access and low cost and power
- Consumption
- Can reduce human effort
- Smarter processing and services
- Can be implemented at any device and automated
- Alert system is quick in case of an emergency
- Eliminates the use of PC for automation
- Helps old age people to control the remote devices
- Simple interface

Disadvantages

- Replacing humans is dangerous May take time and learning
- Security concerns
- Vulnerable to attacks
- Most of the times range is restricted
- High dependency on sensor devices which makes the system vulnerable if sensor fails

5.2.6 PC Based Electrical Load Control:

Personal computers are increasingly becoming the platform of choice to design and implement control algorithms because it is simple to write, modify and update software programs that implement control algorithms.

In this section, the personal computer is used to control the electrical appliances which includes turning high power alternating current (AC) loads such as lights, fans, heaters etc ON or OFF. To successfully integrate the interface box with the machine (laptop), an interface device is used within the PC that can perform the necessary tasks. The interface box can be controlled by the computer by connecting to the USB port and developed a program in C-sharp(C#) programming language.

The program will demonstrate the basic idea of how to control devices and monitor events. With the program, the computer can turn electric devices ON/OFF while disregarding the manual control system. Moreover, the people who are physically disabled in homes and work places are able to control the home appliances by interacting with the interface of the developed appliance. It is a necessity to employ the service of Home Appliances Control as it is more effective, efficient and stress-free.

Keywords: Personal Computers, Home Control Appliance, Distribution Fuse Board (DFB), Graphical User Interface (GUI), Interface Box, Internal Module, Enumeration, Local Area Network (LAN).

A Personal computer (PC) based home control appliance is the use of control systems at homes, in the offices and in industries to reduce human efforts. Home control appliances have greatly decreased the need for human sensory and mental equipments and play an important role in the world economy and in daily experience. It is more efficient and stress-free (Coyle et al 2007). Home and office appliances, including television, VCRs, stereo equipment, refrigerators,, washing machines, thermostat, light switches, telephones, copiers and factory equipment, have embedded computers and often come with remote controls.

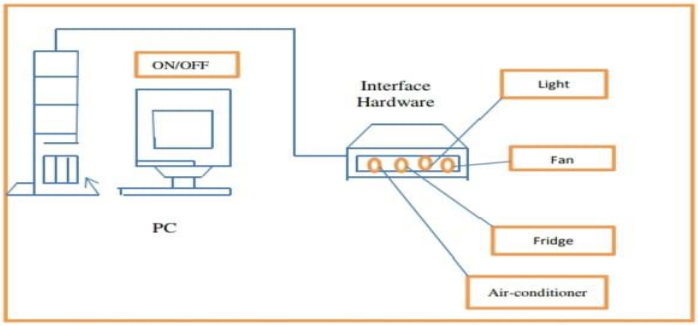
However, the trend has been that as appliances get more computerized with more features, their user interfaces get harder to use (Dickey et al 2012). PCs are commonly used with better input output capability than the average home appliance, such as high-resolution screens, text-entry technologies and speech capability. PC.s are likely to maintain this advantage over appliances, because improved hardware is a key differentiator between PC and is often marketed as an incentive to upgrade to a new PC. All PC has the ability to communicate over the Local Area Network (LAN) and most have built-in short range communication capabilities, such as Bluetooth, that could allow them to communicate with and control appliance in their surrounding environment. PC laptops are also personal devices, which allow them to provide interface that are personalized (Koyuncu 1995, Nunes and Delgado 2000, Sriskanthan and Tan 2002).

The brain of the system.

The brain of the system is actually a small computer whose job is to close the switch that activates the switches that powers sensing devices when ON or OFF. Home based PC differs mainly in Distribution Fuse Board (DFB) and how various home appliances are wired in to the brain. The brain and the DFB features may be wired into the control room, but they usually have a back-up power source as well. The architecture of the PC home based appliances control system is shown in Figure.

The system consists of two units (Swamy et al 2002, Nichols and Myers, 2006):

- Control unit: The control unit is based on the use of standard personal computer with Graphical User.Interface (GUI) software to control the electrical appliances.



(Figure 72: Architecture of the PC home based appliances control)

- Interface unit: The interface unit is for interfacing the high power loads with the control unit.

Hardware Design of the Interface Box

The design of the interface box that is used to connect high power load to the computer is discussed here.

Internal module

The internal circuitry of the interface box can be divided into three main categories namely: relay driver circuit, relay and +6 V DC power supply.

Computer Interfacing

The Universal Bus (USB) is one of the most common interfaces used in electronic consumer product today, including PCS, cameras, GPS devices, MP3 players, modems , printers and scanners, to mention a few. These are data lines, control lines and status lines. The USB is a high-speed serial interface that can provide power to device connected to it (Kim et al 2010, Lin and Brogerg 2002, Neng-Shiiang et al, 2002).

A USB bus supports up to 127 devices (limited by the 7-bit address field noting that address 0 is not used as it has a special purpose) connected through a four-wire serial cable of three to five meters long. Many USB devices can be connected to the same bus with hubs, which can have 4, 8, or even 16 ports. A device can be plugged into a hub which is plugged into another hub and so on. The maximum number of tiers permitted is six. According to the specification, the maximum distance of a device from its host is about thirty meters, accomplished by using five hubs. For longer-distance bus communications, other methods such as use of Ethernet are recommended.

The USB bus specification comes in two versions: the version USB 1.1, supporting 11Mbps, while the version, USB 2.0 supports up to 480Mbps. The USB specification defines three data speeds (Al-Ali and Al-Rousan 2004, Kobatake et al 1989).

i. Low speed ---- 1.5Mb/sec.
ii. Full speed------ 12Mb/sec.
iii. High speed ----- 480Mb/sec.

The maximum power available to an external device is limited to about 100mA at 5.0V. USB is a four- wire interface implemented using a four-core shielded cable.
The signal wire colors are specified. The specification also defines a mini-B connector, mainly used in smaller portable electronic devices such as cameras and other handheld devices. This connector has a fifth pin called ID, though this pin is not used.

The pin assignment and wire colors of a mini-B connector are given. Two of the pins, Data + and Data -, form a twisted pair and differential data signals and some single- ended data states.

Enumeration

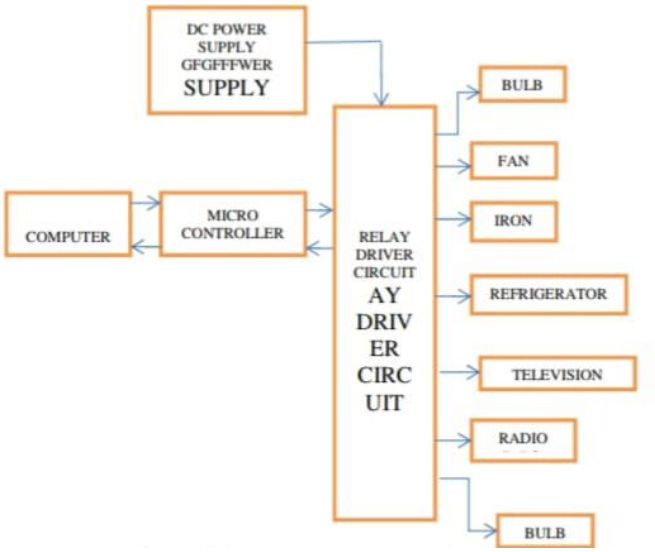
When a device is plugged into a USB bus, it becomes known to the host through a process called enumeration. The steps of enumeration are (Anamal and Kamruzzaman 2006, Casimiro et al 2004):

- When a device is plugged in, the host becomes aware of it because one of the data line voltages (Dp or D) becomes logic high.
- The host sends a USB reset signal to the device to place the device in a known state. The reset device responds to address 0.
- The host sends a request on address 0 to the device to find out its maximum packet size using a Get Descriptor command.
- The device responds by sending a small portion of the device descriptor.
- The host sends a USB reset again.

- The host assigns a unique address to the device and sends a Set Address request to the device.

Materials and method

The design demonstrates a system that allows one to control home appliance and turns ON or OFF any appliance that is connected to a computer. The appliances are connected to the computer via a microcontroller. The power supply for each appliance is through an electromechanical relay. A number of relays are



(Figure 73: Block Diagram of the designed system)

used depending on the number of appliances to be controlled. All the relays are controlled by a microcontroller. The microcontroller is connected to the computer via a USB to RS232 Converter. The diagram below in Figure 13 shows the block diagram of the system;

Approach to Development of the Framework

The basis of the hardware design is mainly the PICI6F876A microcontroller using micro C pro compiler. Two circuit diagrams were developed. These are:
i. Power supply regulation circuit
ii. Main component circuit

Power Supply Regulation Circuit

The a.c. power supply to the circuit has to be regulated to a reasonable amount for the workability and durability of the circuit components. The power supply regulation circuit is shown in Figure 14.The power supply regulation process is accomplished by following the four stages listed below:

- Transformer
- Rectification
- Filtering
- Voltage regulation

Transformer

The a.c. supply gives out 220V or above and the supply is stepped down by the transformer to a reasonable amount of 12V which is needed for the operation of the circuit.

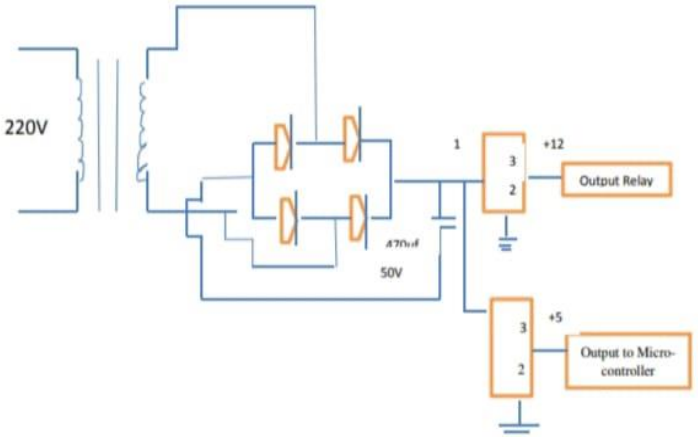
Rectification

There is the need for the conversion of the a.c. voltage to d.c. voltage. Diodes help in this conversion process. However, in the conversion process the voltage drop across the diode

which is greater than 1V is added to the already stepped down 12V and making the total voltage in the rectification to be 13V or greater.

Filtering

The capacitor removes or filters the ripples generated and produced alongside the rectification process. Voltage regulator are devices that produce constant d.c. voltage regardless of the variation in the input load. Two voltage



(Figure 74: Power Supply Regulation Circuit)

Regulators are used in this stage. These are:

- i LM7812 voltage regulator
- ii LM7805 voltage regulator

Software Interface

The layout of the software used for controlling various home appliance is shown in Figure 15 .As an experimental basis, the following layouts are present in the software interface:

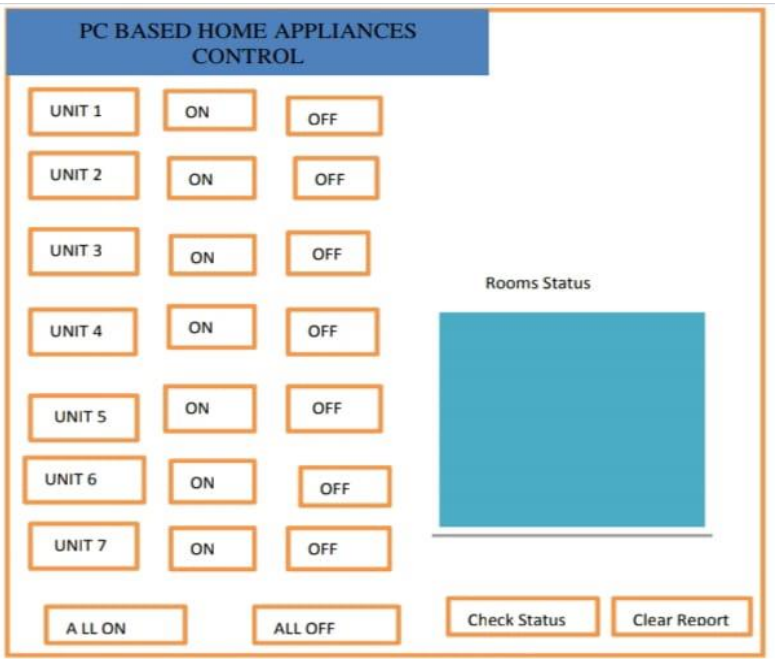
i Seven rooms with their corresponding ON and OFF buttons.

Ii Selection of communication port

Iii. All ON button

Iv. All OFF button

v. ROM status interface which consists of check status and clear report.



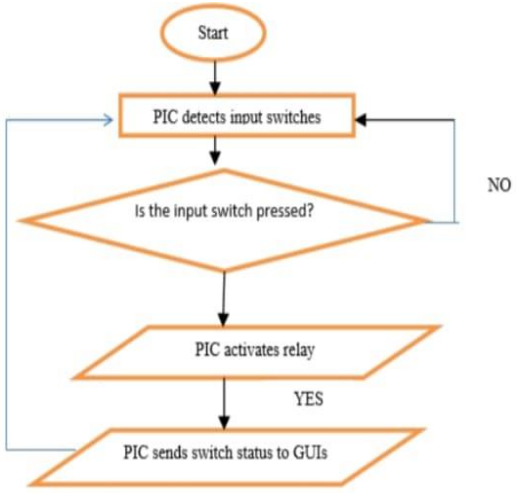
(Figure 75: Software Interface layout)

At first, a port number is set in the Selection Com Port field of the layout to activate connection between computer and microcontroller. If the connection is successful, then it is possible to control the appliances from the computer. Each device can be controlled either as an ON or OFF mode by pressing ON or OFF button on the layout. The “check status” reports the state (ON or OFF) of the electrical control l Appliances by displaying information that the appliance is ON. The clear report command gets rid of the information reported in the room status interface. Although, only seven rooms have been shown, but any number of devices

can be controlled from a computer with a slight modification in the designed system. The software layout interface is shown in Figure.

PIC-GUI Communication

The hardware uses RS232 converter to communicate with the software. Contained in the RS232 converter is the RS232 library which has RX (receiver) and TX (transmitter) for both transmissions and reception of signals. The software in the other end has serial port library which is one of the controls in c-sharp library. It is thus programmed to enable transmission and reception of signals.



(Figure 76: Flow Chart Showing PIC- GUI Communication)

Once the "COM port" is selected in the software, a link is opened up for communication between the hardware and the software which will last for microseconds. Through, there is a propagation delay which allows for execution of commands or instruction before transmission of another signal. For every button clicked in the graphical user interface.The serial port library uses its TX to transmit the signal to the hardware. The signal is received by the hardware via its RX, processed according to instruction and opens up the relay of the required unit and therefore switches ON its socket The hardware on the reverse end uses its TX to transmit signal (indicating the reception of the sent signal by the program) to the software. The software receives the signal via its RX and thus acknowledges it by displaying the message about the state (ON or OFF) of the required unit on the room status interface. The flow chart showing PIC-GUI communication is shown in Figure.

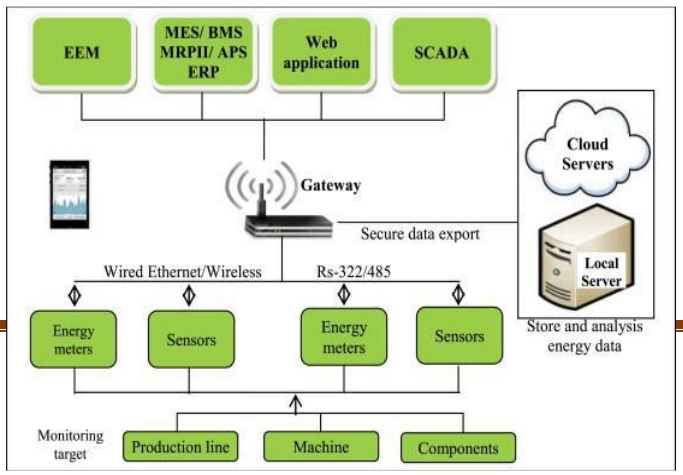
Conclusion

The user's choice is clicked in the developed window application through the PC and signal travels via the USB cable to the corresponding connection. Based on this command, the required appliance is triggered. It can be used at homes, street light management, hotels, power management, and high voltage grid control and in industries.

5.2.7 Electrical Parameters Measurements:

Electricity is one of the basic needs of human; it is commonly used for domestic, industrial and agricultural purposes in day today's life.

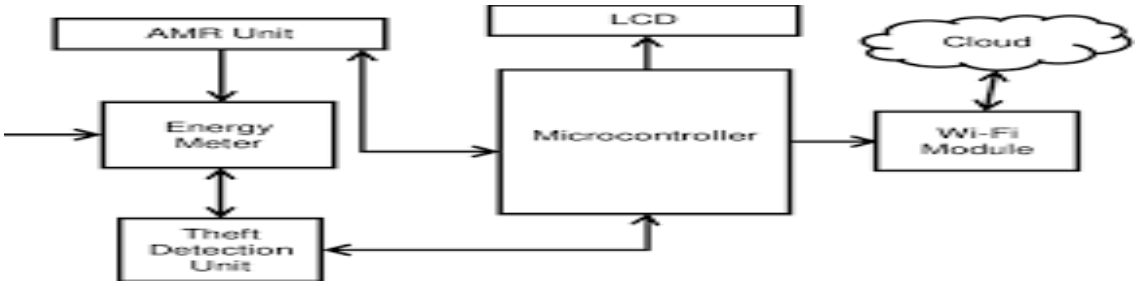
Most of us know the role of energy meter in electricity grid. It's a fundamental component of distribution grid. Energy meter helps the utility (Electricity distribution



company) to account the uses of electricity by consumer on kW per hour basis.

(Figure 77: General System Architecture for Energy Monitoring Using IoT)

In the design of smart energy meter, the microcontroller is interfaced with AMR module, Theft detection module and Wi-Fi module. The microcontroller is a core component of the smart energy meter system which is placed at the consumer end for the purpose of measuring the meter reading, theft detection and storing the data. This data is transferred between consumer end and energy supplier end using IoT ESP3866 Wi-Fi. The AMR module continuously monitors the meter and collects the reading and sends to the microcontroller. In the current scenario, there is a need to uniquely identify the smart meter device remotely in a reliable manner. To achieve the characteristic of device remotely we



(Fig 78: Block Diagram of IoT Based Smart Energy Meter Reading monitoring system)

have provided IP address for each connection. In this paper we have concentrated on the theft detection, optimum utilization of power and convey the energy consumption information to the user end. The block diagram given in Figure 18 illustrates the proposed system.

CONCLUSION

IoT based smart energy meter reading and monitoring system was proposed in this paper. The system provides many significant advantages, such as wireless data transmission, low-workload, remote monitoring and controlling, anti-theft mechanism and less-expenses. The system would provide a simple way to collect the meter reading and detect an electrical power theft without any human involvement. The use of embedded microcontroller and Wi-Fi module increases the stability of wireless data transmission. By using this system the customer can anytime check their consumed unit and bill in the Internet in which paper is not required for billing which saves paper and printing cost.

The bill can be paid using online customer support system. In future, the project can be integrated to form smart cities using Internet of Things based sensors as done globally. When compare with the existing GSM based and other traditional energy metering and monitoring system, the propose system is more efficient and cost effective. It allows the consumer to check the energy consumption and bill any time they login to the system whereas other existing system send the bill monthly or on request to the customer.

Chapter 6: Swatch Bharat Abhiyan (Clean India)

6.1 swatchta needed in allocated village-existing situation with photograph

- In hansapore there is no solid waste management system people through garbage anywhere which cause disease like cholera and typhoid etc.
- Swatchta bharat abhiyan can help the people to prevent many diseases

(Figure 79: Solid Waste at Hansapore)

6.2 guidelines-implementation in allocated village with photograph

- Household toilets, including conversion of insanitary latrines into pour-flush latrines.
- IEC & Public Awareness

(Figure 80: Household Toilet at Hansapore)

6.3 activities done by students for allocated village with photograph

- We talk with villagers and aware them about disease they face because of improper waste management.
- Also we motivate them to use dustbin, toilet also tell them to don't dispose solid waste in open

(Figure 81: Interaction with Villagers at Hansapore)

Chapter 7: Village Condition Due To Covid-19

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

- In hansapore don't allow you in village without mask and permission in this situation.
- And also they don't allow to more than 4 people in group
- At gram penchant office, shop and post office they provide hand sanitizer facility

7.2 activities done by students for allocated village with photograph

- We always maintain a distance during interaction with villagers
- Always wash hand after touch something
- Avoid close contact with other public
- We also discussed with villagers how corona spread like person to person, direct contact with patient, and also through air when an infected person sneeze or cough in open air.
- And we also discussed with villagers what precaution to take in this pandemic like wash your hand after touch something, try to avoid handshakes with other, avoid mass gathering, keep distance from other person, always wear mask, going out only if you have any work, etc

(Figure 82: At Gram Panchayat Office Hansapore)

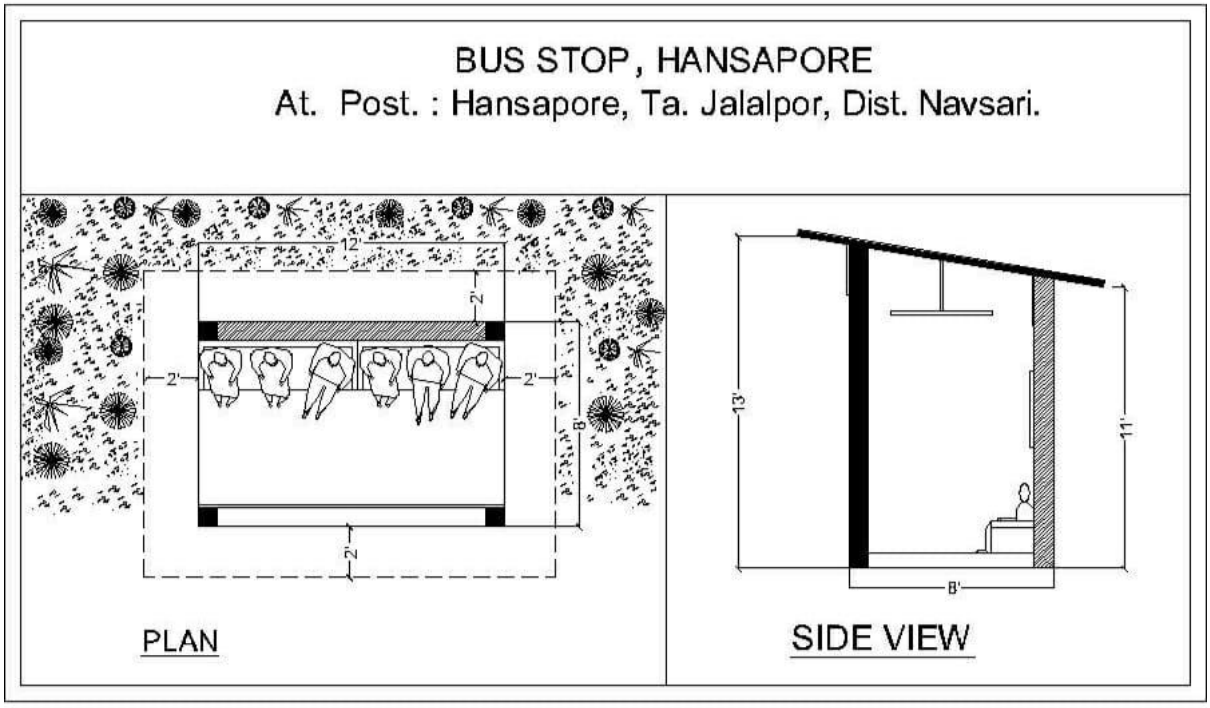
7.3 Any other step taken by the students/villagers

- No other step taken by the student or villagers

Chapter 8: Sustainable Design Planning Proposal Part 1- (Prototype Design)

8.1 Design Proposal

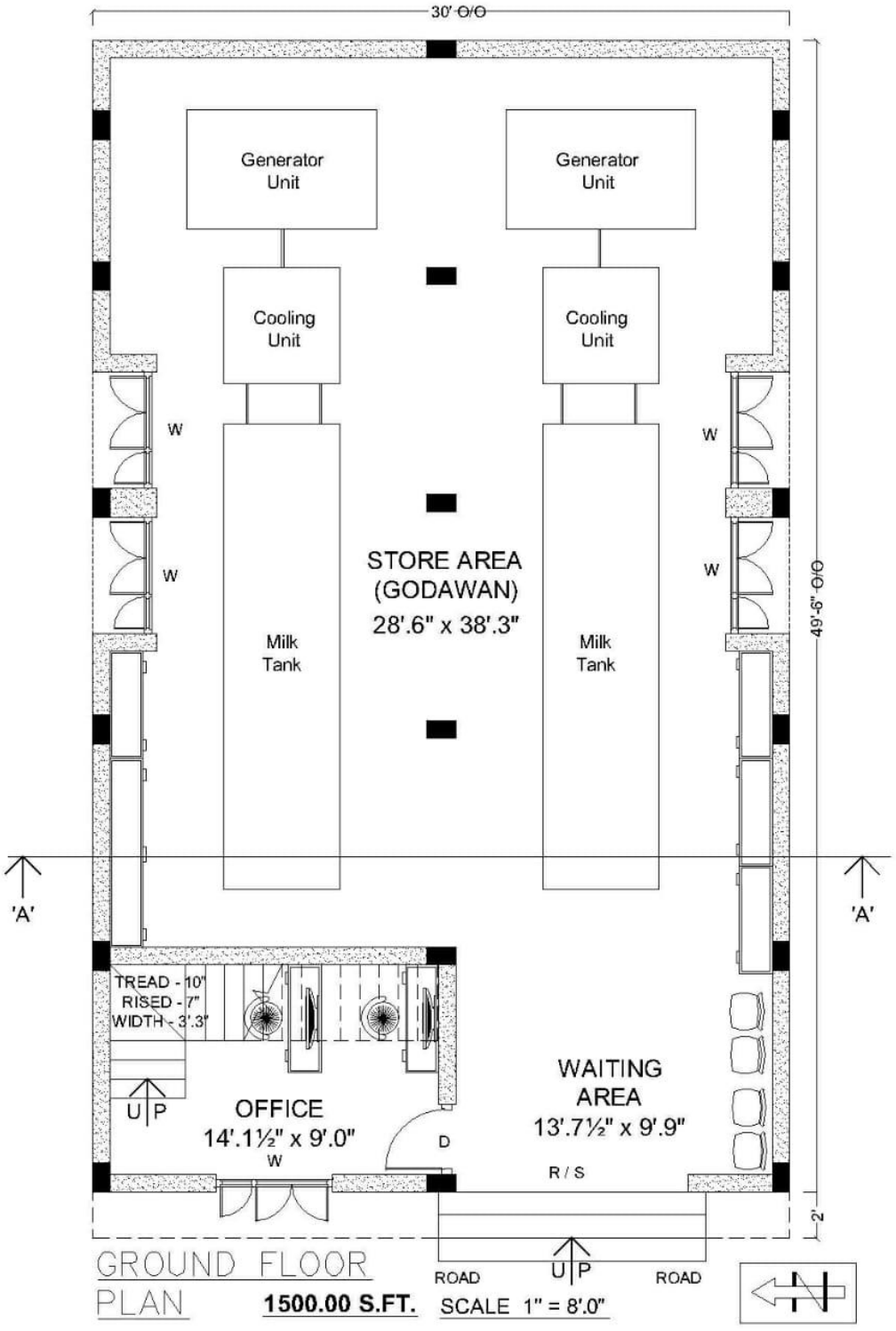
8.1.1 Social design (Bus Stop)

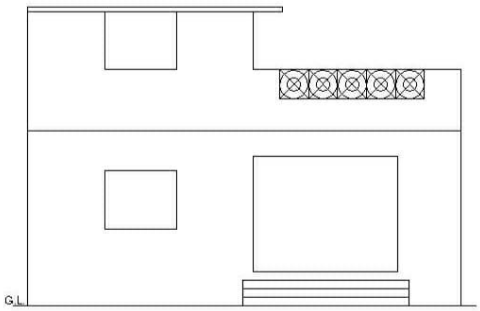


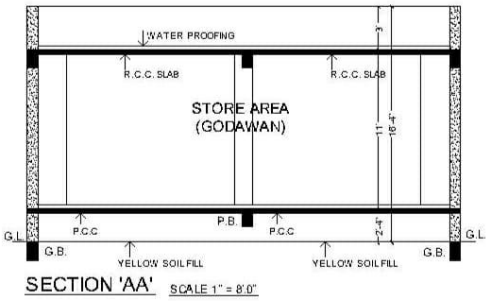
Sr no	Description	No	Length (m)	Width (m)	Height (m)	Quantity (m3)
1	Excavation	1	5.5	0.9	1.3	6.44
2	Flooring	1	3.66	2.44	-	8.93
3	DPC	1	5.5	0.3	-	1.65
4	Brick work	1	5.5	0.2	3.35	3.69
4	RCC work					
	Slab	1	3.66	2.44	0.12	1.07

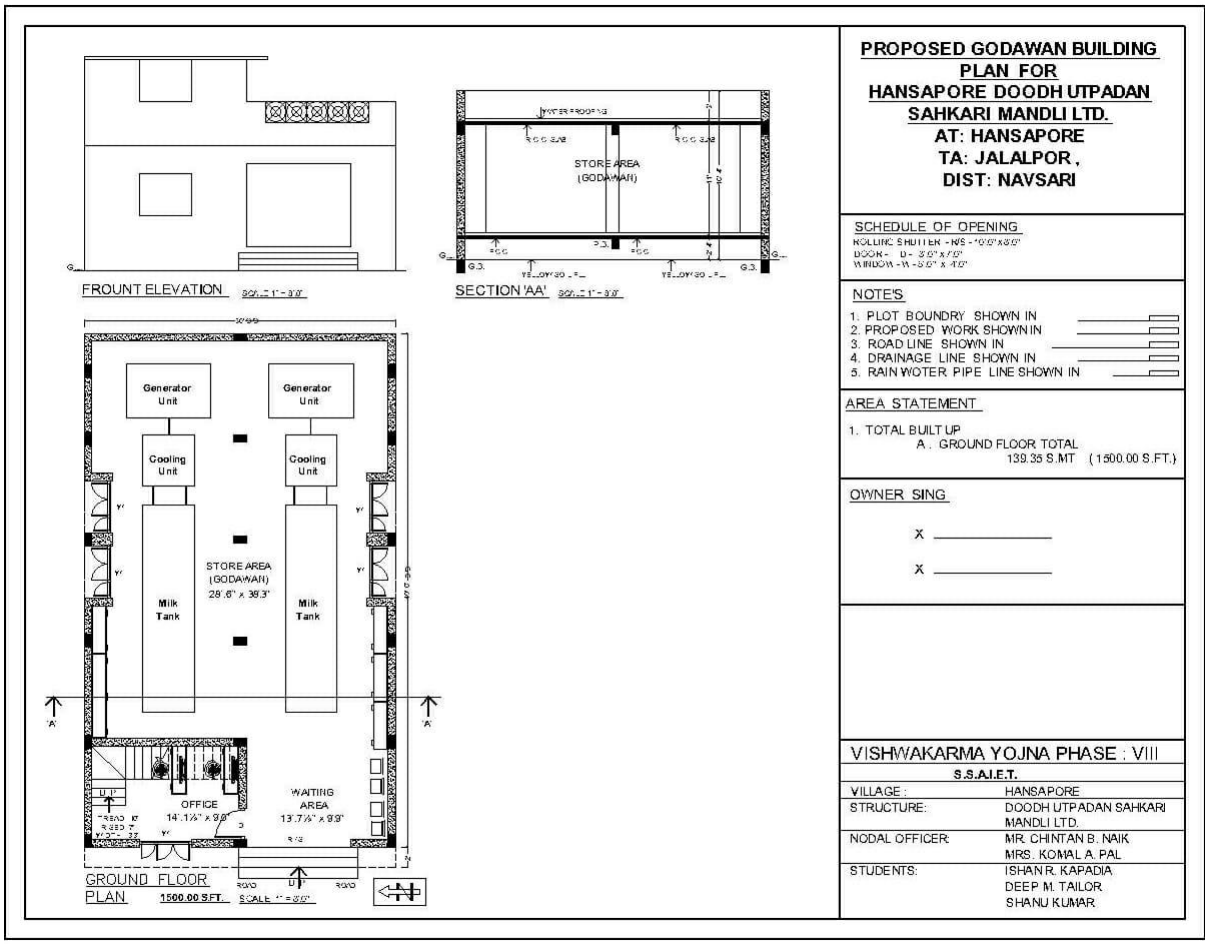
Now approximate price in market is 1000 Rs. per sq.ft for all work like paint, plumbering, construction, electrical work etc. so for this plan estimated price is 96,000 Rs.

8.1.2 Smart design (Doodh Utpadan Mandali)




G.L
FRONT ELEVATION
SCALE 1" = 8'-0"


WATER PROOFING
R.C.C. SLAB
R.C.C. SLAB
STORE AREA
(GODAWAN)
P.C.C
P.B.
P.C.C
G.L
G.B.
YELLOW SOIL FILL
YELLOW SOIL FILL
G.B.
G.L
SECTION 'AA'
SCALE 1" = 8'-0"

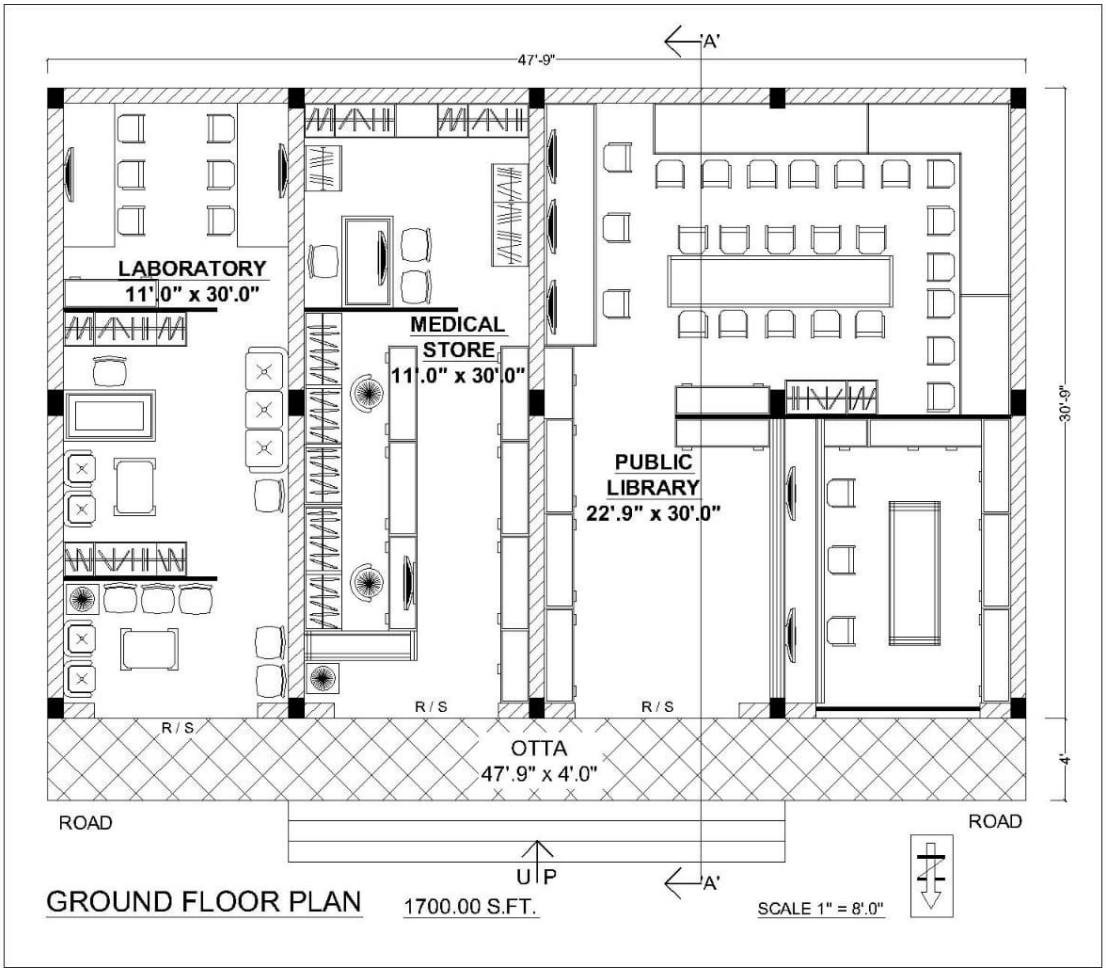

FRONT ELEVATION
SECTION 'AA'
STORE AREA
(GODAWAN)
Generator Unit
Generator Unit
Cooling Unit
Cooling Unit
STORE AREA
(GODAWAN)
28'-6" x 39'-3"
Milk Tank
Milk Tank
OFFICE
14'-1 1/4" x 9'-0"
WAITING AREA
13'-7 1/4" x 9'-9"
GROUND FLOOR PLAN
1500.00 S.FT.
PROPOSED GODAWAN BUILDING
PLAN FOR
HANSAPORE DOODH UTPADAN
SAHKARI MANDLI LTD.
AT: HANSAPORE
TA: JALALPOR,
DIST: NAVSARI
SCHEDULE OF OPENING
NOTE'S
1. PLOT BOUNDRY SHOWN IN
2. PROPOSED WORK SHOWN IN
3. ROAD LINE SHOWN IN
4. DRAINAGE LINE SHOWN IN
5. RAIN WOTER PIPE LINE SHOWN IN
AREA STATEMENT
1. TOTAL BUILT UP
A. GROUND FLOOR TOTAL
139.35 S.MT (1500.00 S.FT.)
OWNER SING
X
X
VISHWAKARMA YOJNA PHASE : VIII
S.S.A.I.E.T.
VILLAGE : HANSAPORE
STRUCTURE: DOODH UTPADAN SAHKARI MANDLI LTD.
NODAL OFFICER: MR. CHINTAN B. NAIK
MRS. KOMAL A. PAL
STUDENTS: ISHAN R. KAPADIA
DEEP M. TAILOR
SHANU KUMAR

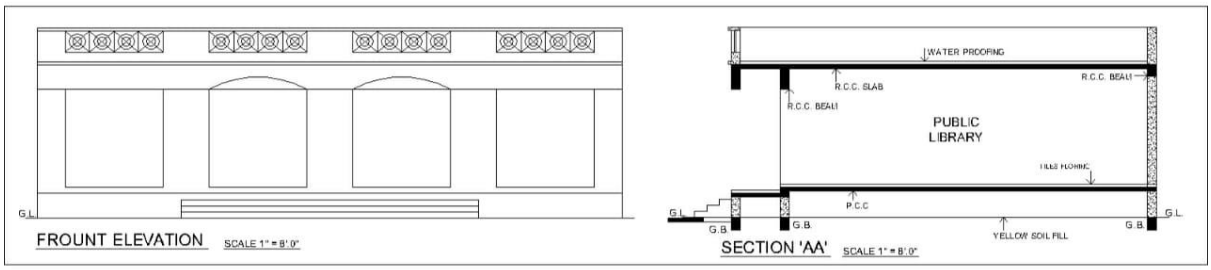
Sr no	Description	No	Length (m)	Width (m)	Height (m)	Quantity (m3)
1	Excavation	1	54.28	0.90	1.3	63.50
2	Flooring					
	Store area	1	11.58	8.53	-	98.78
	Office	1	2.74	4.57	-	12.52
	Waiting area	1	2.74	3.96	-	10.85
3	DPC	1	54.28	0.3	-	16.28
4	Brick work	1	54.28	0.2	3.1	33.65
	Deduction					
	D	1	1.5	0.2	2.1	0.63
	D1	1	1	0.2	2.1	0.42
	W	4	0.9	0.2	1.20	0.86
	Lintel work					
	D	1	1.5	0.2	0.12	0.036
	D1	1	1	0.2	0.12	0.024
	W	4	0.9	0.2	0.12	0.086
5	RCC work					
	Slab	1	14.94	9.144	0.12	16.39

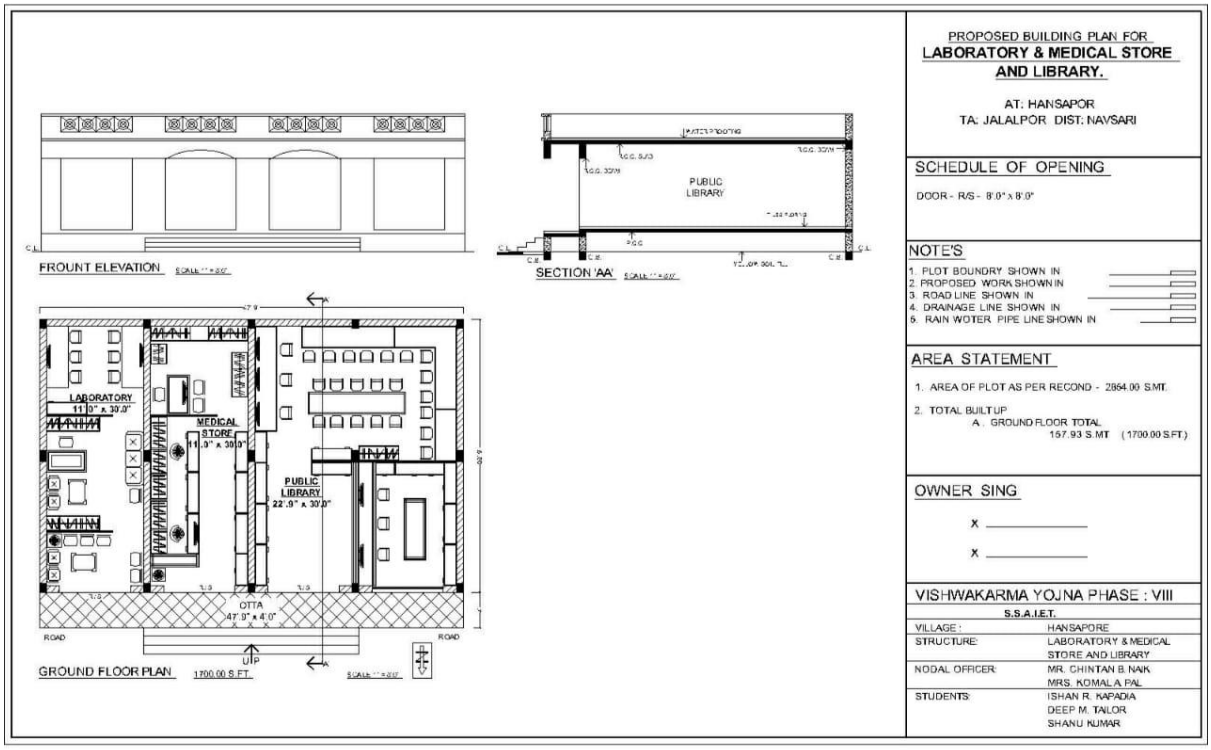
In this doodh utpadan mandali design its total built up area is 1500 sq.ft so the estimated price of this building is 1,500,000 Rs.

8.1.3 Social-cultural design (public library)

Sr no	Description	No	Length (m)	Width (m)	Height (m)	Quantity (m3)
1	Excavation	1	30.48	0.9	1.3	35.66
2	Flooring	1	9.14	6.70	-	61.24
3	DPC	1	30.48	0.3	-	9.14
4	Brick work	1	30.48	0.2	3.1	18.89
	Deduction D	1	1	0.2	2.1	0.42
	Lintel work	1	1	0.2	0.12	0.024
5	RCC work					
	Slab	1	9.14	6.70	0.12	7.35
	Lintel work	1	1	0.2	0.12	0.024


'A'
47'-9"
LABORATORY
11'.0" x 30'.0"
MEDICAL
STORE
11'.0" x 30'.0"
PUBLIC
LIBRARY
22'.9" x 30'.0"
30'-9"
R / S
R / S
R / S
OTTA
47'.9" x 4'.0"
4'
ROAD
ROAD
U P
'A'
GROUND FLOOR PLAN
1700.00 S.FT.
SCALE 1" = 8'.0"


G.L
FROUNT ELEVATION
SCALE 1" = 8'.0"
WATER PROOFING
R.C.C. SLAB
R.C.C. BEAM
R.C.C. BEAM
PUBLIC
LIBRARY
FILLE FLOORING
P.C.C
G.L
G.B.
G.B.
G.B.
G.L
YELLOW SOIL FILL
SECTION 'AA'
SCALE 1" = 8'.0"

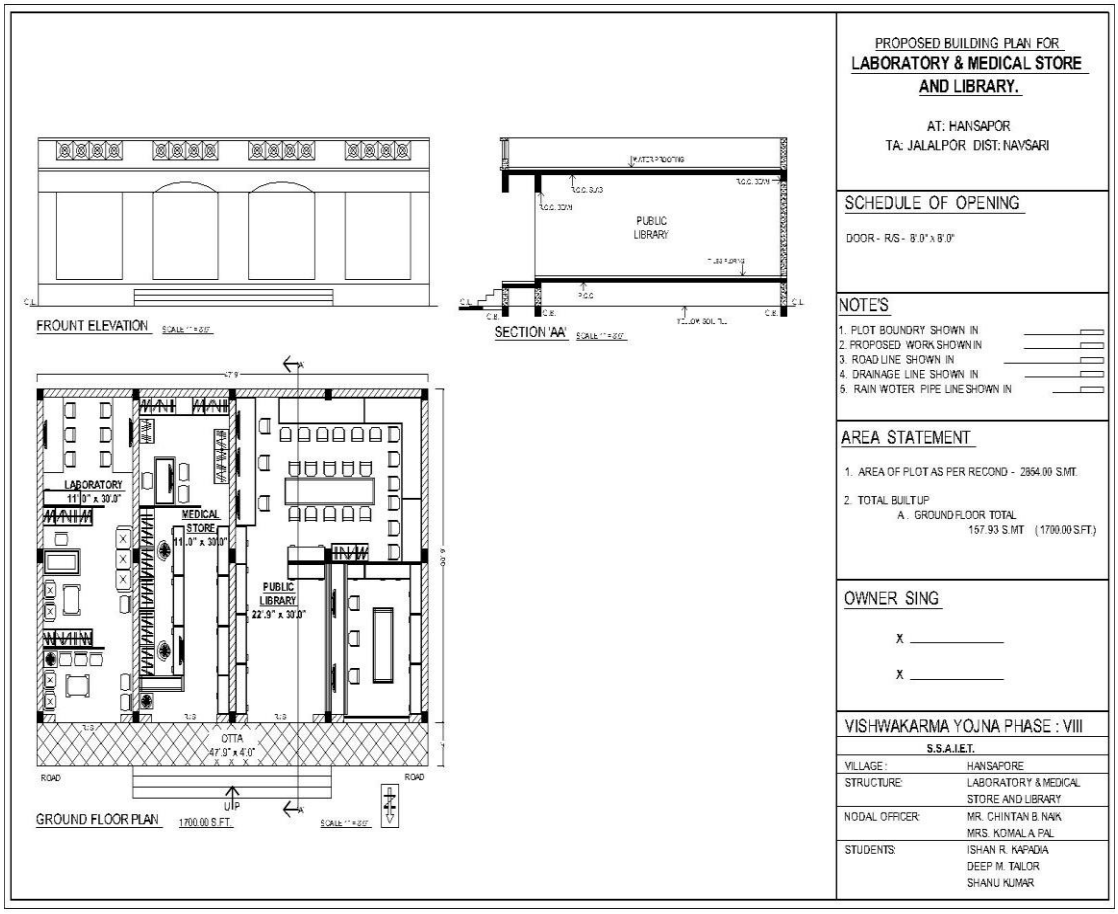


In this public library its total built up area is 687 sq.ft so estimated price of this building including material and labor cost is 687,000 Rs.

8.1.4 Social design (medical shop)

Sr no	Description	No	Length (m)	Width (m)	Height (m)	Quantity (m3)
1	Excavation	1	23.78	0.9	1.3	27.82
2	Flooring	1	9.14	3.35	-	30.62
3	DPC	1	23.78	0.3	-	7.134
4	Brick work	1	23.78	0.2	3.1	14.74
	Deduction					
	D	1	1	0.2	2.1	0.42
	Lintel work					
	D	1	1	0.2	0.12	0.024
5	RCC work					
	Slab	1	9.14	3.35	0.12	3.67

In this design its total built up area is 330 sq.ft so estimated price of this shop including all material and labor cost is 330,000 Rs.

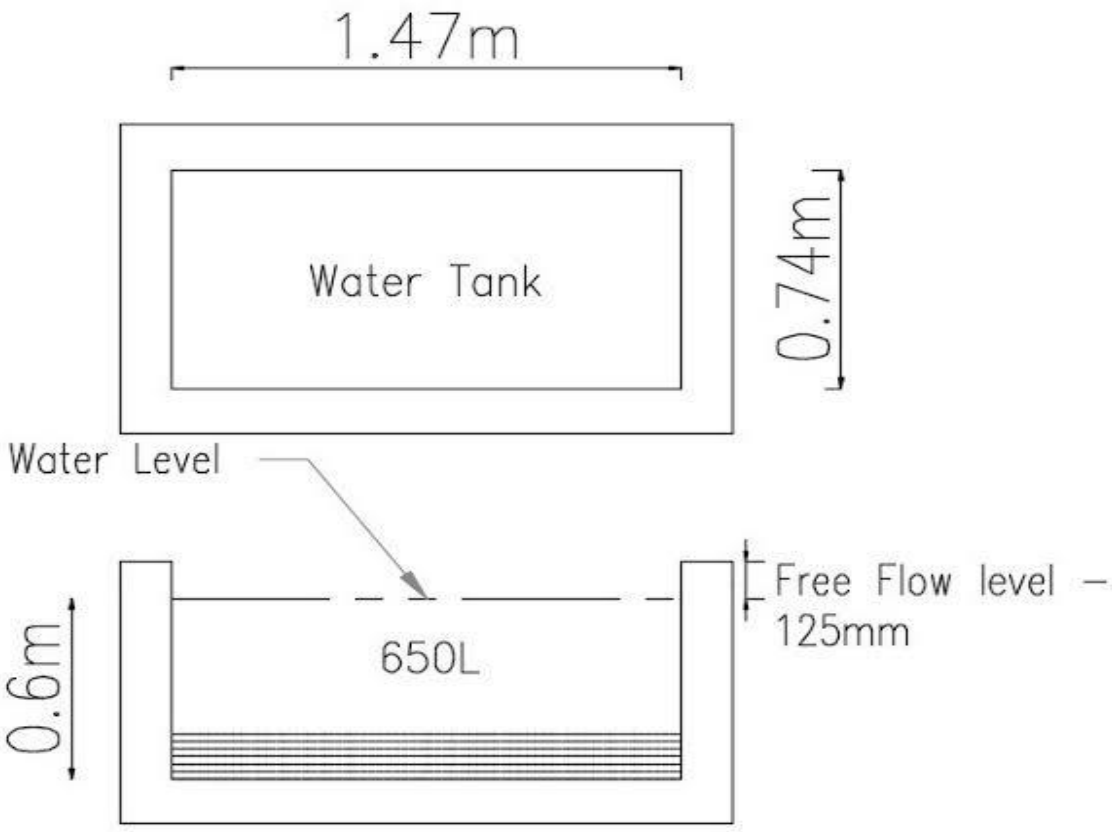


8.1.5 Physical design (Water Harvesting Tank)

Sr no	Description	No	Length (m)	Width (m)	Height (m)	Quantity (m3)
1	Excavation	1	1.87	1.14	0.9	1.91
2	PCC work	1	1.87	1.14	0.15	0.31

3	RCC work					
	In floor	1	1.87	1.14	0.20	0.42
	In wall	1	3.01	0.20	0.9	0.54
	Slab	1	2	1.6	0.15	0.48

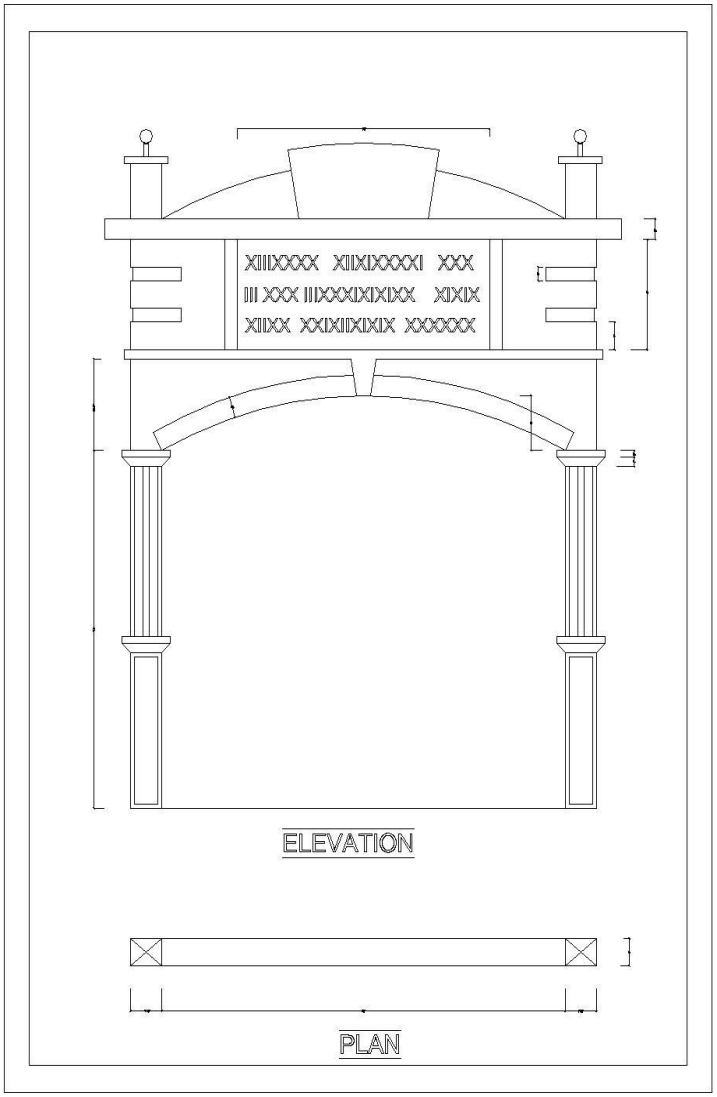
In this design its total built up area is 11.72 sq.ft so estimated price of this shop including all material and labor cost is 11717.46 Rs.

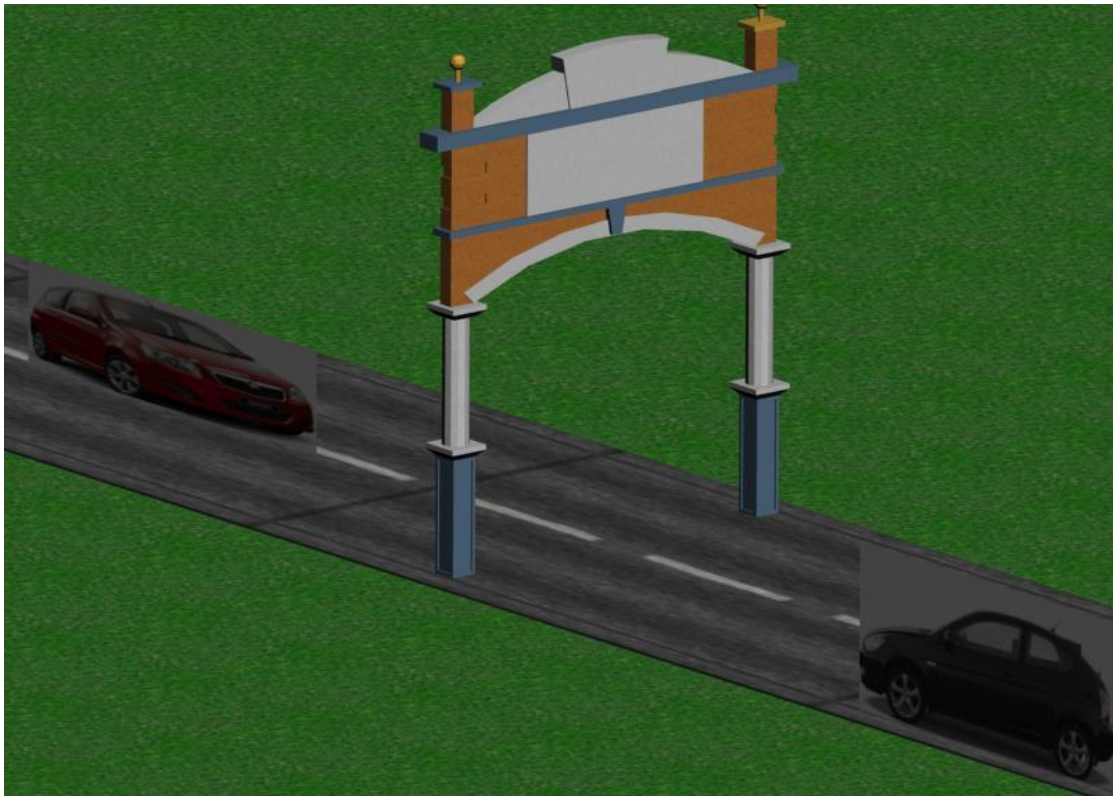


8.1.6 Heritage village design (gate)

Sr no	Description	No	Length (m)	Width (m)	Height (m)	Quantity (m3)
1	Excavation	1	5	2	1.5	15
2	Column	2	0.5	0.8	1.5	1.2
3	Support	2	1	1	0.2	0.4
4	Pillar	2	r-0.250	-	2.5	0.98

In this structure its total built up area is 150 sq.ft so estimated price of this structure including all material and labor cost is 150,000 Rs.


XIIIXXXX XIIXIXXXXI XXX
III XXX IIIXXXIXIXXX XIXIX
XIIXX XXIXIIXIXIX XXXXX
ELEVATION
PLAN



8.1.7 Electrical Design 1 (Automatic Bell System for Schools):

We are living in the world of automation where all the activities are getting automated through the use of advanced programmable controllers in home automation and industrial automation systems. An automatic school timer system reduces the effort needed to turn on or off an electric bell manually that gives alarm for certain intervals of time based on school timings. This automatic system is a microcontroller based project that uses a simple basic microcontroller, which makes this product affordable.

FIG. 83 Automatic Bell System

Usually, conventional methods require a peon or bell operator to attend and operate the bell system for every period and interval in schools and institutions. Such systems need sufficient human efforts to do so, and require advancement in order to become automated – the ones that minimize human efforts. As the bell system is important in schools, homes, and industries, the automatic operation of this instrument must have to be performed with a precise time controller economically.

This automatic school bell timer system is designed using a basic 8051 microcontroller for managing time intervals. Read or Write memory is also necessary for storing bell timings, but

for less number of timings this memory is not needed. This system also provides the display of timing information in the seven-segment display for a user interface purpose.

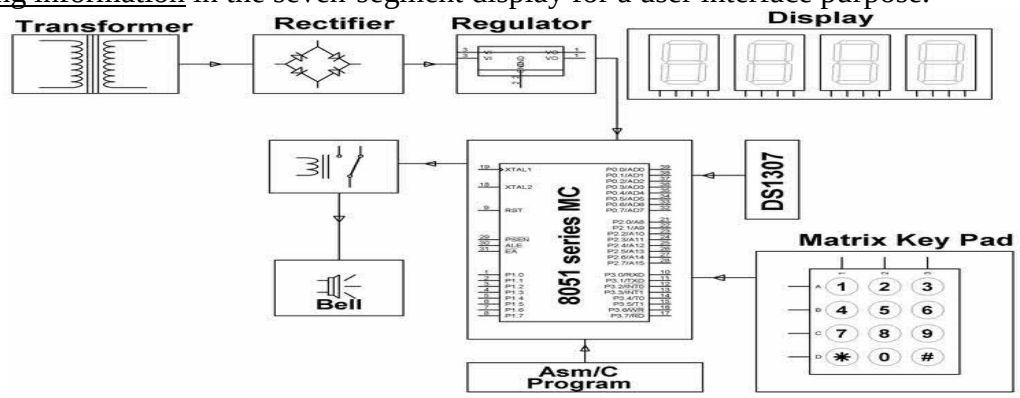


Fig.84 Automatic Bell System for School

This system uses a power-supply block to drive all the circuit components, an 8051 microcontroller to control and manage bell timings, a real-time clock for accurate timing operation, a matrix keypad to enter and configure the bell timings and a seven-segment display to display the time and information. The operation of this system can be easily understood from the above block diagram, wherein the keypad entered timings are stored in the microcontroller, which is responsible for operating the bell based on the program of the microcontroller.

1.1 Microcontroller based School Timer Circuit Operation:

The Regulated DC power supply is given to the microcontroller using a power-supply block (In the circuit, it is not given but given in the block diagram). This power-supply block consists of a step-down transformer, a bridge rectifier, a filter, and a regulator IC. The mains 230V supply is stepped downed to a 12V AC by using the transformer. This AC is rectified to a DC supply by the bridge rectifier and capacitor filters to a pure DC, and then by a regulator that regulates the power to a constant DC to 5V. This power supply drives the entire circuit except for the relay and bell devices.

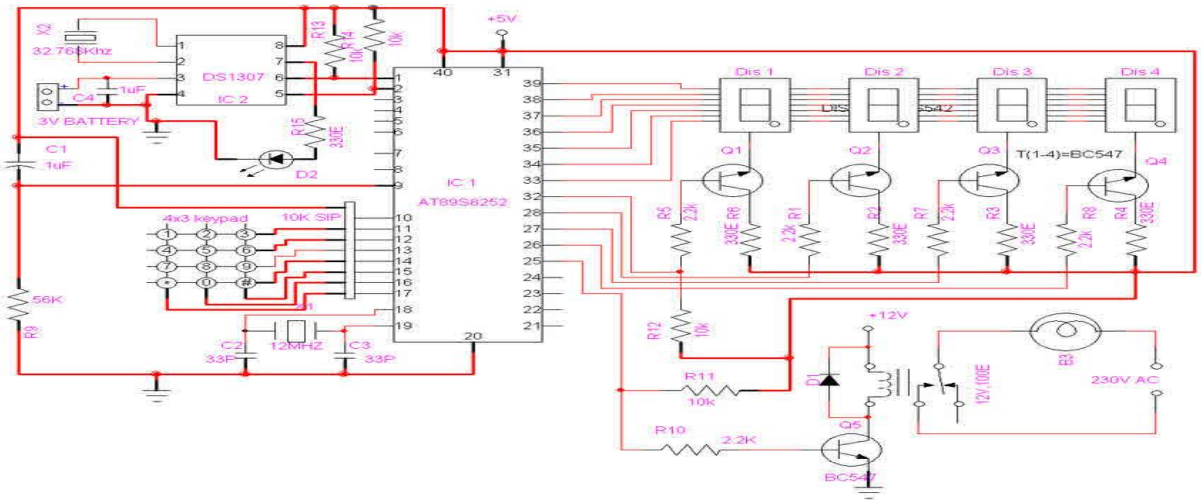


Fig.85 School Timer Circuit

For making an accurate and precise time controller, DS1307 serial RTC (Real Time Clock) is connected to the microcontroller. This RTC is a low-power, fully binary-coded decimal clock with 56 bytes of SRAM. This clock displays year, month, date, day, hours, minutes, and seconds information. In this clock, data and addresses are serially transferred by the I2C

bidirectional bus. It also has a built-in backup supply to keep time operation continuous in times of power failures as shown in the figure.
A matrix keypad is interfaced to the microcontroller for setting and storing the timing values. Various keys are used in this keypad for setting real-time hours and minutes, bell timing operations, and for storing and deleting bell and real timings.
The Seven-segment display is connected in common anode mode and interfaced with the microcontroller for displaying the timing information.
The buzzer is switched using relay and the relay coil is energized by the microcontroller.
The microcontroller has inbuilt flash EPROM memory to store the data that remains even after power failure.
The microcontroller is programmed in such a way that it accepts the real timing and bell timings and correspondingly sends the controls signals to the seven-segment display and also to the transistor connected to the relay coil.
When the relay transistor is enabled, it energizes the relay coil so that the path is closed to power the bell device.
Before working with this system we have to configure the real-time and bell time values using a matrix keypad. The procedure for the configuration is given below:

Enter the Current real-time using the keypad.
Press '#' to store real-time.
Press '*' display that shows all dashes.
Enter the 1st bell ON time.
Press '*' to save the 1st bell ON time.
Continue this procedure for 5 bells.
Press '*' to get the real-time

In this way, one can build a school bell timer using a simple microcontroller.

Implementation;

- In schools
- In digital watches
- In security systems

Benefits:

- This project can be used in educational institutes.
- It can be also used in industries.
- Human errors can be avoided.
- Safety is assured.
- Cost is less.

Conclusion:
Present day ringing the bell in schools are carried out manually. So this can be eliminated completely by making use of automation.
This will also reduce the error that is caused due to human.

8.1.8 Electrical Design 2 (Solar based water pump for irrigation):

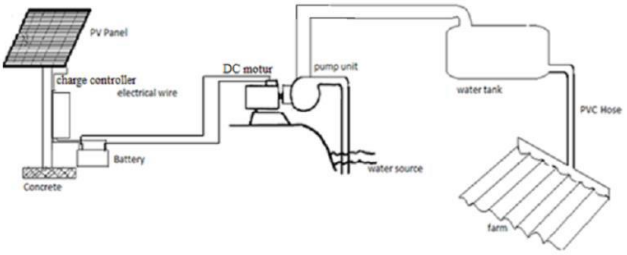
The purpose of this project is to construct solar energy operated water pump for small scale irrigation. The main contribution of the project is to; reduce the environmental pollution due to the exhausts emissions from conventional water pumps used for small scale irrigation and reducing the foreign currency by reducing the amount of conventional fuel which is imported to operate different mechanical engines including water pumps for irrigation purpose. The conventional water pump has high noise especially if it is diesel engine which affects the wild animals and migrating them from the area. In addition to that the

(Figure 86: clogged tank)

conventional fuel which is used to operate the water pump engine should be transported to the farmer and if leaks on farm land it contaminates the farm affecting the final product. The project location is Methara town where the Kereyu tribes living around the town situated on the geographical location latitude 8.9°N and 39.92°F elevation is 1007 M above sea level. The average temperature of the town is 30.5°C and the wind is blown at a speed of 1.5 m/s to 3 m/s, average humidity of the town is 34.9%, atmospheric pressure 1008.8 pas. This town is cloud around 25%. The area is sandy and due to this reason, the water main canal that the government was made had plastic shield to the ground to prevent the water from sink in to ground. Another feature of the water canal that the design determined is the level of water main canal is lower than the field. As a result, the canals could not supply sufficient water to the farm land and some of them are even clogged.The onion need more water during the sunny day. Onion is widely grown across a range of climate but it is best when temperature is cool during early development and then warmer and sunny during maturation. Onion is recommended to be irrigated for two to three days per week and also

When it is irrigated the morning is preferable than at mid-day or the warmer time of the day. Too much water is lost by evaporation if irrigation is done at the warmer day time.

In order to avoid such complications and to irrigate the farmlands effectively a solar powered water pump is designed and a schematic representation of the whole plant is shown below.



(FIG. 87. Schematic of Solar powered water pumping)

Construction of Solar Powered Water Pumping

For solar energy, operated water pump energy design is crucial and front step. Every design is proceeding from energy design. During energy design the researcher study the nature of irrigation, types and different application of solar water pump. Pumping is the hydraulic energy required to deliver a volume of water. This hydraulic energy in joule can be calculated by the following formula:
Where,
E: the hydraulic energy;
P: density of water;
G: gravity of the water;
V: volume of water;
H: head of the pump;
E: ρgVh.
The required energy pumps highly depend on the demand of water and the head of water level. The area at which the solar water pump is constructed is Eastern Showa Methahara Kereyu farm lands as described above. The quantity of water then increased by increasing the water pump horse power and the electrical energy which is controlled by the solar panel and intensity of solar radiation. The researchers selected this area because in that area, hence it gets good sun light rays which is collected by the solar panel and used to charge the storage solar battery and operate the electrical motor that rotates the impeller. During the project implementation, different tasks are performed. The project includes constructing and testing the water pumps for real operation with minimum pump and solar panel used to operate the brushless DC motor. Most of the components of the system are bought from the markets. For this project, the prototype solar energy water pump is constructed and tested. The plantation which is selected for the system is onion and the farm land area is half of a hectare. This project touches many theoretical and practical areas to become real on the ground and to achieve the objectives. The selection of material and methodology is so important and critical to optimize the success. Material selection such as panel, battery and the method to connect the electric panel to battery, battery to DC motor is performed with great care to protect the system from damage and burn. At the same time piping the water from source to farm also considered before going in to work engagement. Since the solar energy is abundantly found in Ethiopia the project is applicable in different areas of Ethiopia in addition to that of area indicated in the project. Parameters that are considered during project implementation to have better pumping efficiency are as follows:
1) The density of water: As the water density increase due to the content of sand and mud, its flow rate is highly affected. The water with more sand and mud it may clog the waterline and pump.
2) Section head: Head height from water to reservoir will determine the power required to pump the water from the ground.
3) Size of field: The size of the land will determine the required water for irrigation which sizing the pump and the tank.
4) Solar radiation: The efficiency of the solar panel is depended on the light intensity arrives on the panel. If more radiation is available on the field the induction of DC current in the solar cell will be more.

Specification of different HP rating Pump:

HP rating	Solar Module in W	Dynamic Pump Head in m	Water Discharge in LPD
1 HP	900	10	81000
2 HP	1800	10	162000
3 HP	2700	20	121000
5 HP	4800	20	216000

(Table 17: specification of different hp rating pump)

Implementation:

- In Agriculture
- In commercial Buildings
- In household

Benefits:

- Low cost
- Low maintenance
- Reliable
- Eco friendly
- Economically beneficial

Conclusion

- Grid change over option available to operate with grid power
- Auto ON/OFF feature for utilizing maximum solar energy
- Payback period (as compared to equivalent water from diesel pump) of 2 to 3 years
- Ideal for areas with low or minimum grid power
- 25 years warranty for the modules and 5 years warranty on pump and controller

From the experimental results, the following conclusion has been drawn. The 12 V, 1.11-amp PV panel could give 12 V at 30° south to east. It was found that controller allows the flow of current only if the battery status is low. The 3.33 LPS flow rate of water pump has met the maximum pumping only when the battery is fully charged. As the panel position changed the voltage production at PV panel was found to be changed. According to the experiment as the height increase the flow rate decrease. It is proved that solar water pump is suitable for small scale irrigation.

8.1.9 Electrical Design 3 (Solar Water Purifier):

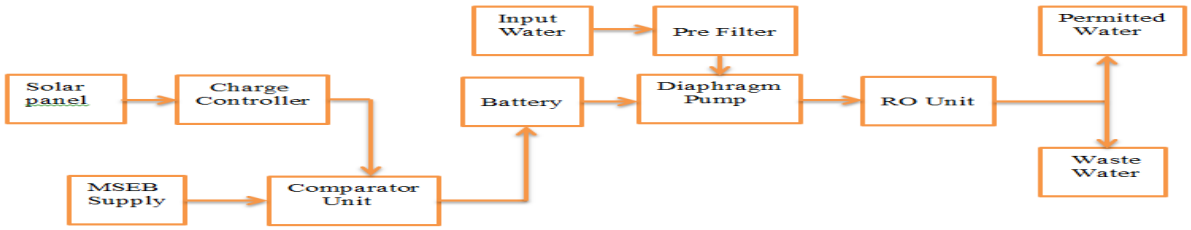
Mobile Solar Water Purifier is used to purify water. This equipment is based on the renewable energy source. Solar is a clean energy system which can cut down the pollution problems and gives the opportunity to generate reliable source of potable water. In the absence of solar energy, we are using electricity supply from electric company. This system is specially designed to meet the need of peoples in various regions. Also this system is designed mainly for those regions where electricity rate is high and electricity is rarely available. The system is mounted on the 4 wheel trolley so it is portable from one place to another and because of this we give name for project is as "Mobile Solar Water Purifier".
In India, over one lakh people die due to water borne diseases per annually. It is observed that now a days most of the groundwater is unfit for drinking purpose due to excessive concentration of fluoride and ions and also water which is present in environment it is also not fit to drink due to presence of many types of bacteria and chemicals, because in many of company the waste water or waste material is disposed in rivers and other water reservoir. With the increase in the population, the shortage of drinking water is becoming more noticeable. So purified drinking water is need of humans for their healthy health. The technologies present in now days for purification of water are too much costly, these technologies are not affordable to rural areas due it it's cost and availability of electricity because all the present water purifiers works on electric supply.

Solution and Effect

As clean and purified water is need of humans we can use "Solar Water Purifier" for purification of water. The mobile solar water works on solar energy which is free in nature with no cost. Also solar energy is a clean source of getting energy. In rainy days when solar energy is insufficient or not available we are using electricity from electric company. As we are using solar energy for getting electrical supply to purify water it is cost free. So customer will not pay electricity bill for purification of water and it is monthly saving of a customer. In this experiment we intend to make a low cost purifier which provide safe drinking water to rural and urban areas. The "Mobile Solar Water Purification" has a advantage that the purifier is movable from one place to another so it can be used anywhere in absence of electrical supply also.

Proposed Work

Now a day's electricity is a one of the important thing in our life. All the conventional are depleting day by day. So we have to shift from conventional to non-conventional energy resources. In this project combination of energy resource is takes place i.e., solar energy. This process reviles the sustainable energy resources without damaging the nature. In this project we are going to use a purify water using a renewable energy source.
The block diagram for "Mobile Solar Water Purifier" is given in fig (3). In "Mobile Solar Water Purifier" we are using solar panel for getting electrical supply this electrical supply is fed to charge controller which charge battery up to 24 volts. Then supply from battery is given to the diaphragm pump. The input water is given to the pre filter which removes solid dust particles from water then this water is fed to diaphragm pump. The diaphragm pump fed high pressure water to the RO membrane which kill bacteria form the water and we get purified water.



(Fig 88. Block Diagram)

Specification	**250LPH RO plant**	**500LPH RO plant**
Capacity of plant Li/hour	250	500
TDS	<150 ppm	<150 – 200 ppm
PH	Nearly 7	Nearly 7
Raw water feed flow Li/hour	750	1500
Raw water feed pump	0.5 HP	1 HP
Tank capacity	50 Ltrs	100 Ltrs
Storage capacity	1000 – 2000 Ltrs	1500 – 3000 Ltrs
Cost of plant	Rs. 50000 - 100000	Rs. 75000 - 150000

(Table 18: specification)

Specification	**250 LPH**	**500LPH**
Power required for driving a plant	1 kW	1.5 kW
Solar power plant size	1 kW – 1.5 kW	1.5 kW – 2 kW
No. of panels use	3 – 5	5 – 9

System DC capacity	0.99 kW	1.6 kW
Size of Inverter	1450 VA	2000 VA
Battery Voltage	12 V	12 V
Battery capacity	200 AH	200 AH
Total no. Battery in Parallel	2	3
Cost of Inverter	Rs. 7000	Rs. 9000
Cost of Battery	15000 per battery	15000 per battery

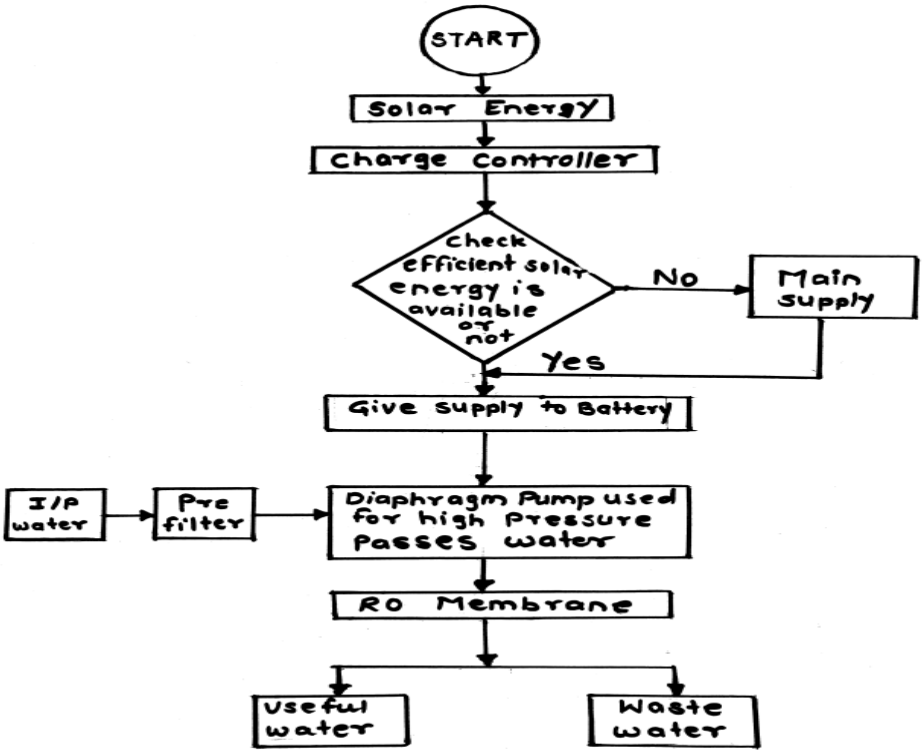
(Table 19: specification)

Hardware Implementation

(Fig 89. Hardware Model)

In this project, we are generating the electricity from the solar energy. Based on this generated electricity whole purification process will be run. But in the absence of electricity, we are providing electricity from mains supply. Here we are using comparator to compare solar energy supply, wind energy supply and mains supply. Comparator passes the high voltage supply for the purification process but here we are giving the first reference to the solar energy then wind energy supply or mains supply. The purification process consist of diaphragm pump, RO membrane, activated carbon filter.The input water feeds to the pre-filter which removes the debris, sand particles and solid particles present in the water. Then this water is passed through RO membrane with high pressure by using diaphragm pump. Diaphragm pump passes the water with high pressure. We have designed the comparator unit based on PIC16F877A 40 pin microcontroller. In low sunshine days, the whole assembly will run on mains supply. The comparator unit compares the solar energy supply and mains supply. And then provides the high voltage supply to the battery. Then battery gives supply to diaphragm pump which feds water to RO membrane.

In comparator unit the first preference is to solar energy then mains supply. Also this project run on the supply from wind energy for that we have connection on our comparator unit. Our goal is to purify water with the help of renewable energy sources which will reduce the billing of energy consumed for water purification. The payback period of this project is around 1-1.5 years.



(Fig 90. Flow chart)

Implementation:

- Near Gram Panchayat

Benefits:

- SODIS improves the microbiological quality of drinking water.
- SODIS improves the family health.
- SODIS can serve as an entry point for health and hygiene education.
- SODIS is easy to understand.
- Everybody can afford SODIS, as the only resources required are sunlight, which is cost free and plastic bottles.

Conclusion

So as per our goal off this project, we design a dependable way to purify water for locations those are off grid and don't have constant sources of clean water. This design also fulfill the requirement of low budget product considering the most of the places don't provide potable water to their citizens. Water purification through solar power is one of the best inventions to save energy and to have uncontaminated water. An electric purifier system requires more power and costs a lot more too.

8.2 Reason for Student Recommending This Design

- We recommend the rain water harvesting system because in village there is no rain water storage facility so this water runoff and fill the depression area this create nuisance of mosquitoes also sometime this water store on the internal road of village and create trouble for people. The rain water harvesting also good for efficient use of water by collecting this water we can use during summer for various purposes.
- In this village there are about 33% children and elder so proposal of designing public garden is good for them.
- In this village only PHC is available so we recommend high tech health care centre
- In this village only primary school is available so we recommend secondary and higher secondary and also there is no library at or near the village so we include this proposal in our design.

8.3 About design suggestions/benefits of the villagers

- Aim of the design is to first of all satisfy the essential need of the villagers.
- After that design goal is to create employment through various sources available in village.

Chapter 9: Proposing Design for Future development of the Village for the PART-2 Design

Proposing design for future means we will try to give some new and good design for some of the structure of the town.

- Solid waste management(social design)
- Water treatment plant(smart design)
- Community hall(socio-cultural design)
- Panchayat building(social design)
- Public toilet block(physical design)
- School(heritage design)
- Electrical design 1: (solar water heater)
- Electrical design 2: (fully automatic solar street light)
- Electrical design 3: (fish farm aquaculture monitoring & controlling system)

Chapter 10: Conclusion of the Entire Village Activity of the Project

As per our actual visit of village we found the current scenario of village. As village is located far from urban area the facility in village is not very much available. Rice, sugarcane and vegetable is the major crops grown in village. Village is connected with local public transport of GSRTC. Village is lacking for the proper solid waste management and many facilities are needed to be provided.

After analyzing all the data, we found that village need some new facilities and some need maintenance. We provide nine new design for our village, a public library, bus stand, medical shop, dudh mandli, entry gate, rain water harvesting tank, solar based water pump irrigation, solar water purifier and grid connected solar roof top. By providing such facilities it will be quite easy for all the people of village to connect to people of outer world and it will be helpful to create more opportunities for them.

in village they have dudh mandi but not in good condition so if any farmer not gave milk at time in dudh mandala then his cows or buffalo milk is not accepted in mandala because of storage issue so we provide new design with high tech facility in this new design they can store milk overnight without any problem so farmer don't get in loss and new design is more space than older one so they can manage easily and by this design more people get job so village people get job from it.

In village they don't have medical shop so if any villager want any medicine then they are travel in city for get medicine so we provide medical store in village so villagers get medicine easily and fast.

In village they don't have library so we provide public library design so by this design students and villagers both get benefits of it by this design student village get easy access to any book and gain their knowledge and by this initiative we are able to increase literacy rate of village.

In village they have bus stand but not in good condition so we provide new design of bus stand. Bigger than older bus station so all traveler get benefits of this station.

In village people have knowledge about rain water harvesting but they don't have this facility at their property or home so we provide this design at grampanchyat of hansapore so they store rain water for different use like gardening, block wash, office wash, and many more.

In village they don't have entry gate in there and this village so we gave entry gate design for aesthetic view and national high way pass through village so we provide entry gate in village local rode.

Chapter 11: Reference Refereed For This Report

- Census of India 2011 (censusindia.gov.in)
- Hygienic rural toilet (dry sanitation system); research, design & development carried out at IDC, IIT Bombay, September 2013
- UDPFI Guidelines, urban development plans formulation and implementation-vol I, ministry of urban affairs and employment, government of India, new Delhi, august 1996
- SP 35: handbook on water supply and drainage (1987), beurau of indian standards, December 1987
- Ecological sanitation practitioner's handbook; united nations children's fund (UNICEF), India, 2011

Chapter 12: Annexure Attachment

12.1 Ideal Village

Gujarat Technological University, Ahmedabad, Gujarat

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:	Chikhli
Name of Taluka:	Chikhli
Name of District:	Navsari
Name of Institute:	S.S. Agrawal Institute of eng. & tech
Nodal Officer Name & Contact Detail:	Chintan Naik. 73599 33090
Respondent Name: (Sarpanch/ Panchayat Member/ Teacher/ Gram Sevak/ Aaganwadi worker/Village dweller)	Ankit Patel.
Date of Survey:	7-9-2020

1. **Demographical Detail:**

Sr. No.	Census	Population	Male	Female	Total House Holds
i)	2001	6953	51%	49%	–
ii)	2011	7025	3556	3469	1218

2. **Geographical Detail:**

Sr. No.	Description	Information/Detail
i)	Area of Village (Approx.) (In Hector) Coordinates for Location:	9KM.
	Forest Area (In hect.)	–
	Agricultural Land Area (In hect.)	–
	Residential Area (In hect.)	–
	Other Area (In hect.)	–
	Water bodies	Kaveri River.
	Nearest Town with Distance:	Bilimora - 10 km.

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Techno Economic Survey

3. **Occupational Details:**

Name of Three Major Occupation groups in Village	1. Shops 2. business 3. Farmers

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		✓ ✓ ✓ ✓ ✓ ✓		
	Suggestions if any:				
B.	**Water Tank Facility**				
	Overhead Tank	Capacity:	480000, 580000		2 tank Available
	Underground Sump	Capacity:	—		
	Suggestions if any:				
C.	**Drainage Facility**				
	Available (Yes/ No)		Yes		
	Suggestions if any:				
D.	**Type of Drainage**				
	Closed/ Open	closed	✓		
	If Open than Pucca / Kutchcha	Pucca	✓		
	Whether drain water is discharged directly in to Water bodies/ Sewer plants	No			
	Suggestions if any:				

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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

E.	Road Network :All Weather/ Kutchha (Gravel)/ Black Topped pucca/ WBM				
	Village approach road	Pucca	✓		
	Main road		✓		
	Internal streets		✓		
	Nearest NH/SH/MDR/ODR Dist. in kms.	NH, SH	✓		
Suggestions if any:					
F.	**Transport Facility**				
	Railway Station (Y/N) (If No than Nearest Rly Station---Kms)	10 KM	✓		
	Bus station (Y/N) Condition: (If No than Nearest Bus Station---Kms)		✓		
	Local Transportation (Auto/ Jeep/Chhakda/ Private Vehicles/ Other)		✓		
Suggestions if any:					
G.	**Electricity Distribution**				
	(Y/N) Govt./ Private (Less than 6 hrs./ More Than 6 hrs)	24X7	✓		
	Power supply for Domestic Use		✓		
	Power supply for Agricultural Use		✓		
	Power supply for Commercial Use		✓		
	Road/ Street Lights		✓		

	Electrification in Government Buildings/ Schools/ Hospitals		✓		
	Renewable Energy Source Facilities (Y/ N)		✓		
	LED Facilities		✓		
Suggestions if any:					
H.	**Sanitation Facility**				
	Public Latrine Blocks If available than Nos.	nalsarry	✓		
	Location Condition	In village good	✓ ✓		
	Community Toilet (With bath/ without bath facilities)	without bath	✓		
	Solid & liquid waste Disposal system available		✓		
	Any facility for Waste collection from road	temple & tractors.	✓		
Suggestions if any:					
I.	**Irrigation Facility:**				
	Main Source of Irrigation (Stream/River/ Canal/ Well/ Tube well/ Other)		✓		
Suggestions if any:					
J.	**Housing Condition:**				
	Kutchha/Pucca (Approx. ratio)		✓		

5. **Social Infrastructural Facilities:**

Sr. No.	Descriptions	Information/ Detail	Adequate	Inadequate	Remarks

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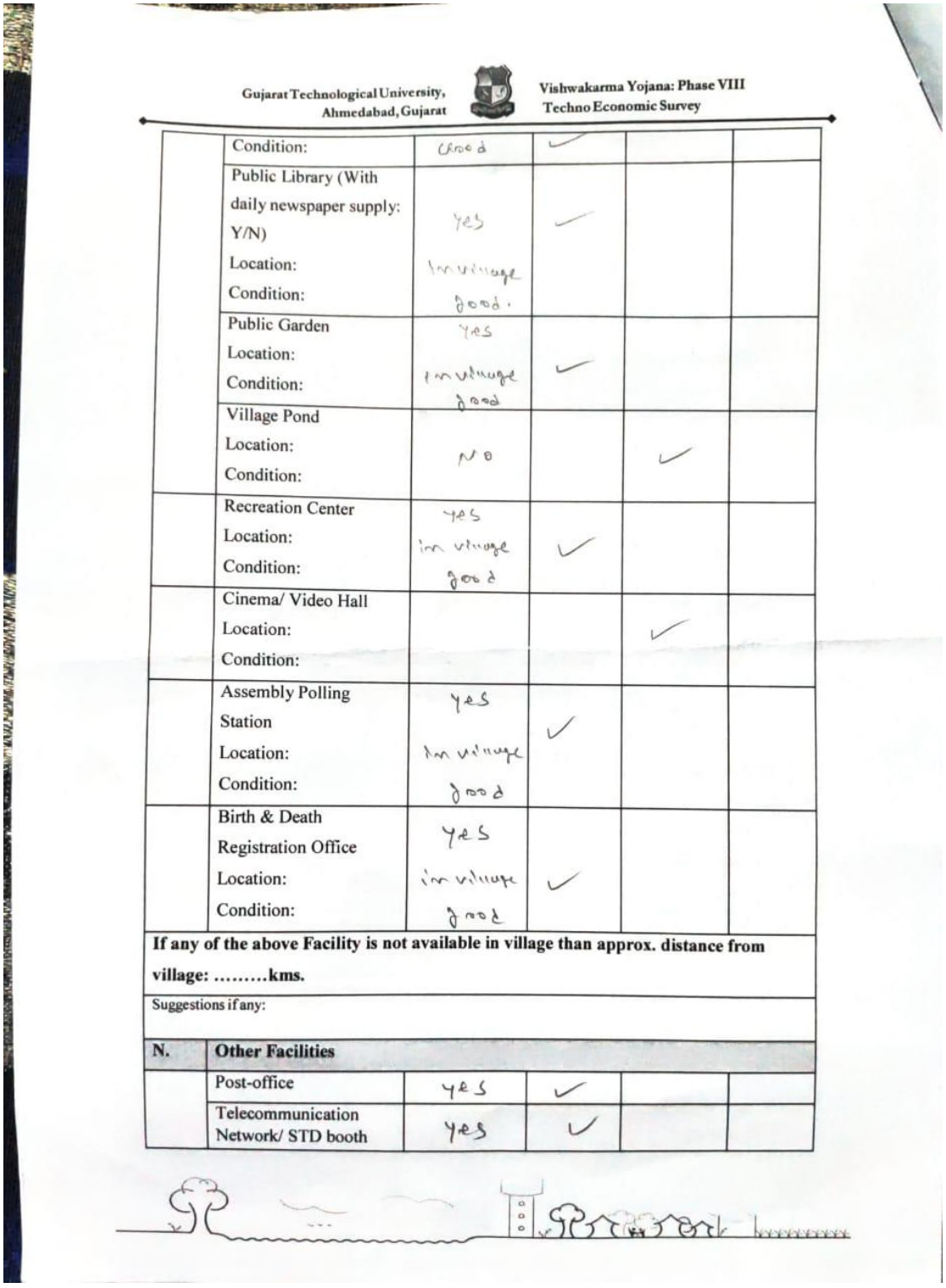
Techno Economic Survey

K.	**Health Facilities:**				
	Sub center/ PHC/ CHC /Government Hospital/ Child welfare & Maternity Homes (If Yes than specify No. of Beds) Condition:	—	✓		
	Private Clinic/Private Hospital/ Nursing Home		✓		
	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		✓		
	Primary School		✓		
	Secondary school		✓		
	Higher sec. School		✓		
	ITI college/ vocational Training Center		✓		
	Art, Commerce& Science /Polytechnic/ Engineering/ Medical/ Management/ other college facilities		✓		
	If any of the above Facility is not available in village than approx. distance from village: .....kms.				
Suggestions if any:					

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



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	Condition:	Good	✓		
	Public Library (With daily newspaper supply: Y/N) Location: Condition:	Yes In village good.	✓		
	Public Garden Location: Condition:	Yes In village good	✓		
	Village Pond Location: Condition:	No		✓	
	Recreation Center Location: Condition:	Yes in village good	✓		
	Cinema/ Video Hall Location: Condition:			✓	
	Assembly Polling Station Location: Condition:	Yes In village good	✓		
	Birth & Death Registration Office Location: Condition:	Yes in village 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	Yes	✓		
	Telecommunication Network/ STD booth	Yes	✓		

	General Market	Yes	✓		
	Shops (Public Distribution System)	Yes	✓		
	Panchayat Building	Yes	✓		
	Pharmacy/Medical Shop	Yes	✓		
	Bank & ATM Facility	Yes	✓		
	Agriculture Co-operative Society	Yes	✓		
	Milk Co-operative Soc.			✓	
	Small Scale Industries	Yes	✓		
	Internet Cafes/ Common Service Center/Wi Fi			✓	
	Other Facility		✓		
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	----	✓		
P.	Bio-Gas Plant Solar Street Lights Rain Water Harvesting System	Yes	✓		
Q.	Any Other		✓		

7. **Data Collection From Village**

Village Base Map Available: Hard Copy/Soft Copy	Yes

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Techno Economic Survey

Recent Projects going on for Development of Village	Road development.
Any NGO working for village development	Yes many.

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)	Yes Bus station	
2.	Additional Information/ Requirement	NA	

9. Smart Village Proposal Design

Sr. No.	Descriptions	Information/ Detail	Remarks
1.	is their Any thing for the village enhancement possibility	wi-fi facility and many.	-

ગ્રામ પંચાયત ચીખલી તા.ચીખલી જિ.નવસારી

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

સરપંચ
ચીખલી ગ્રામ પંચાયત
તા.ચીખલી જી.નવસારી

12.2 Smart Village

Gujarat Technological University, Ahmedabad, Gujarat — Vishwakarma Yojana: Phase VIII Techno Economic Survey

Techno Economic Survey

Vishwakarma Yojana: Phase VIII

SMART VILLAGE SURVEY

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

Name of District:	Tapi
Name of Taluka:	Uchod
Name of Village:	Bukari
Name of Institute:	S.S.A.I.E.T
Nodal Officer Name & Contact Detail:	Chintan Vaidya
Respondent Name: (Sarpanch/ Panchayat Member/ Teacher/ Gram Sevak/ Aaganwadi worker/Village dweller)	Ramesh Bhai Chaudhari
Date of Survey:	

I. DEMOGRAPHICAL DETAIL:

Sr. No.	Census	Population	Male	Female	Total Number of House Holds
1.	2001				
2.	2011	5905	3060	2845	1289

II. GEOGRAPHICAL DETAIL:

Sr. No.	Description	Information/Detail
1.	Area of Village (Approx.) (In Hector)Coordinates for Location:	288.53
2.	Forest Area (In hect.)	—
3.	Agricultural Land Area (In hect.)	118.33
4.	Residential Area (In hect.)	130.20
5.	Other Area (In hect.)	40
6.	Distance to the nearest railway station (in kilometers):	—

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7.	Name of Nearest Town with Distance:	Vitpor (2.3 KM)
8.	Distance to the nearest bus station (in kilometers):	Buhari Bus Station 1 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.	Agriculture
	2.	Job
	3.	Dairy

Major crops grown in the village:	1.	Sugar cane
	2.	Rice
	3.	Veggitables

IV. PHYSICAL INFRASTRUCTURE FACILITIES:

Sr. No.	Descriptions	Detail	Adequate	Inadequate	Remarks
A.	**Main Source of Drinking water**				
1.	**PIPED WATER**				
	Piped Into Dwelling	Yes	Yes	—	Good
	Piped To Yard/Plot	Yes	Yes	—	Good
	Public Tap/Standpipe	Yes	Yes	—	Good
	Tube Well Or Bore Well				
2.	**DUG WELL**				
	Protected Well	Yes	Yes	—	Good
	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	Yes	Yes	—	In Good condition
	Bottled Water				
	Hand Pump				
	Other(Specify)**Lake/ Pond**	River	Yes	—	—

Suggestions if any:					
B.	**Water Tank Facility**				
	Overhead Tank	Capacity			
	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				
Suggestions if any:					
D.	**Road Network : All Weather/ Kutchha (Gravel)/ Black Topped pucca/ WBM**				
	Village approach road	RCC			
	Main road	Bitumen			
	Internal streets				
	Nearest NH/SH/MDR/ODR Dist. in kms.	SH			
Suggestions if any:					
E.	**Transport Facility**				
	Railway Station (Y/N) (If No than Nearest Rly Station---Kms)	NO			
	Bus station (Y/N) Condition: (If No than Nearest Bus Station---Kms)				
	Local Transportation (Auto/ Jeep/Chhakda/ Private Vehicles/ Other)				
Suggestions if any:					
F.	**Electricity Distribution**				
	(Y/N) Govt./ Private (Less than 6 hrs./ More Than 6 hrs)	Govt			

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Techno Economic Survey

	Power supply for Domestic Use	Yes	–	–	24 hrs
	Power supply for Agricultural Use	Yes	–	–	As per schedule
	Power supply for Commercial Use	Yes	–	–	24 hrs
	Road/ Street Lights	Yes	–	–	Solar
	Electrification in Government Buildings/ Schools/ Hospitals	Yes	–	–	Solar
	Renewable Energy Source Facilities (Y/ N)	Yes			
	LED Facilities	Yes	–	–	
Suggestions if any:					
G.	**Sanitation Facility**				
	Public Latrine Blocks If available than Nos.	No	–	–	–
	Location Condition	–	–		–
	Community Toilet (With bath/ without bath facilities)	No	–	–	–
	Solid & liquid waste Disposal system available	Yes	–	Yes	Need improvement
	Any facility for Waste collection from road	Yes	Yes	–	Good
Suggestions if any:					
H.	**Main Source of Irrigation Facility:**				
	TANK/POND STREAM/RIVER CANAL WELL TUBE WELL OTHER (SPECIFY)	– Yes Yes Yes Yes –	–	–	As per schedules
Suggestions if any:					
I.	**Housing Condition:**				
	Kutchha/Pucca (Approx. ratio)	70% Pucca 30% Kutchha	Yes	–	Good condition

V. SOCIAL INFRASTRUCTURAL FACILITIES:

Sr. No.	Descriptions	Information/ Detail	Adequate	Inadequate	Remarks
J.	**Health Facilities:**				
	ICDS (Anganwadi)	Yes	Yes	—	Good
	Sub-Centre	Yes	Yes	—	Good
	PHC	Yes	Yes	—	Good
	BLOCK PHC	—	—	—	—
	CHC/RH	—	—	—	—
	District/ Govt. Hospital	Yes	Yes	—	Need improvement
	Govt. Dispensary	—	—	—	—
	Private Clinic	Yes	Yes	—	Good
	Private Hospital/	Yes	Yes	—	Good
	Nursing Home	—	—	—	—
	AYUSH Health Facility	—	—	—	—
	sonography /ultrasound facility	Yes	Yes	—	Good
	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	Yes	Yes	—	Good
	Primary School	Yes	Yes	—	Good
	Secondary school	Yes	Yes	—	Good
	Higher sec. School	Yes	Yes	—	Good
	ITI college/ vocational Training Center	—	—	—	—
	Art, Commerce& Science /Polytechnic/ Engineering/ Medical/ Management/ other college facilities	Art and commerce college	Yes	—	Good
	If any of the above Facility is not available in village than approx. distance from village: .....kms.				

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Suggestions if any:

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

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	Village	Yes	—
	Telecommunication Network/ STD booth	Good	In Village	Yes	—
	General Market	Good	[illegible]	Yes	—
	Shops (Public Distribution System)	Good	In Village	Yes	—
	Panchayat Building	Good	Village	Yes	—
	Pharmacy/Medical Shop	Good	In Village	Yes	—
	Bank & ATM Facility	Good	In Village	Yes	—
	Agriculture Co-operative Society	Good	Near Village	Yes	—
	Milk Co-operative Soc.	Good	In Village	Yes	—
	Small Scale Industries	Good	Near Village	Yes	—
	Internet Cafes/ Common Service Center/Wi Fi	Good	In Village	Yes	—
	Youth Club	Good	In Village	Yes	—
	Mahila Mandal	—	Village	Yes	—

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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?				
	2. Are there any beneficiaries in the village from the following programme?				
	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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VI. SUSTAINABLE /GREEN INFRASTRUCTURE FACILITIES:

Sr. No.	Descriptions	Information/ Details	Adequate	Inadequate	Remarks
1.	Adoption of Non-Conventional Energy Sources/ Renewable Energy Sources	use Renewable energy in home	Yes	–	good
2.	Bio-Gas Plant Solar Street Lights Rain Water Harvesting System	Yes Yes –	Yes Yes –	– – –	good good –
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	Yes	Yes	–	Hard 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)	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	NO	—
2.	Additional Information/ Requirement	—	—
3.	During the last six months how many times CLEANING ..... FOGGING..... Drive was undertaken in the village?	YES YES	DAILY

IX. Smart Village / Heritage Details

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

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

સરપંચ
ગ્રામ પંચાયત ખુડાદા
તા. વાલોડ જી. તાપી

12.3 Allocated Village

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Techno Economic Survey

Techno Economic Survey

Vishwakarma Yojana: Phase VIII

ALLOCATED VILLAGE SURVEY

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

Name of District:	Navsari
Name of Taluka:	Jalalpore
Name of Village:	Hansapor
Name of Institute:	S S Agrawal Institute of Engineering and Technology
Nodal Officer Name & Contact Detail:	Chintan Naik
Respondent Name: (Sarpanch/ Panchayat Member/ Teacher/ Gram Sevak/ Aaganwadi worker/Village dweller)	Bhavnaben D Patel
Date of Survey:	9-11-2020

I. DEMOGRAPHICAL DETAIL:

Sr. No.	Census	Population	Male	Female	Total Number of House Holds
1.	2001				
2.	2011	2281	1179	1102	

II. GEOGRAPHICAL DETAIL:

Sr. No.	Description	Information/Detail
1.	Area of Village (Approx.) (In Hector)Coordinates for Location:	410
2.	Forest Area (In hect.)	NO
3.	Agricultural Land Area (In hect.)	311
4.	Residential Area (In hect.)	98
5.	Other Area (In hect.)	1
6.	Distanee to the nearest railway station (in kilometers):	Gandevi Station 2.5 KM

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7.	Name of Nearest Town with Distance	1 KM
8.	Distance to the nearest bus station (in kilometers):	—
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.	AGRICULTURE
	2.	JOB
	3.	DAIRY

Major crops grown in the village:	1.	SUGARCANE
	2.	RICE
	3.	CASTOR, YOUNG CULTIVATION ETC.

IV. PHYSICAL INFRASTRUCTURE FACILITIES:

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

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Vishwakarma Yojana: Phase VIII
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	Other(Specify)Lake/ Pond	Yes Lake	Yes	—	—
Suggestions if any:					
B.	**Water Tank Facility**				
	Overhead Tank	Capacity:	50000		
	Underground Sump	Capacity:	—	—	—
Suggestions if any:					
C.	**The Type of Drainage Facility**				
	A. UNDERGROUND DRAINAGE 1	Yes	Yes	—	—
Suggestions if any:					
D.	**Road Network :All Weather/ Kutchha (Gravel)/ Black Topped pucca/ WBM**				
	Village approach road	Bitumen	Bitumen		
	Main road	Bitumen			
	Internal streets	RCC	BLOCK		
	Nearest NH/SH/MDR/ODR Dist. in kms.	SH			
Suggestions if any:					
E.	**Transport Facility**				
	Railway Station (Y/N) (If No than Nearest Rly Station---Kms)	Govt Yes			
	Bus station (Y/N) Condition: (If No than Nearest Bus Station---Kms)	Yes			
	Local Transportation (Auto/ Jeep/Chhakda/ Private Vehicles/ Other)	Yes			
Suggestions if any:					
F.	**Electricity Distribution**				
	(Y/N) Govt./ Private (Less than 6 hrs./ More Than 6 hrs)	Govt	—	—	more than 6 hrs

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Vishwakarma Yojana: Phase VIII
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	Power supply for Domestic Use	Yes			24 hrs
	Power supply for Agricultural Use	Yes			8 hrs Per Solar
	Power supply for Commercial Use	Yes			24 hrs
	Road/ Street Lights	Private			
	Electrification in Government Buildings/ Schools/ Hospitals	Yes			24 hrs
	Renewable Energy Source Facilities (Y/ N)	Yes			
	LED Facilities	Yes			

Suggestions if any:

G.	**Sanitation Facility**				
	Public Latrine Blocks If available than Nos.	NO			
	Location Condition	—			
	Community Toilet (With bath/ without bath facilities)	NO			
	Solid & liquid waste Disposal system available	NO			
	Any facility for Waste collection from road	NO			

Suggestions if any:

H.	**Main Source of Irrigation Facility:**				
	TANK/POND	Yes			As per Seasons
	STREAM/RIVER	—			
	CANAL	Yes			
	WELL	—			
	TUBE WELL	Yes			
	OTHER (SPECIFY)	—			

Suggestions if any:

I.	**Housing Condition:**				
	Kutchha/Pucca (Approx. ratio)	50% Pucca 50% Kutchha			Good condition

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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

V. SOCIAL INFRASTRUCTURAL FACILITIES:

Sr. No.	Descriptions	Information/ Detail	Adequate	Inadequate	Remarks
J.	**Health Facilities:**				
	ICDS (Anganwadi)	Yes			
	Sub-Centre	—			
	PHC	Yes			
	BLOCK PHC	—			
	CHC/RH	—			Available in village
	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: ..~~4~~.....kms.				
Suggestions if any:					
K.	**Education Facilities:**				
	Aaganwadi/ Play group	Yes			Good
	Primary School	Yes			Good
	Secondary school	Yes			
	Higher sec. School	Yes			
	ITI college/ vocational Training Center	NO			
	Art, Commerce& Science /Polytechnic/ Engineering/ Medical/ Management/ other college facilities	NO			

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Vishwakarma Yojana Phase VIII
Techno Economic Survey

	If any of the above Facility is not available in village than approx. distance from village: 2-8 kms
Suggestions if any:	

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

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

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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

	Credit Cooperative Society Agricultural Cooperative Society Milk Cooperative Society Fishermen's Cooperative Society Computer Kiosk/ e-chaupal / Mills / Small Scale Industries			102	—
	Other Facility	—	—	—	100

Suggestions if any:

N.	Other Facilities	Condition		Available (YES)	Available (NO)
	1. Have these programme implemented the village?				
	2. Are there any beneficiaries in the village from the following programme?				
	3. Janani Suraksha Yojana				
	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)			Yes	
	20. Samagra Awas Yojana (SAY)				
	21. Sanjay Gandhi Niradhar Yojana (SGNY)				
	22. Jawahar Gram Samridhi Yojana (JGSY)				
	23. Other (SPECIFY)				

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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	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	yes			Hard copy
2.	Recent Projects going on for Development of Village	yes			Gram Sabha Pojna
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)	NO			

VIII. 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	NO	—
2.	Additional Information/ Requirement		
3.	During the last six months how many times CLEANING …………………………… FOGGING…………………………… Drive was undertaken in the village?	Yes Yes	2-3 time 1-2 time

IX. Smart Village / Heritage Details

Sr. No.	Descriptions	Information/ Detail	Remarks
1.	IS THEIR ANY THING FOR THE VILLAGE ENHANCEMENT POSSIBLE ?	Repaired house gutter need [illegible]	Design

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

Patel B D
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12.4 Village Gap Analysis

VILLAGE GAP Analysis

Village Name: Hansapore

Population:

Village Facilities	Planning Commission/UDPFI Norms	Existing	Required as per Norms	Smart Village / Cities / Heritage Future Projection Design	Gap
Social Infrastructure Facilities					
Education					
Anganwadi	Each or Per 2500 population	1	1	—	0
Primary School	Each Per 2500 population	1	1	—	0
Secondary School	Per 7 500 population	—	—	—	0
Higher Secondary School	Per 15 000 Population	0	0	—	0
College	Per 125 000 Population	0	0	—	0
Tech. Training Institute	Per 100000 Population	0	0	—	0
Agriculture Research Centre	Per 100000 Population	0	0	—	0
Skill Development Center	Per 100000 Population	0	0	—	0
Health Facility					
Govt/Panchyat Dispensary or Sub PHC or Health Centre	Each Village	1	1	—	0
Primary Health & Child Health Center	Per 20 000 population	0	0	—	0
Child Welfare and Maternity Home	Per 10 000 population	0	0	—	0
Multispeciality Hospital	Per 100000 Population	0	0	—	0
Public Latrines	1 for 50 families (if toilet is not there in home, specially for slum pockets & kutcha house)	0	1	—	-1
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	—	—	—
Drinking Water (Minimum 70 lpcd)		Adequate / ~~Inadequate~~			
Over Head Tank	1/3 of Total Demand	Adequate	—	—	—
U/G Sump	2/3 of Total Demand	—	—	—	—
Drainage Network - Open		~~Adequate~~ / Inadequate			
Drainage Network - Cover		Inadequate	—	—	—
Waste Management System		~~Adequate~~ / Inadequate			
Socio- Cultural Infrastructure Facilities					
Community Hall	Per 10000 Population	1	1	—	0
community hall and Public Library	Per 15000 Population	0	0	—	0
Cremation Ground	Per 20 000 population	1	1	—	0
Post Office	Per 10 000 population	1	1	—	0
Gram Panchayat Building	Each individual/group panchayat	1	1	—	0
APMC	Per 100000 Population	0	0	—	0
Fire Station	Per 100000 Population	0	0	—	0
Public Garden	Per village	0	1	—	-1
Police post	Per 40 000Population	0	0	—	0
Shopping Mall					
Electrical Design					
Electricity Network		Adequate / ~~Inadequate~~	—	—	—
Any Smart Village Facility					
Technology					
		ESR cap	0		
		Sump cap	0		
		Lat	0		

12.5 Summary of all the Villages Design in Part-1 and Part-2

Sr. No.	Village Name	Part-1 design
1	Danti	Primary Health Care Centre
		Library
		Pharmacy
		Panchayat Office
		Bus Stop
		Entrance Gate
		Fully Automatic Solar Street Lights
		Agricultural Solar Pump
		Fish farm aquaculture monitoring and controlling system
2	Mandir	Bus Stop
		Public Toilet
		Entrance Gate
		Library
		Garden
		Medical Store
		Solar Street Light
		Solar Roof Top
		Solar Water Heater
3	Hansapor	Bus Stop
		Doodh Utpadan Mandali
		Library
		Medical Shop
		Water Harvesting Tank
		Entrance Gate
		Automatic bell system
		Solar based water pump irrigation
		Solar water purifier

(Table 20: summary of village design)

12.7 Summary of Good Photograph in Table Format

(Fig 91: hansapor gram panchayat, PHC, school, pond)

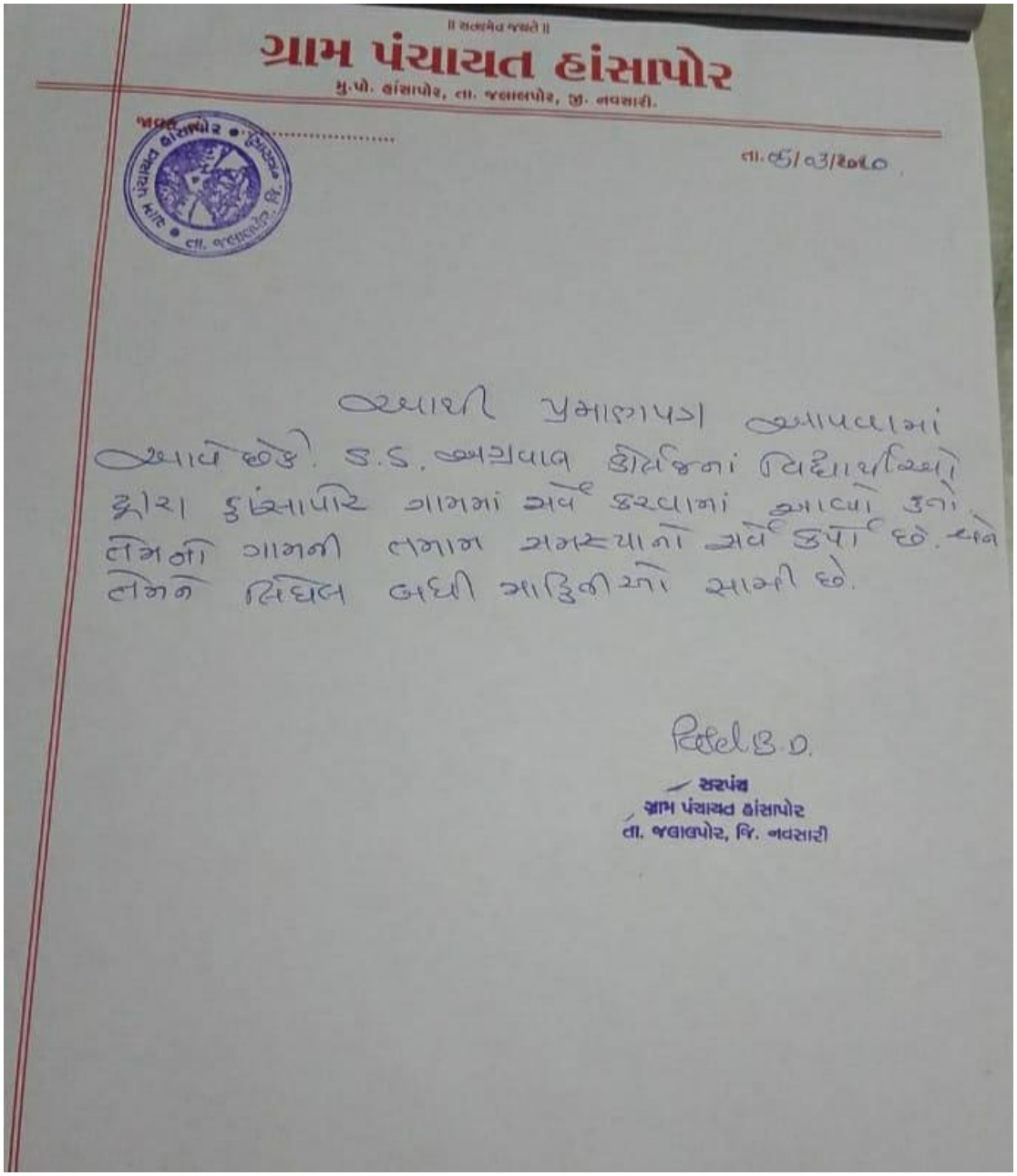
12.8 Village Interaction with Sarpanch Report with Photograph

We visited allocated village hansapore and also visited ideal village chikhli and smart village buhari. We met sarpach bhavnaben and TDO. They both halp us in get data of village.

We visited whole village cooperate with villagers and get some more information about village from them. We visited all interior streets of the village and interacted with vilagers. We also visited post office of hansapore and interacted with post office operator. Villagers told us about facility they already have in village and also problem they face in village.

(Fig 92: at gram panchayat hansapor with sarpanch and TDO)

12.9 Sarpanch Letter Giving Information about the Village Development



ગ્રામ પંચાયત હાંસાપોર

મુ.પો. હાંસાપોર, તા. જલાલપોર, જી. નવસારી.

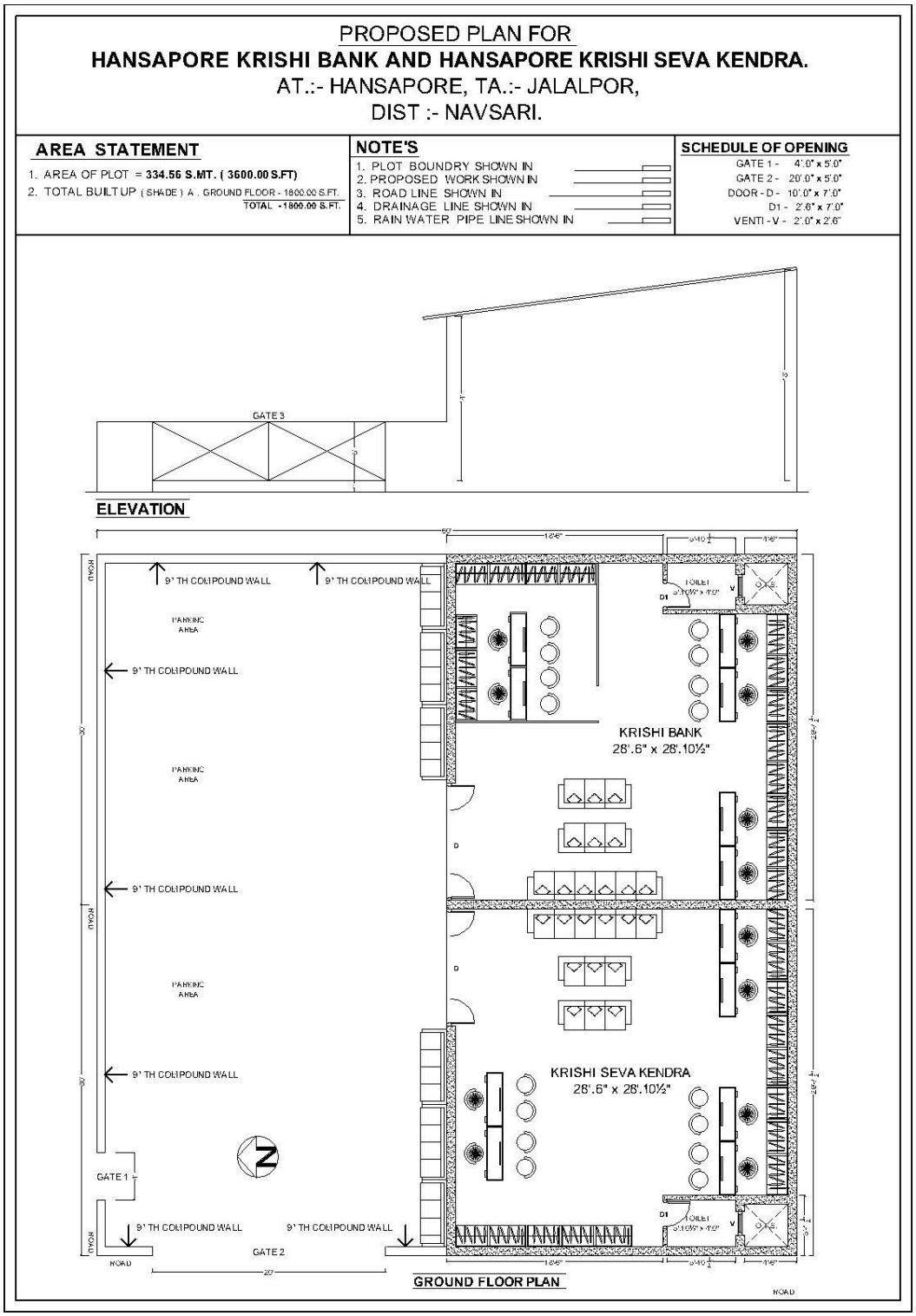
તા. 05/03/2020

સરપંચ
ગ્રામ પંચાયત હાંસાપોર
તા. જલાલપોર, જિ. નવસારી

13. from the chapter 9 future design of the aspect

13.1 Design proposal

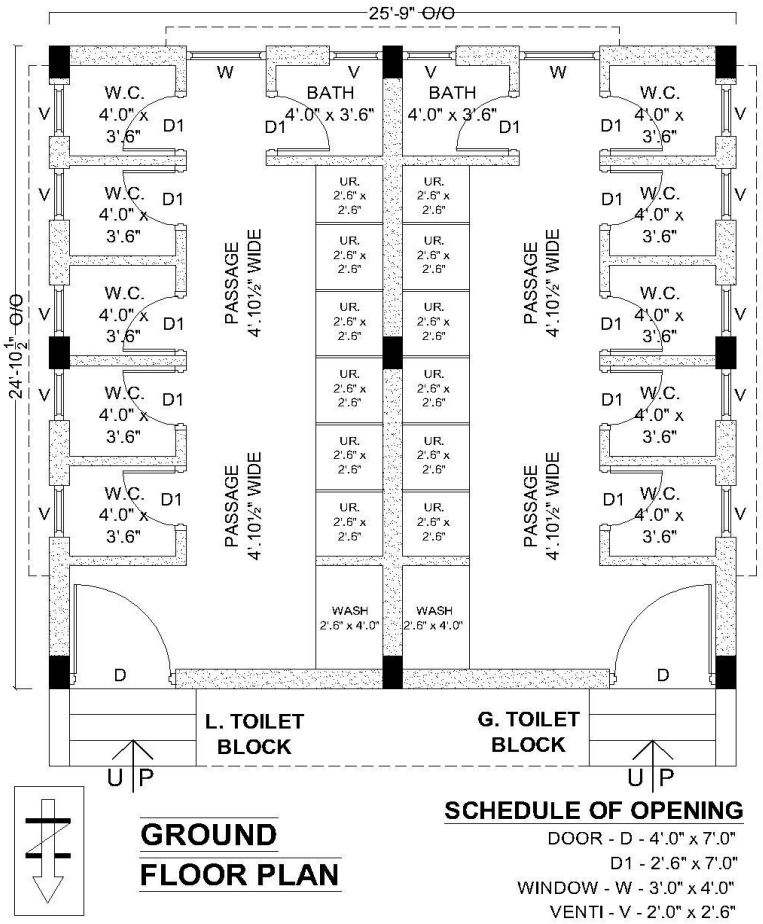
13.1.1 Krishi bank



Sr.no	description	No	Length	Width	Height	Quantity
1	Excavation	1	26.78	0.80	1.2	25.70
2	Pcc in foundation	1	26.78	0.80	0.2	4.28
3	Brick work up to plinth					
	1 step	1	26.88	0.60	0.3	4.83
	2 step	1	26.93	0.50	0.3	4.04
	3 step	1	26.98	0.40	0.3	3.23
4	Brick work from g.l to p.l	1	26.98	0.40	0.55	5.93
5	Earthfiling					
	Krishi bank	1	8.71	8.56	0.5	37.27
	Krishi Kendra	1	8.71	8.56	0.5	37.27
6	Flooring					
	Krishi kendra	1	8.71	8.56	-	74.55
	Krishi bank	1	8.71	8.56	-	74.55
7	DPC	1	27.03	0.3	-	8.1
8	Brick work in s.s	1	27.08	0.2	3.1	16.78
	Deduction					
	D	2	1.5	0.2	2.1	1.26
	D1	2	1	0.2	2.1	0.84
	Lintel work					
	D	2	1.8	0.2	2.1	1.51
	D1	2	1.3	0.2	2.1	1.09
9	Rcc work					
	slab	1	18.32	8.56	0.12	18.81
	Lintel					
	D	2	1.8	0.2	2.1	1.51
	D1	2	1.3	0.2	2.1	1.09

In this krishi Kendra and krishi bank total built-up area is 3214.64 sq.ft so the estimated price of this building is 3,214,640 Rs.

13.1.2 Public toilet



Sr.no	description	No	Length	Width	Height	Quantity
1	Excavation	1	27.26	0.7	0.80	15.26
2	PCC in foundation	1	27.26	0.7	0.20	3.81
3	Brick work up to plinth					
	Step 1	1	29.06	0.40	0.60	6.97
	Step 2	1	29.66	0.30	0.60	5.33
4	Earth filling					
	wash	2	1.21	0.60	0.4	0.58
	W.C	12	0.91	1.21	0.4	5.28
	UR	12	0.60	0.60	0.4	1.72

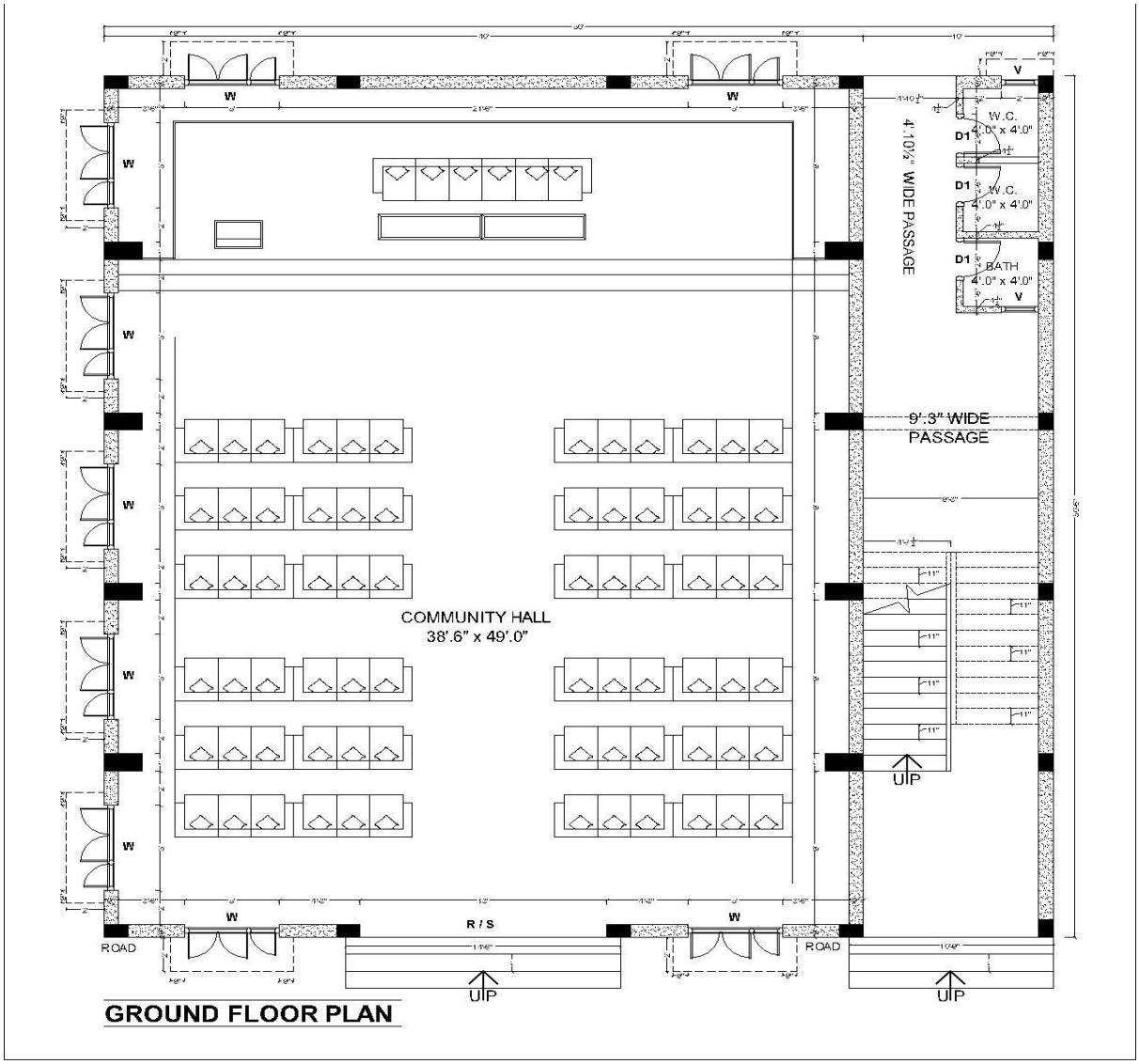
5	Flooring					
	Wash	1	1.21	0.60	-	0.72
	W.C	1	0.91	1.21	-	1.09
	UR	1	0.60	0.60	-	0.36
6	DPC	1	29.66	0.3	-	8.89
7	Brick work in s.s	1	30.26	0.2	3.1	18.76
	Deduction					
	D1	12	1	0.2	2.1	5.04
	Lintel					
	D1	12	1.3	0.2	0.15	0.46
8	RCC work					
	Slab	1	7.31	7.62	0.12	6.68
	Lintel					
	D1	12	1.3	0.2	0.15	0.46

In this public toilet design its total built-up area is 624.19 sq.ft so the estimated price of this building is 624,190 Rs.

13.1.3 Community hall

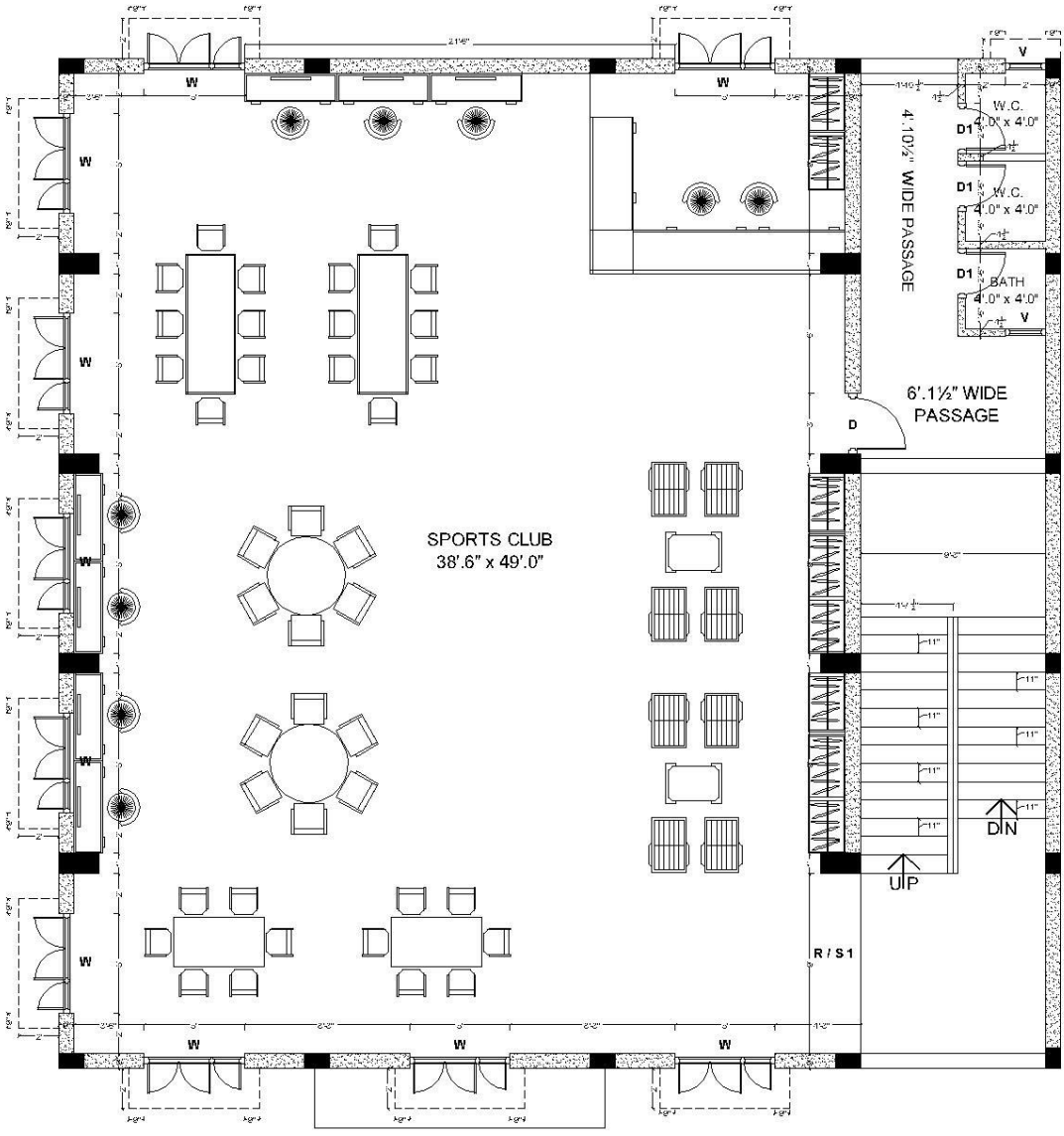
Sr.no	Description	No	Length	Width	Height	Quantity
1	Excavation	1	29.76	0.7	0.80	16.66
2	PCC in foundation	1	29.76	0.7	0.20	4.166
3	Brick work up-to plinth					
	Step 1	1	30.06	0.40	0.60	7.21
	Step 2	1	30.16	0.30	0.60	5.42
4	Earth filling					
	Room 1	1	14.94	14.33	0.4	85.63
5	Flooring					
	Room 1	1	14.94	14.33	-	214
	D	1	1.5	0.2	-	0.23
6	DPC	1	30.16	0.3	-	9.04
7	Brick work in s.s	1	30.26	0.2	3.1	18.76
	Deduction					
	D	1	1.5	0.2	2.1	0.48

	W	7	0.9	0.2	1.20	1.51
8	RCC work					
	Slab	1	14.33	14.94	0.12	25.69
	Lintel					
	D	1	1.45	0.2	0.15	0.04
	W	7	1.2	0.2	0.15	0.25



In this community hall design its total built-up area is 2347.1 sq.ft so the estimated price of this building is 2,347,100 Rs.

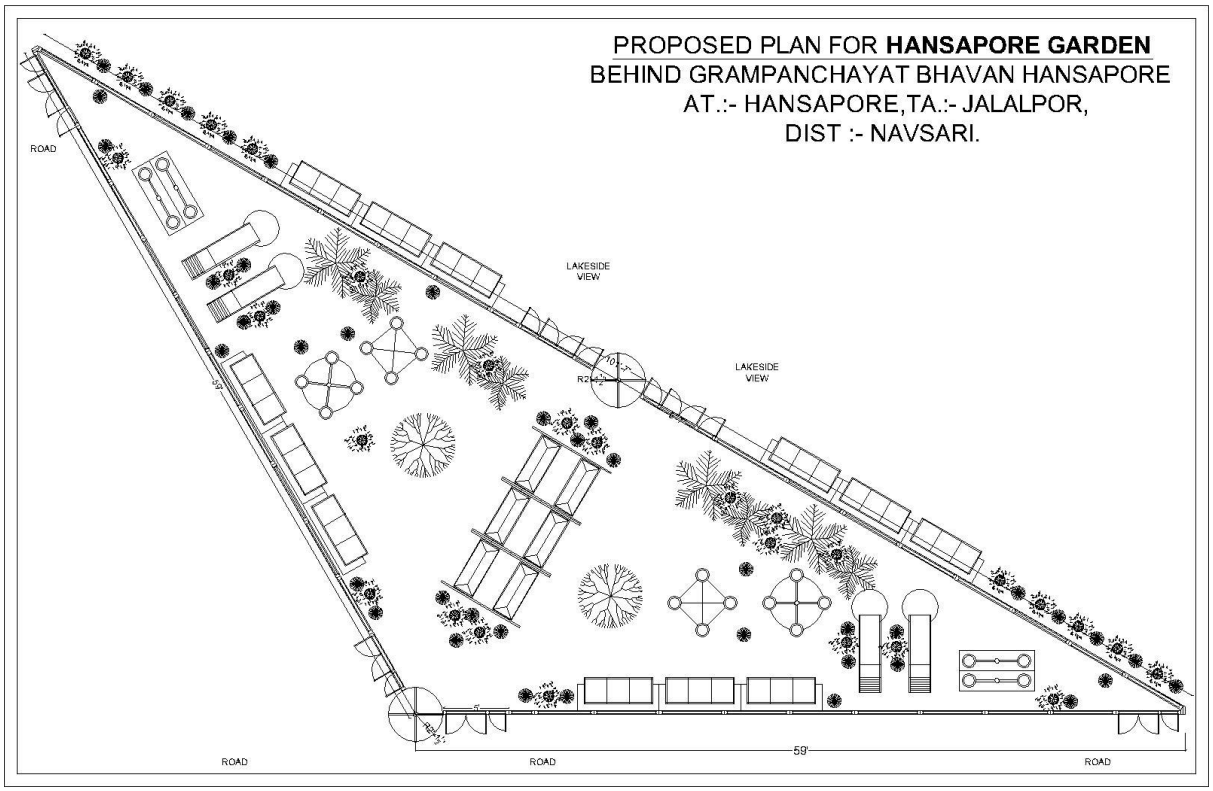
13.1.4 Sports club



Sr.no	Description	No	Length	Width	Height	Quantity
1	Excavation	1	29.76	0.7	0.80	16.66
2	PCC in foundation	1	29.76	0.7	0.20	4.166
3	Brick work up-to plinth					
	Step 1	1	30.06	0.40	0.60	7.21
	Step 2	1	30.16	0.30	0.60	5.42
4	Earth filling					
	Room 1	1	14.94	14.33	0.4	85.63
5	Flooring					
	Room 1	1	14.94	14.33	-	214
	D	1	1.15	0.2	-	0.23
6	DPC	1	30.16	0.3	-	9.04
7	Brick work in s.s	1	30.26	0.2	3.1	18.76
	Deduction					
	D	1	1.5	0.2	2.1	0.48
	W	7	0.9	0.2	1.20	1.51
	Lintel					
	D	1	1.45	0.2	0.15	0.04
	W	7	1.2	0.2	0.15	0.25
8	RCC work					
	Slab	1	14.33	14.94	0.12	25.96
	Lintel					
	D	1	1.45	0.2	0.15	0.04
	W	7	1.2	0.2	0.15	0.25

In this sports club design its total built-up area is 2347.1 so the estimated price of this building is 2,347,100 Rs.

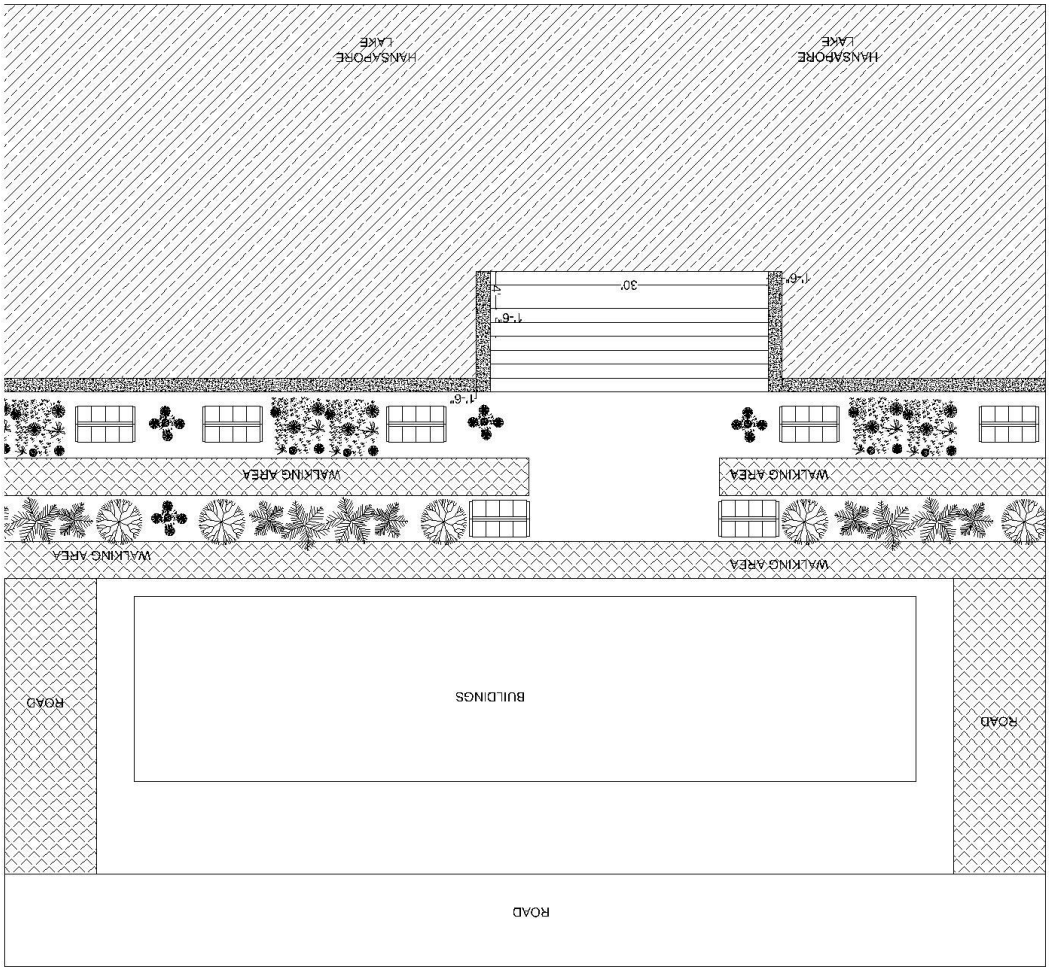
13.1.5 Garden



Estimated price of this garden design including all material and labor cost is 200000 Rs.

13.1.6 Lake side development

Estimated price of this lake side development design including all material and labor cost is 500000 Rs.



13.1.7 Electrical Design 1 (Auto Power Supply Control System from Different Sources to Ensure No Break Power):

The auto power supply control system is very convenient system for that consumers who want to attain uninterruptible power supply from different sources such as solar, main, generator and inverter**.** If we see it at commercial level, then we can estimate that there are so many consumers or customers which have the equipment or machines whose requirements is only uninterruptable power supply. Such as the data base companies whose all work is done on computer then it is required an uninterruptable power supply all the time, otherwise their computer could be off during the time when the load is shifted on another source, similarly the companies which have the data base production machines then it also could be also off during the load shifted then their production can be stop or damage. Also the demand for electricity is increasing every day and frequent power cuts is causing many problems in various areas like industries, hospitals. Hence an alternative arrangement for power source is a must. An important requirement of electric power distribution systems is the need for automatic operation. In particular, the rapid and reliable transfer of the system from one power source to another during certain system events is important to achieving the reliability goals for such systems and the facility serves. However, the design of such an automatic transfer system is all–too-often considered “less important” than many other aspects of the overall power system design. Nowadays, electrical power supply is one of the important

elements in human being needs. The most of the human activities is dependent on electrical power supply. In other words, without electrical power supply, almost the whole of activities is become postponed or worse cancelled. For usage of daily routine, voltage supplied is within 240V ac. The need for power supply is paramount for the growth of a country, access to electricity as the basic form of energy supply to the masses is vital for the development of a nation's economy. The power sector provides a platform for economic development; electricity has brought about development in all area of productions and services. Electricity has become indispensable to socio-economic and industrial development of any nation. Using uninterrupted power supply in an automated mode, we always have a substitute arrangement as backup to take place of main power supply in case of power-cut in an emergency case, where the power cut cannot be avoided.

Concentrating on these above problems we can examine the importance of this auto power supply control system in this modern world. Different peoples and companies are working on this auto power supply control system which are making this system with the help of magnetic contactors and power relays but their system is so much costly and do not provide precise uninterruptible power supply. Here we are making this auto power supply control system with the help of power electronics components, pic microcontroller 18F452 and electronic relays.

Block Diagram of the Auto Power Supply Control System from 4 Different Sources Using PIC Microcontroller:

Here is the block diagram of the auto power supply control system from 4 different sources using pic microcontroller with all the essential components. The Block Diagram of the auto power supply control system from 4 different sources using pic microcontroller:

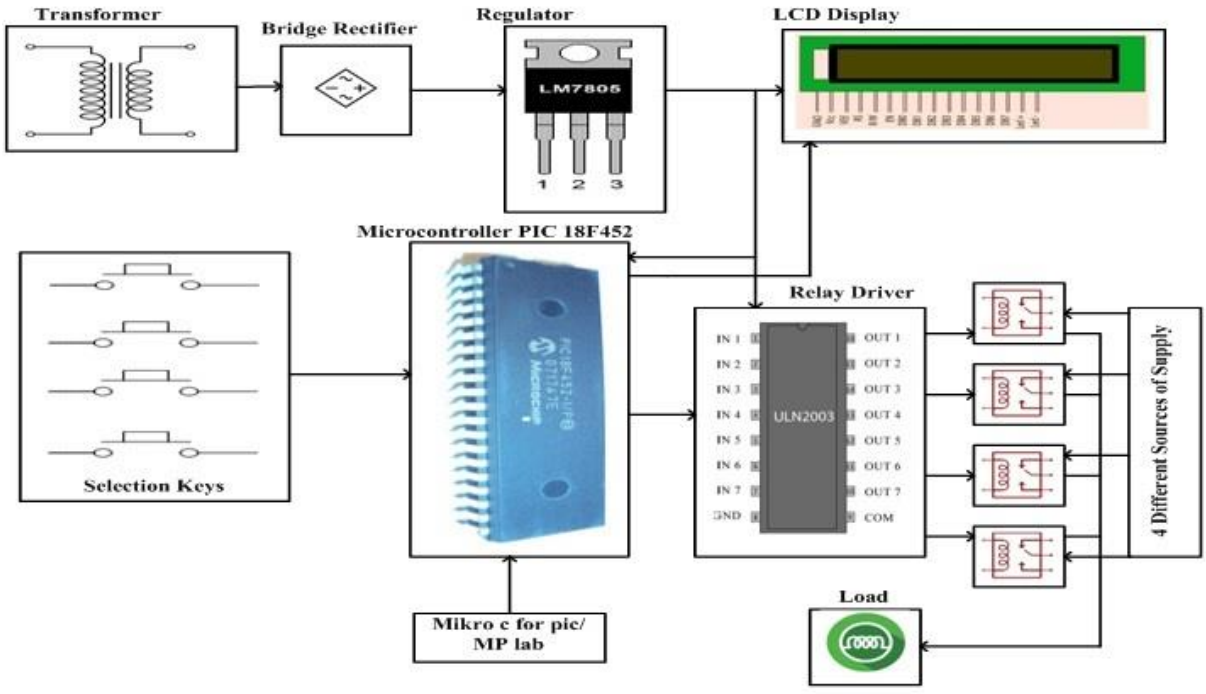


Fig.1 **Block Diagram of the Auto Power Supply Control System**

1.1.1 Components List with Detail of Auto Power Supply Control System from 4 Different Sources Using PIC Microcontroller:

Transformer: In this auto power supply control system, the transformer is used for connecting this system directly to 220V ac. It steps down the 220V ac into 12V ac.

Bridge rectifier: In this auto power supply control system, the bridge rectifier is used for converting the 12V ac voltages into dc voltages for supplying the power to the other electronics components.

Voltage Regulator: In this auto power supply control system, the voltage regulator is used for regulating the 12V dc voltages into 5V dc voltages for supplying the power to the LCD display, microcontroller and relay driver IC. In this system LM 7805 voltage regulator is used for regulating the bridge rectifier the voltages.

LCD Display: In this auto power supply control system, the LCD display is used for displaying that source of supply on which the whole system or load has shifted. It also displays the voltage which are coming from current source. It is interfaced with microcontroller and powered up with 5V dc.

Selection Keys: In this auto power supply control system, the selection keys are the basically push buttons which are used for checking the working function of this system. These are pushed up one by one for demonstration purposes.

Load: In this auto power supply control system, the lamp is used here as an output load for demonstration purposes.

PIC Microcontroller 18F452: In this auto power supply control system, the Pic 18F452 microcontroller is used for the auto selection of the available source. It shifted the load to the other power supply source automatically without any interruption. It is programmed in c language and is powered up with 5V dc voltages. It is interfaced with LCD display and relay driver IC.

Relay Driver: In this auto power supply control system, the relay driver IC is used for driving the load relays. This relay receives the signal from microcontroller for shifted the load on another supply source. It is powered up with 5V dc and interfaced with microcontroller.

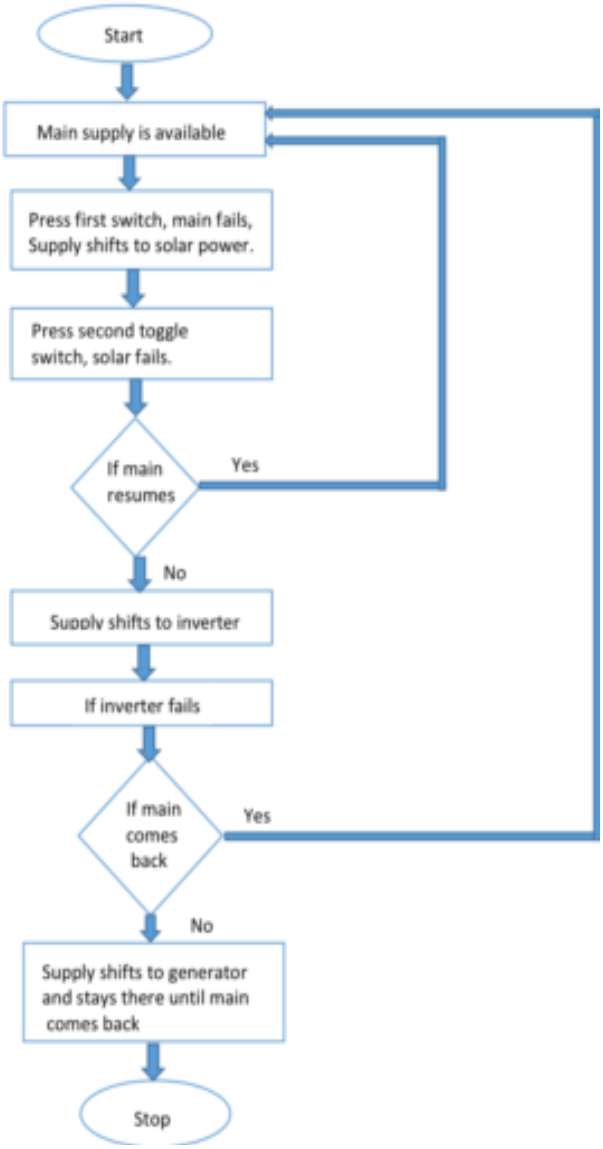


Fig.2 Flow chart of the **Auto Power Supply Control System**

1.1.2 Working of Auto Power Supply Control System from 4 Different Sources Using PIC Microcontroller:

This auto power supply control system works on the principle of auto function for switch over the load to other available source without wasting any time or switch off the load. Here for the demonstration purposes we have used the selection keys for switch off any source of supply. In this system, the microcontroller which is very essential component of this system always, keep sensing the whole available sources. When any source is switched off through the selection keys then the microcontroller shifted the load to the other supply source by giving the signal to the relay driver IC then the relay driver IC switched on the appropriate load relay. The whole function is done by the microcontroller is micro seconds and this shifted time can be changed during the programming of microcontroller. Here 4 load relays are used which are connected in parallel with load and 4 sources of supplies are also

connected in parallel with these load relays. These load relays consist of normally open and close contacts and are operated through the relay driver IC. We have checked this system by connecting the lamp at output side as a load when any interruption is take place during the shifted time then the lamp is blinking but here there is no any blinking take place during the shifted time means there is no any interruption in supplying the power at output side.

1.1.3 Applications of Auto Power Supply Control System:

- This system could be used in that places where we have different sources of supply such as solar, main and inverter and generator.
- This system could be used in educational institutes and hospitals for supplying the uninterruptable power supply to the hospital or educational equipment.
- This system could be used in industries for supplying the uninterruptable power supply to the industrial machines.

1.1.4 Advantages of Auto Power Supply Control System:

- **Compact and reliable**
- **Less costly as compared to the other power control systems.**

Conclusion:
Automatic Power Supply from Four Different Sources (Solar, Mains, Wind, and Thermal) Using a Microcontroller is used to handle power supply from mains, solar, wind and thermal most effectively. The outline of the project is the selection of supply from mains, solar, wind and thermal automatically using microcontroller concept. The significance of this project lies in the various and wide places of applications such as; schools, hospitals, and most especially manufacturing industries and mining industries where a continuous supply of power is vital.

13.1.8 Electrical Design 2 (Password Based Circuit Breaker):

Nowadays, the current power system deals with huge power network as well as associated electrical equipment. During the electrical fault or short circuit, the power network will suffer from a high stress of fault current in them which may harm the equipment permanently. For conserving the power networks and equipment, the fault current should be very cleared from the system as fast as possible. To overcome this problem, the proposed system password based circuit breaker gives a solution to ensure lineman security. In this project, the control (ON/OFF) of the electrical lines lies with lineman. This project is set in such a way that preservation staff or lineman has to enter the password to ON/OFF the electrical line.
Now, if there is any mistake in the electrical line, then the lineman will control the power supply to the line by pressing the password and happily repair the electrical line, and after coming to the substation lineman switch on the supply to the particular line by pressing the password. Separate passwords are allocated for every electrical line.

1.2 What is Circuit Breaker?

An electrical circuit breaker is a switching device which can be functioned manually as well as routinely for protection and control of electrical power system. As the modern power system deals with huge currents, the special concentration should be given during designing of a circuit breaker to secure interruption of the arc generated during the working of the circuit breaker. This was the normal definition of the circuit breaker.

Fig.3 Circuit Breaker

1.2.1 Password Based Circuit Breaker:

The hardware and software requirements of password-based circuit breaker include Power supply block, Microcontroller (at89s52/at89c51), Pushbutton, LCD, Matrix keypad, Relay, Relay driver LED, 1N4007, Capacitors, and Resistors. Keil compiler, Embedded C or Assembly language.

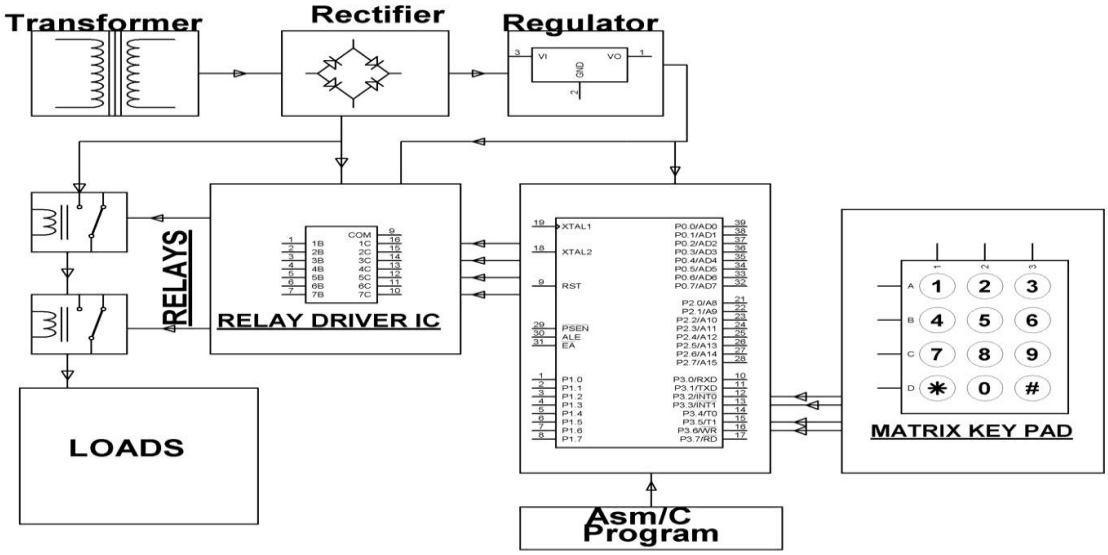


Fig.4 Password Based Circuit Breaker Block Diagram

Microcontroller:

The microcontroller is a smaller computer; it has on-chip RAM, ROM, I/O ports.

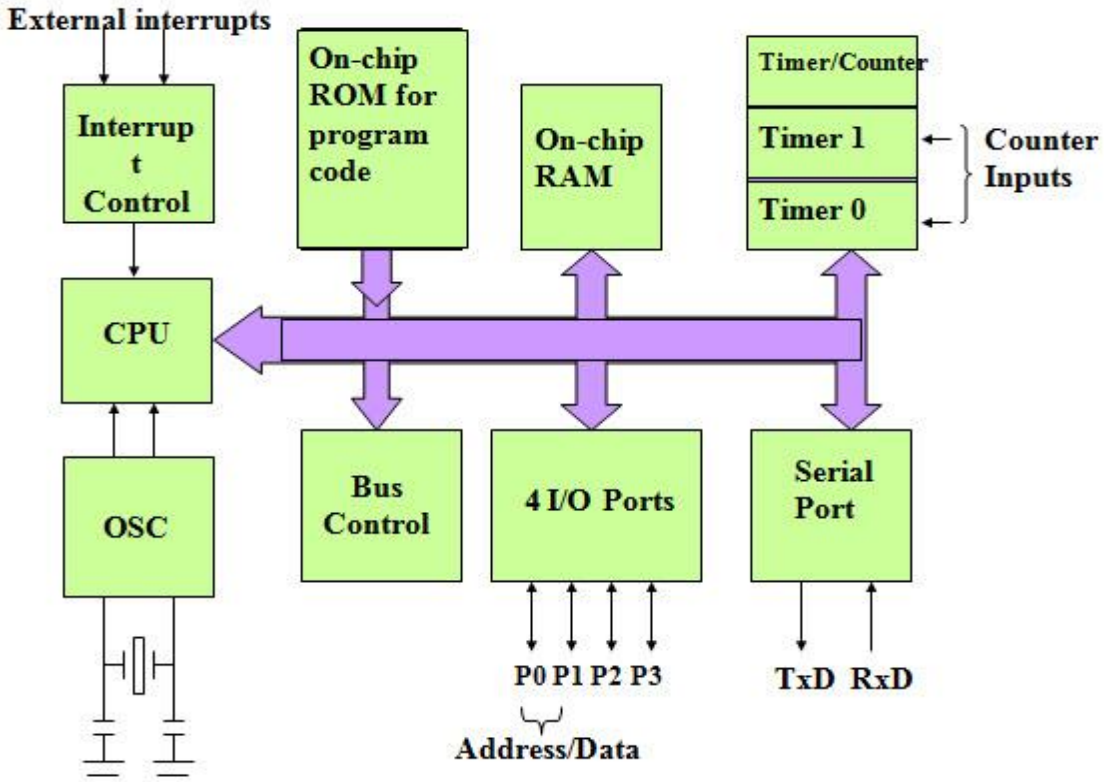


Fig.5 AT89S51 Microcontroller

Features of AT89S51/52:

- Compatible with MCS®-51 Products
- 8K Bytes of In-System Programmable (ISP) Flash Memory
- Endurance: 10,000 Write/Erase Cycles
- 4.0V to 5.5V Operating Range
- Fully Static Operation: 0 Hz to 33 MHz
- 256 x 8-bit Internal RAM
- 32 Programmable I/O Lines
- Three 16-bit Timer/Counters
- Eight Interrupt Sources
- Full Duplex UART Serial Channel
- Interrupt Recovery from Power-down Mode
- Watchdog Timer
- Dual Data Pointer

Relay:

The relay is an electromagnetic switch, used to control the electrical devices. Copper core magnetic flux plays the main role here.

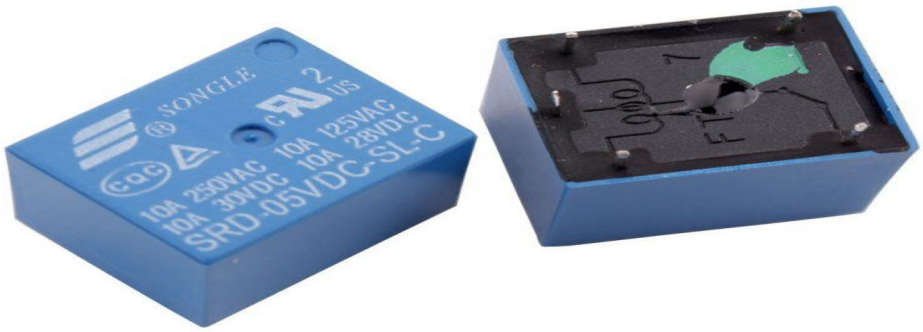


Fig.6 Relay

- The relay's switch connections are usually labeled as COM, NC, and NO.
- COM = Common, always connect to this; it is the moving part of the switch.
- NC = Normally Closed, COM is connected to this when the relay coil is off.
- NO = Normally Open, COM is connected to this when the relay coil is on.

Keypad:

- A keypad is a set of buttons arranged in a block or "pad" which usually bear digits, symbols and usually a complete set of alphabetical letters. If it mostly contains numbers then it can also be called a numeric keypad.
- In order to detect which key is pressed from the matrix, the row lines are to be made low one by one and read the columns. Assume that if Row1 is made low, then read the columns.
- If any of the keys in row1 is pressed then correspondingly the column 1will give low that is if the second key is pressed in Row1, then column2 will give low.

Fig.7 Keypad

Relay Driver (ULN 2003):

- ULN2003 is a high voltage and high current Darlington transistor array
- It consists of seven NPN Darlington pairs that feature high-voltage outputs with common-cathode Clamp diode for switching inductive loads.
- The ULN2003 has a 2.7kW series base resistor for each Darlington pair for operation directly with TTL or 5V CMOS devices.
- Current, Output Max:500mA
- Voltage, Input Max:5V
- Voltage, Output Max:50V

Fig.8 Relay Driver

Liquid Crystal Display (LCD):

- Most common LCDs connected to the microcontrollers are 16×2 and 20×2 displays.
- This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.
- The standard is referred to as HD44780U, which refers to the controller chip which receives data from an external source (and communicates directly with the LCD.

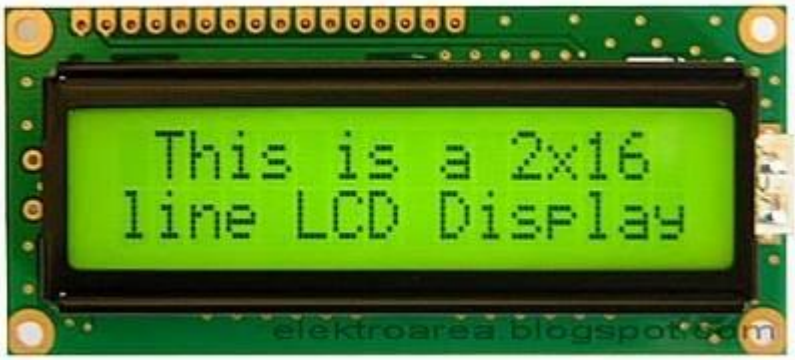


Fig.9 LCD

Working Principle of Password-Based Circuit Breaker:

The proposed system is designed to control a circuit breaker with the help of a password on a keypad, which is connected to the project.

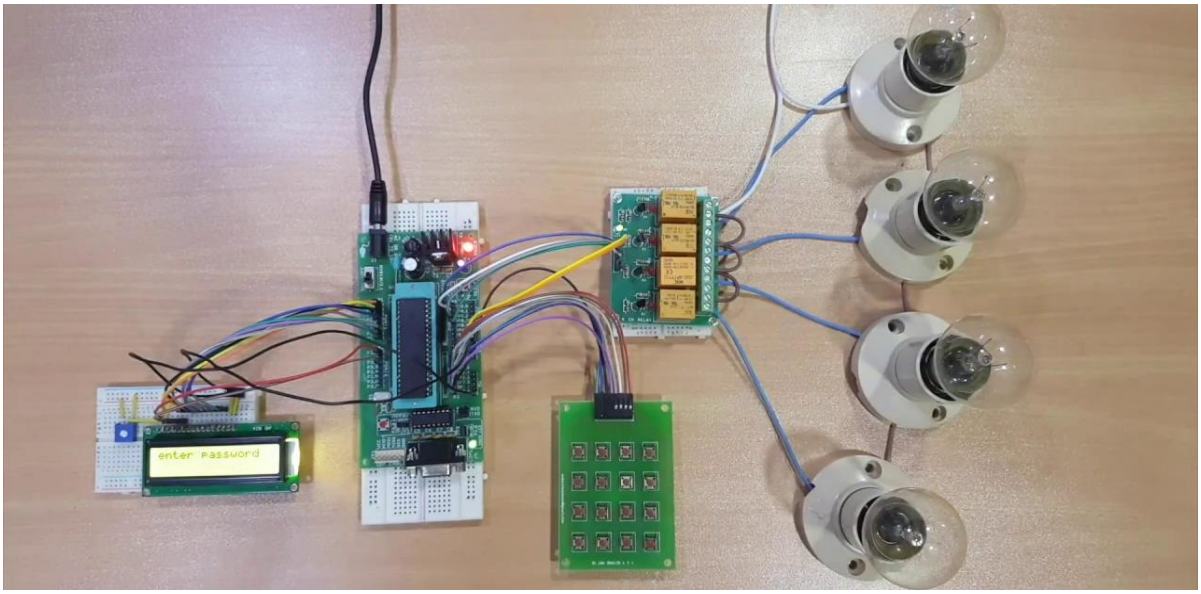


Fig.10 Password Based Circuit Breaker Project Kit

The controlling of this project can be done by an 8051 family microcontroller. A matrix keypad is connected to the microcontroller to enter the password. The entered password is compared with the stored password in the ROM of the microcontroller. If the given password is right, then only the line can be switched ON/OFF. The circuit breaker Activation/deactivation is indicated by a lamp (ON/OFF).

Further this project can be enhanced by using an EEPROM for the user to modify the password for a more protected system. It can also be interfaced with a GSM modem for remotely controlling the electronic circuit breaker through SMS.

Advantages of Password-Based Circuit Breaker*:*

- It avoids electrical accidents to lineman
- This project is very simple and easy
- It can be built with commonly available components

1.2.1.1 Applications of Password-Based Circuit Breaker:

- It is used to ensure the lineman safety in electrical substations
- This system is used in houses and buildings
- To conserve the energy, it is used in public areas like hotels and shopping malls

Conclusion:

Circuit breaker can work on a single given known password. The password to operate can be changed and system can be operated efficiently with the changed password. No other person can reclose the breaker once the changed password is given into system other than the person who had changed it. It gives no scope of password stealing. It is effective in providing safety to the working staff. It is economical and it can be easily installed.

13.1.9 Electrical Design 3 (Automatic Water Plant System):

In daily operation related to watering the plants are the most important cultural practice and the most labor-intensive task. No matter whichever weather it is, either too hot and cold or too dry and wet it is very crucial to control the amount of water reaches to the plants. So, It will be effective to use an idea of automatic plant watering system which waters plants when they need it. An important aspect of this project is that: "when and how much to water". To reduce manual activities for the human to watering plant, an idea of plant watering system is adopted. The method employed to monitor the soil moisture level continuously and to decide whether watering is needed or not, and how much water is needed in plant's soil.

Since nowadays, in the age of advanced technology and electronics, the life style of the human should be smart, simpler, easier and much more convenient. So, therefore; there is a need for many automated systems in human's daily life routine to reduce their daily activities and jobs. Here an idea of one such system named as automatic plant watering system is very useful. As many people are facing a lot of problem watering the plants in the garden, especially when they away from the home. This model uses sensor technologies with microcontroller in order to make a smart switching device to help millions of people.

In its most basic form, system is programmed in such a way that soil moisture sensor which senses the moisture level from the plant at particular instance of time, if moisture level of the sensor is less than the specified value of threshold which is predefined according to the particular plant than the desired amount of water is supplied to plant till it's moisture level reaches to the predefined threshold value. System involves humidity and temperature sensor which keep tracks the current atmosphere of the system and has an influence when watering

Block Diagram of Automatic Water Plant System:

We can see the block diagram as given below.

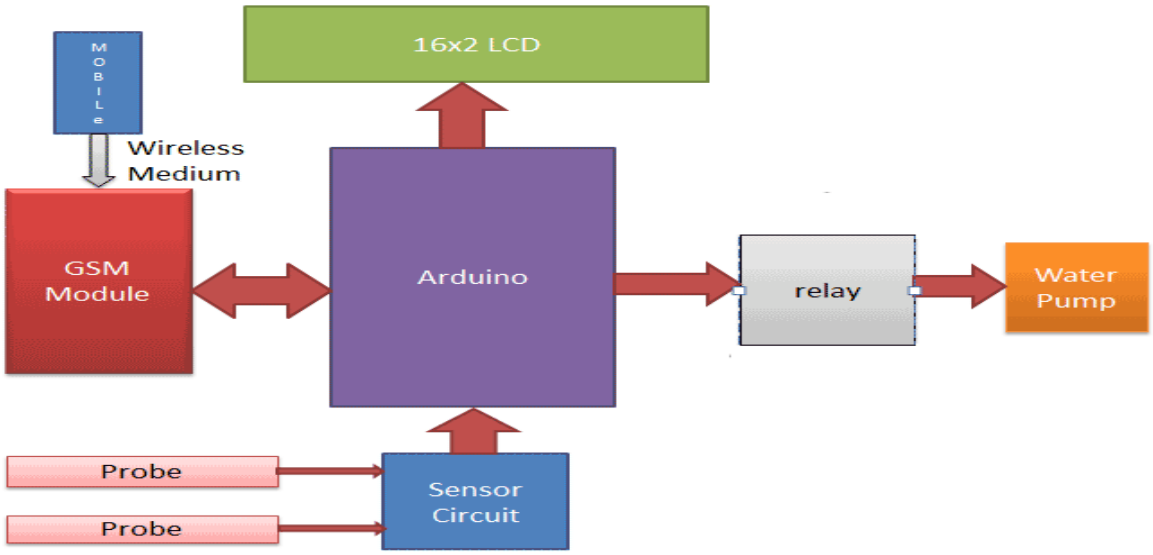


Fig.11 Block Diagram of Automatic Water Plant System

1.3 Automatic plant watering system circuit and working:

The circuit diagram of the automatic plant watering system is shown in Fig. 12. The circuit comprises an Arduino UNO board, a soil moisture sensor, a servo motor, a 12V water pump and an L293D (IC1) motor driver IC to run the water pump. We can power the Arduino board using a 7V to 12V wall wart or plug-in adaptor or solar panel. We need a separate 12V battery or power supply or solar panel for the pump motor.

Test Points	
Test Point	**Details**
TP0	**0V**
TP1	**5V**
TP2	**12V**

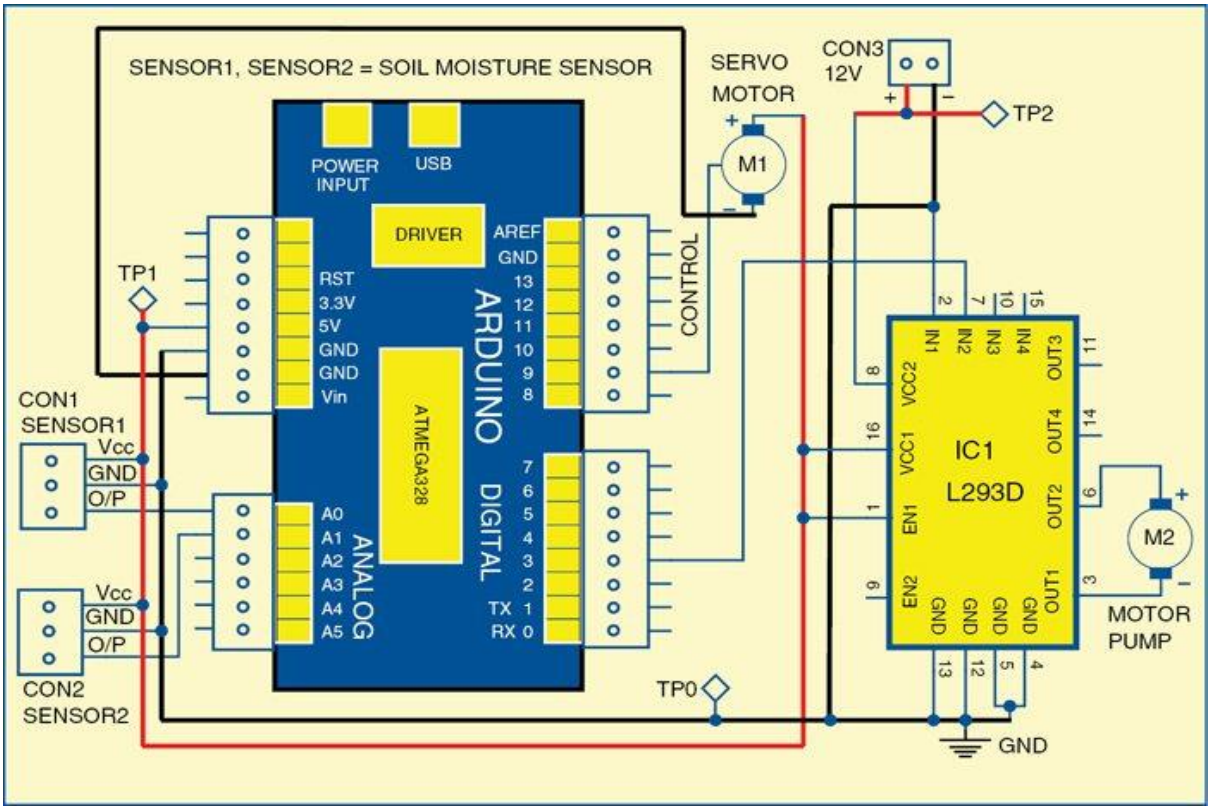


Fig.12 Circuit diagram of the automatic plant watering system

Soil moisture sensor:

Two types of soil moisture sensors are available in the market—contact and non-contact sensors. A contact soil sensor (as shown in Fig. 13) is used in this project because it has to check soil moisture to measure the electrical conductivity.

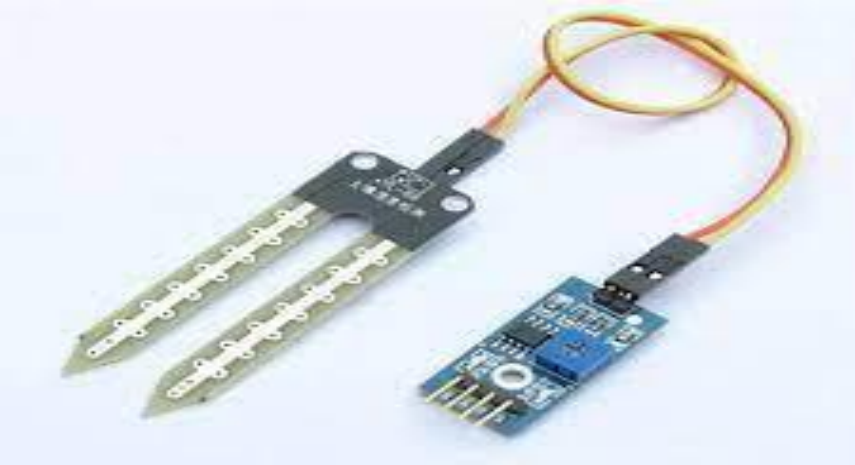


Fig.13 Soil moisture sensor (contact type)

The moisture sensor provides an analogue output, which can easily be interfaced with Arduino. In this project, two sensors can be connected to analogue pins, A0 and A1, of the Arduino board. Each sensor has four pins (Vcc, Gnd, Ao and Do) available for interfacing with the Arduino board. Here, digital output pin (Do) is not used. The water pump and servo motor are controlled by Arduino connected to digital pins 3 and 9, respectively. That is, the servo motor signal control pin is connected to pin 9 of the Arduino board.

PARTS LIST

Semiconductor:

IC1	- L293D motor driver
	- Soil moisture sensor
	- Arduino UNO board

Miscellaneous:

M1	- Servo motor
M2	- 12V DC motor pump
CON1, CON2	- 3-pin connector
CON3	- 2-pin connector
	- Water container
	- Small flexible water pipe
	- 12V battery
	- 7-12V power adaptor

The program in the Arduino reads the moisture value from the sensor every 20 seconds. If the value reaches the threshold value, the program does the following three things:

1. It moves the servo motor horn, along with the water pipe fixed on it, toward potted plant, whose moisture level is less than the predetermined/ threshold level.

2. It starts the motor pump to supply water to the plant for a fixed period of time and then stops the water pump (refer Fig. 14).
3. It brings back the servo motor horn to its initial position.

1.4 Software program:

The program is written in Arduino programming language. The code is well commented and is easy to understand. Compile the autowatering.ino code and upload it to the microcontroller, using Arduino IDE version 1.
The sensor will calibrate by itself once it is kept in the soil and the threshold value will be shown on the serial monitor in Arduino. Serial debugging is available in this program. Comment out if you do not wish to use the serial monitor.

Fig.14 Motor pump

1.5 Construction and testing:

An actual-size, single-sided PCB layout of the automatic plant watering system is shown in Fig. 15 and its component layout in.

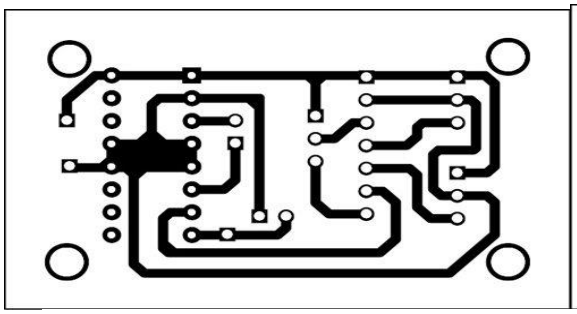


Fig.15 *Actual*-size PCB layout of the circuit

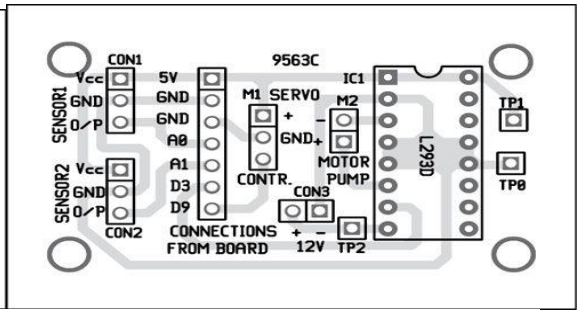


Fig.16 Component layout of the PCB

Assemble the components on the PCB to minimise errors. Alternatively, you can assemble them on a breadboard or Arduino prototyping shield or a general-purpose PCB. Upload the code to Arduino UNO board and install the sensors in the soil of the potted plants. Do not immerse the sensors fully inside the soil. Install the pump in a water container (refer Fig. 17) that can hold a few litres of water. Attach the water pipe on the servo motor horn as shown in Fig. 18.

Fig.17 installing water pump in the container

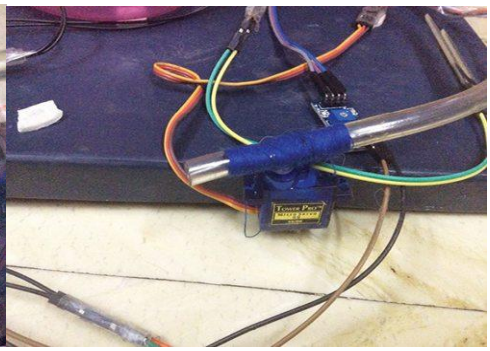


Fig.18 attaching the pipe on the servo horn

Before powering the circuit on, we need to keep in mind the following macro definitions in the code:

1. Changing the angle of rotation of the servo horn toward the first pot and second pot. The default values are 70 degrees and 145 degrees.
2. Changing the watering time according to the size of the pot. The default values are five seconds and eight seconds.
3. Changing the threshold value according to our need. The default value is 600.

Place the flower pots where the pipe from the servo motor horn can easily reach them. When the moisture level dips below 600, servo horn rotates at an angle of 70 degrees. That is, after servo motor horn moves 70 degrees toward the first pot, the motor pump will be on for five seconds and then stop automatically. Then, the servo returns to its original position. Similarly, if we are using a second sensor, the servo motor horn will move to 145 degrees to the second biggest pot, motor pump will be on for eight seconds and then stop automatically. The servo returns to its original position.

Advantages of Automatic Plant Watering:

- Reduces the wastage of water.
- It eliminates the manual switching mechanism used by the farmers or gardeners.
- The use of this system will be able to contribute to the socio-economic development of the nation.
- Faster response and user friendly.

Applications of Automatic Plant Watering:

- It can be used in agricultural fields, lawns and as drip irrigation systems.
- It can be used to provide water in nursery planting area.
- Pond water management and water transfer.

Conclusion:

Automated irrigation system optimizes the usage of water by reducing wastage of water. This project can able to contribute towards socio-economic development of the nation. It has fast response and system is user friendly. The primary application of this project is for farmers and gardeners who do not have sufficient time to water their crops or plants regularly. This project also covers an application for formers who are wasting water unknowingly during irrigation. The main objective of this smart irrigation system is to make it more innovative, user friendly, time saving and more efficient than the existing system. Due to the direct transfer of water to the roots, water conservation takes place and also helps to maintain the moisture to soil ratio at the root zone constant to some extent. Thus, the system is efficient and compatible to the changing environment. Hence, this system is very useful as it reduces manual work of the formers and also helps in proper utilization of water and other resources. This project can be extended to greenhouses where manual supervision is less. Fully automated gardens and farm lands can be created using this principle in the right manner on large scale.

13.2 Reason for Student Recommending this Design:

- **Auto Power Supply Control System from Different Sources to Ensure No Break Power:** The main objective of this project is to provide uninterrupted power supply to the loads by selecting one source out of four such as solar, mains, wind and thermal whichever is available. The significance of this project lies in the various and wide places of applications such as; schools, hospitals, and most especially manufacturing industries and mining industries where a continuous supply of power is vital.

- **Password Based Circuit Breaker:** This project will help in controlling the electrical lines with the help of a password as nowadays electrical accidents to the line man are increasing, while repairing the electrical lines due to the lack of communication between the electrical substation and maintenance staff.

- **Automatic Plant Watering:** Since nowadays, in the age of advanced technology and electronics, the life style of the human should be smart, simpler, easier and much more convenient. So, therefore; there is a need for many automated systems in human's daily life routine to reduce their daily activities and jobs. Here an idea of one such system named as automatic plant watering system is very useful. As many people are facing a lot of problem watering the plants in the garden, especially when they away from the home.

13.3 Benefit to the Villagers:

Auto Power Supply Control System from Different Sources to Ensure No Break Power:

- Availability of electricity throughout the day.
- No interruption on their lives due to uninterrupted power supply.
- The small scale industries can work efficiently due to no break of power.
- Increased power efficiency.
- One step forward towards to be smart village.

Password Based Circuit Breaker:

- It is used to ensure the lineman safety in electrical substations.
- This system can be used in houses and buildings.
- To conserve the energy, it is used in public areas like hotels and shopping malls.

Automatic Plant Watering:

- Reduces the wastage of water.
- Faster response and user friendly.
- It eliminates the manual switching mechanism used by the farmers or gardeners.
- The use of this system will be able to contribute to the socio-economic development of the nation.

Ch.14: Technical Option with Case Study

14.1 Civil Engineering

14.1.1 Advance Earthquake Resistance

Earthquake-resistant structures are structures designed to protect buildings from earthquakes. While no structure can be entirely immune to damage from earthquakes, the goal of earthquake-resistant construction is to erect structures that fare betteduring Seismic activity than their conventional counterparts. According to building codes, earthquake-resistant structures are intended to withstand the largest earthquake of a certain probability that is likely to occur at their location. 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.

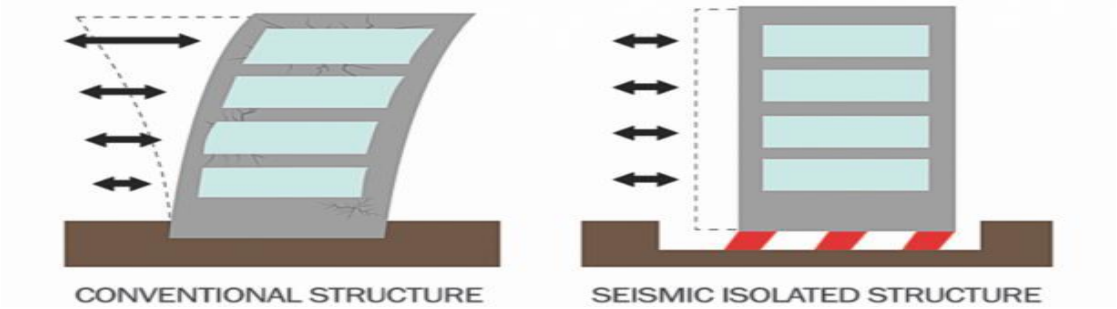


Fig 19 sesmic isolated building

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. But more advanced techniques for earthquake resistance is not to strengthen the building, but to reduce the earthquake-generated forces acting upon it.

Among the most important advanced techniques of earthquake resistant design and construction are:

1. Base Isolation

2. Energy Dissipation Devices

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. 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 an 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.

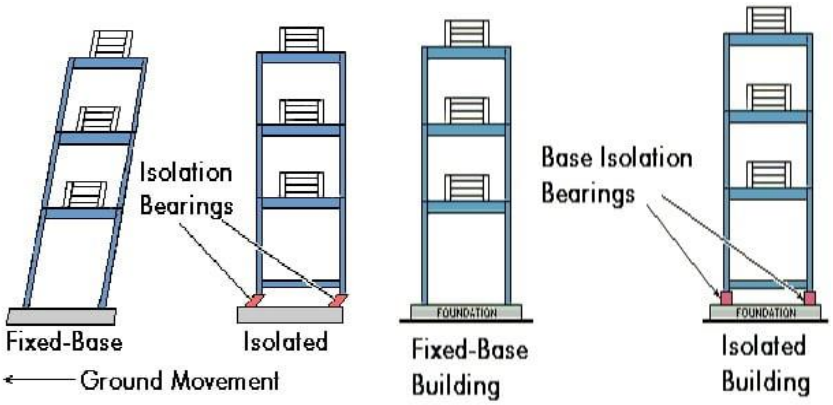


Fig 20 earthquake resistance design

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.

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 devices. The large number of damping devices that have been developed can be grouped 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 (prefacing) of fluids within the damp

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)

GUIDELINES FOR EARTHQUAKE RESISTANT CONSTRUCTION

In addition to the main earthquake design code 1893 the BIS (Bureau of Indian Standards) has published other relevant earthquake design codes for earthquake resistant construction Masonry structures (IS-13828 1993) • Horizontal bands should be provided at plinth, lintel and roof levels as per code • Providing vertical reinforcement at important locations such as corners, internal and external wall junctions as per code. • Grade of mortar should be as per codes specified for different earthquake zones. • Irregular shapes should be avoided both in plan and vertical configuration. • Quality assurance and proper workmanship must be ensured at all cost without any compromise. In RCC framed structures (IS-13920) • In RCC framed structures the spacing of lateral ties should be kept closer as per the code • the hook in the ties should be at 135 degree instead of 90 degree for better anchorage. • The arrangement of lateral ties in the columns should be as per code and must be continued through the joint as well.

14.2.2 Seismic Retrofitting of Building

It is the modification of existing structures to make them more resistant to seismic activity, ground motion, or soil failure due to earthquakes. The retrofit techniques are also applicable for other natural hazards such as tropical cyclones, tornadoes, and severe winds from

thunstorms.

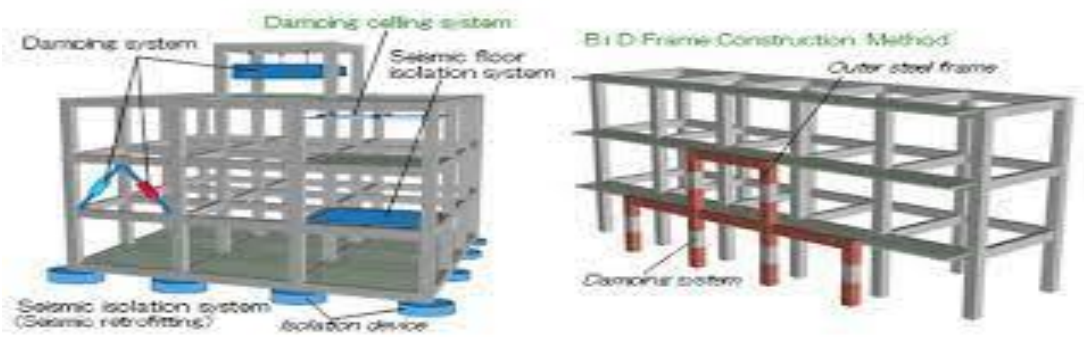


Fig 21 sesmic retrofitting of building

1.5.1 Need for Seismic Retrofitting:

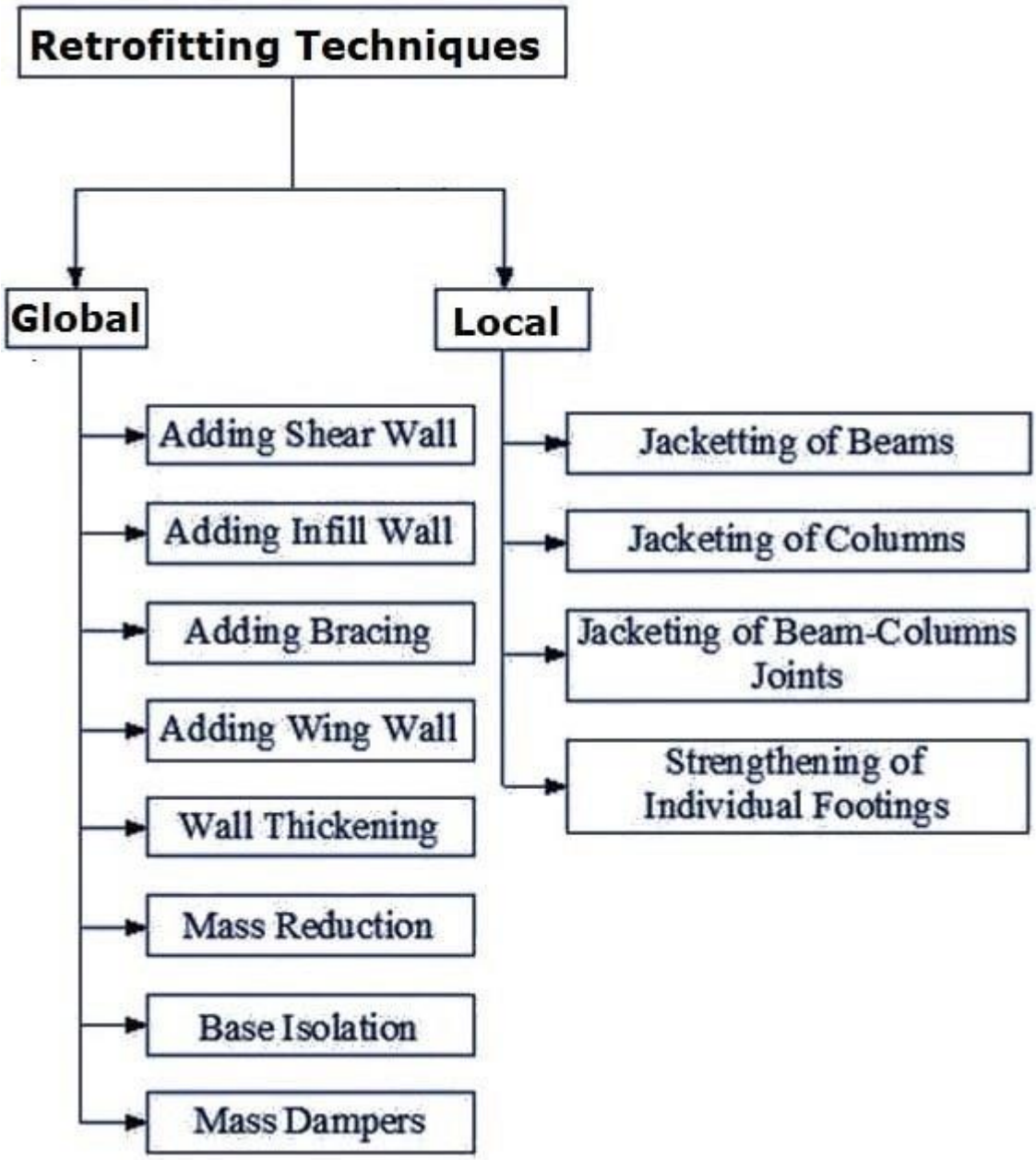
- To ensure the safety and security of a building, employees, structure functionality, machinery and inventory
- Essential to reduce hazard and losses from non-structural elements.
- Predominantly concerned with structural improvement to reduce seismic hazard.
- Important buildings must be strengthened whose services are assumed to be essential just after an earthquake like hospitals.

1.5.2 Basic Concept of Retrofitting:

The aim is at:

- Upgradation of lateral strength of the structure
- Increase in the ductility of the structure
- Increase in strength and ductility

1.6 Classification of Retrofitting Techniques:



14.1.3 Advance practice in construction field in modern material, techniques and equipment's

Modern construction material

1. Cross laminated timber:

CLT is a sustainable and resilient form of engineered wood which does not require burning of any fossil fuels during its construction. It is made by gluing layers of solid-sawn lumber together and layers lay perpendicular to each other making it more tensile and greater compressive strength. Originated in Europe, CLT is now worldly used, plays to be an excellent building material due to faster production, great quality and flexibility in design. The initial costs of the material are higher but when taken an account on the complete building costs, it saves up. Due to its natural-looking aesthetics and strength,

designers and builders are now coming up with building CLT based skyscrapers. One of the eye-catchy examples of CLT used in a building is:-

Project Information:

Name of the project: the Smile
Architect: Alison Brooks Architect
Location: London
Building Type: Pavilion

Fig 22 modern construction material

2. Rammed earth:

The rammed earth construction mainly based in Ghana is a locally available material used in a construction system in which earth is compressed into wooden boxes. The abundant clay is then placed in layers of 15cm height and compacted with tools to achieve the resiliency and durability. This material has been highly observed as an aesthetic material in Sub-Saharan continent along with its ecological and economic benefits in constructing housing for 1.7 million homes. Hive Earth has been working on this project in the rural areas of Ghana and one of the examples is as follows:

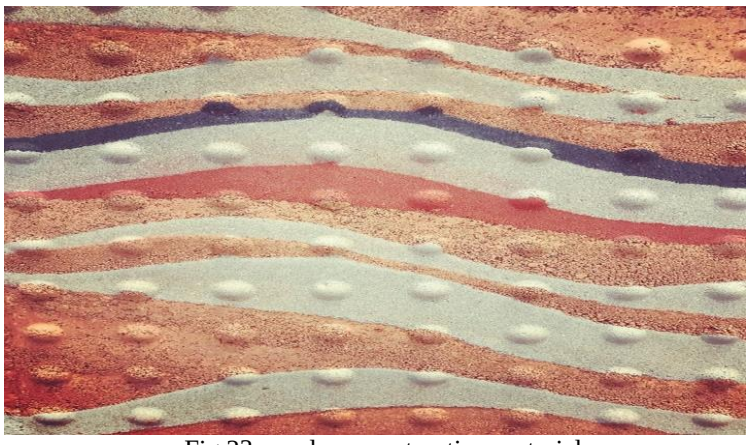


Fig 23 mordern construction material

These walls are made with a combination of earth, sand, clay and 5% cement (or lime) and due to this; several waves and patterns are formed on the walls which gives an everlasting mesmerizing impression. Although all these colors are natural due to the earth available and hence they reduce the dependence on paints and other sealants that off-gas making the interiors cooler and cleaner in hot and humid climate of Ghana.

3. Pigmented concrete:

Concrete is an achromatic symbol of strength that triggers harsh and roughness with human feelings when exposed. However, when appropriate pigmented admixtures added to cement, gravel, sand and water can result in coloured concrete mixtures. Other than aesthetics, it adds a sense of perspective and contrast with surroundings while reducing the dependence on paints and sealants.

Project Information:
Name of the project: Casa Terra
Architect: BernardesArquitetura
Location: Itaipava, Brazil
Building Type: Residential

The reddish-brown texture of this house profoundly complements with the surrounding hills and the lush landscape. The walls are emulsified with pigmented concrete of iron oxide.

Fig 24 mordern material

Advance techniques and equipment's

- **Advance construction techniques**

1. 3D printing in construction: In the construction industry, 3D printing can be used to create construction components or to 'print' entire buildings. Construction is well-suited to 3D printing as much of the information necessary to create an item will exist as a result of the design process, and the industry is already experienced in computer aided manufacturing. The recent emergence of building information modelling (BIM) in particular may facilitate greater use of 3D printing.

Construction 3D printing may allow, faster and more accurate construction of complex or bespoke items as well as lowering labor costs and producing less waste. It might also enable construction to be undertaken in harsh or dangerous environments not suitable for a human workforce such as in space.

In 2014, engineers at Arup used 3D printing to fabricate a steel node for a lightweight structure. Salomé Galjaard, team leader at Arup said, 'This has tremendous implications for reducing costs, cutting waste and enables a very sophisticated design…

Fig 25 3d painted construction

2. Computer aided design (CAD)

The term computer aided design (CAD) refers to the use of computers to create graphical representations of physical objects to assist in the design process. It can also refer to the use of computers to prepare presentational images or to prepare production information enabling objects to be manufactured, although sometimes this is referred to as computer aided drafting as it does not necessarily involve designing. In combination, these processes may be referred to as computer-aided design and drafting (CADD).

CAD can be used to create 2D or 3D representations, and can also be used to generate animations and other presentational material. It may allow the addition of supplementary information such as dimensions, descriptions of components, references to specifications and so on.

Specialist CAD software is available for specific purposes, and a wide range of software applications have been developed for use in the design and construction of built assists such as buildings.

- **Advance construction equipment**

1. Excavators:

Excavators are important and widely used equipment in construction industry. Their general purpose is to excavation but other than that they are also used for many purposes like heavy lifting, demolition, river dredging, cutting of trees etc. Excavators contains a long arm and a cabinet. At the end of long arm digging bucket is provided and cabinet is the place provided for machine operator. This whole cabin arrangement can be rotatable up to 360^{o} which eases the operation. Excavators are available in both wheeled and tracked forms of vehicles.

Fig 26 excavator

2. Pile driving machine

Another heavy equipment used in construction site is pile driving equipment in case of pile foundation construction. This equipment lifts the pile and holds it in proper position and drives into the ground up to required depth. Different types of pile driving equipment are available namely, piling rigs, piling hammer, hammer guides etc. in any case the pile is driven into the ground by hammering the pile top which is done hydraulically or by dropping.

Fig 27 pile driving machine

14.1.4 Engineering aspect of soil mechanics-environmental impact assessment

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

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

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

Objectives of Environmental Impact Assessment

The objective of an EIA is to predict the environmental impact project would have on all aspects of the environment. Once this is done, a study has to be made to see if the impacts can be reduced in any way. The project has then to be modified to suit the local environment and all predictions and likely options presented to decision makers for final decisions.

You can gain a better understanding of EIA by understanding how any typical project can affect the environment of a particular area. Take for example the building of a new road in a city.

The alignment of the road may require that certain lands have to be leveled or new embankments created. Cutting of the land and the new embankments would affect the geography of the area and probably upset its drainage pattern. This would require re-planning existing methods of treating the run-off and could cause existing watercourses to be modified. The new road may require the removal of existing green cover and this could affect the living conditions in that area. The traffic going through that area can cause pollution problems from vehicles which also includes an increase in sound pollution. The emissions from the vehicles can affect already existing atmospheric pollutants which in turn could affect human health, animal health and affect greenery in the area. The road may affect existing structures in the area which may have to be removed and can cause changes in the economic wellbeing of the persons who are using those structures.

A positive impact of the new road may mean a reduction in traffic congestion, its positive effect on pollution, and the economic advantage of these two aspects.

For any environmental impact assessment, complete data on all these aspects as they are at present has to be made so that any changes can be reasonably judged to existing standards required for good living. The deterioration or increase in these living standards has then to be highlighted by the EIA before any final decision on the project can be undertaken.

14.1.5 Water supply-Sewage system-Waste water-Sustainable development

- **Water supply: -** In the construction project, the need for building materials, products, labor, water, and identify the availability and possibilities of water supply sources. The priority task of the water supply project for the construction site is to determine the category of consumers, the quantity and mode of water consumption, and the requirements of individual consumers for water quality.
- Water at the construction site is intended for the following purposes: household and drinking needs of workers and the population of workers' settlements at the construction site; technological needs of construction; fire extinguishing needs.
- On construction sites with a short construction period, they use mobile car-dining rooms for 28 seats, equipped with a washbasin for two sinks. The water consumption in them is assumed to be 10 ... 15 liters per one dinner.

- According to the sanitary characteristics of production processes, construction sites can be assigned to a group of production processes 16 - causing contamination of clothing and hands. In accordance with the requirements of sanitary standards, a dressing room, a washroom and a shower room must be installed on the construction site. The shower is projected at the rate of one shower for 20 people using a shower. The water consumption is 500 liters per one shower box.

- In the production of earthen and pile works, water is used to ensure the normal operation of earth-moving machines equipped with internal combustion engines in the amount of 10 ... 15 liters per 1 mash/cm.
- In the production of concrete work, water is used for washing concrete aggregates at the rate of 0.5 ... 1 m3 per 1 m3 of crushed stone or gravel and 1.25 ... 1.5 m3 per 1 m3 of sand.
- Water used for cooling internal combustion engines and compressor equipment should have the least possible rigidity (not more than 4.5 ... 5 mg • eq/l) and turbidity (not more than 20 ... 25 mg/l). To feed steam boilers of temporary power plants, water with a hardness of not more than 3.5 mg • eq/l and a dissolved oxygen content of not more than 1 ... 2 mg/l can be used.
- If city water cannot file the required amount of water on the construction site, then it takes the water only for drinking purposes. Water for technological purposes is supplied from the nearest surface sources.
- Mobile pumping stations and small capacity stations located on pontoons, stilts or on reinforced concrete slabs are used for temporary water intake structures.

❖ **Sewage system: -** Sewerage (the sewer system), is the underground networks of pipes that carries sewage (waste water and excrement), waste water and surface water run-off, from buildings to treatment facilities or disposal points.

- A sewer is; 'A pipe or channel taking domestic foul and/or surface water from buildings and associated path and hard standing from two or more cartilages and having proper outfall‟
- There are a number of ways of moving the contents of sewers: 1. Gravity sewers use differing elevations to facilitate movement. 2. Force mains use pumps where sewers are at a lower elevation than the destination. 3.Vacuum sewers use differential atmospheric pressure
- A sewerage undertaker is: 'A collective term relating to the statutory undertaking of water companies that are responsible for sewerage and sewage disposal, including surface water from roofs and yards of premises.'
- A drain is a pipe that serves only one building, conveying water and waste water to a sewer. A lateral drain is a section of drain positioned outside the boundary of a building, connecting with the drains from other buildings to become a sewer.
- Combined Sewer Overflow (CSO) is: „A structure on a combined or partially separate sewer system that allows the discharge of flow in excess of that which the sewer is designed to carry, usually to a receiving surface water body.

❖ **Waste water: -** An important part of the economic and social development of any country is the construction sector. There are major challenges in all phases of projects, in both civil engineering and in building, to minimise the impact on people and the environment.

- In the developed world, environmental issues such as the efficient use of resources and their sustainability, the protection of biodiversity, climate change and the risk of accidents have become very important in all areas, including construction.
- A project is understood as a construction or other installations and works, including those devoted to the exploitation of mineral resources. Both public and private projects are subject to a process of *Environmental Impact Assessment* (EIA) and an obligation to establish an *Environmental Management Plan* (EMP), which is a tool accompanying the project at all stages of design, implementation and monitoring.
- Water is a key component of a construction project and is used as part of the fluid for excavation and foundations, as a means of cooling machines (e.g. tunnel boring machines, drilling rigs and cutting machines) and as a means of cleaning.
- In many cases, it also appears as a result of rain and effluent seepage. In any case, it must be properly managed to optimise its consumption and to ensure it does not harm the environment. There are national and local regulations in most countries establishing the properties of water being fed into a public effluent, which place limits on suspended solids (SS), acidity (pH), biological oxygen demand (BOD) and chemical oxygen demand (COD).
- To solve this problem, NIHON KASETSU has developed a simple and effective clarification system to treat construction wastewater.

- It is based on using a single chemical additive powder, which acts as a coagulation-flocculation agent, which is largely insensitive to the water pH, so no adjustment is required in most cases. It is an inorganic chemical compound made from 100% natural substances, which are safe and non-polluting and are based on mollusk shells, seaweed and minerals.
- It is **s**afe, easy to handle and contains no substances harmful to humans or the environment, so the final sludge can be deposited in landfill sites.
- The whole clarification process is extremely efficient and is performed in a very compact machine (3.5 x 2 m only), with a large treatment capacity (up to 90 m3/h), and is very easy to transport, install and operate.

❖ **Sustainable development: -** The Sustainable Development Goals (SDGs) are the most recent attempt by the international community to mobilise government, private and non-governmental actors at national, regional and local levels to improve the quality of life of billions of people in the developed and developing worlds. The goals are an ambitious, challenging and much-needed action plan for “people, planet and prosperity” until the year 2030.

- This objective, however, did not take into consideration water quality or wastewater management aspects, which represented a main limitation for its achievement2. This omission has been rectified in the Sustainable Development Goals (SDGs), where one of the goals (SDG 6) calls for clean water and sanitation for all people by ensuring “availability and sustainable management of water and sanitation for all”. Among other aspects, it considers improvement of water quality by reducing by half the amount of wastewater that is not treated, and increasing recycling and safe reuse globally.
- This will result in the availability of more clean water for all uses, and on an enormous progress on sanitation and wastewater management. This target unequivocally indicates the close interrelation between clean water, sanitation and wastewater management, giving these two last aspects the importance they deserve.

No government of any human settlement irrespective of its size, be it a megacity, mid-size city or large or small town, can provide clean water without concurrently considering sanitation and waste water management. Clean water is not, and will never be possible, if waste water is not collected, treated and disposed properly for intended uses.

- Worsening water pollution affect both developed and developing countries. In developing countries, it is mostly due to rapid population growth and urbanization, increased industrial and other economic activities, and intensification and expansion of agriculture, coupled with lack of local and national legal and institutional capacities and political and public apathy to improve and maintain water and waste water management processes in the long-term.

14.2 Electrical Engineering

14.2.1 Design of Power Electronics converters

1.6.1 Introduction of Power Electronics Converters

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

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

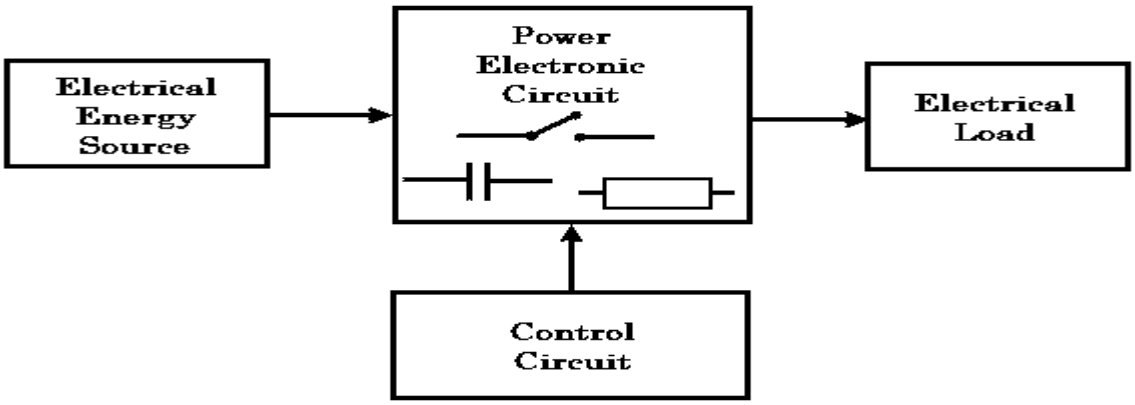


Figure 28 Block diagram of power electronic converter

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

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

- **AC to DC** = Rectifier: It converts AC to unipolar (DC) current
- **DC to AC** = Inverter: It converts DC to AC of desired frequency and voltage
- **DC to DC** = Chopper: It converts constant to variable DC or variable DC to constant DC
- **AC to AC** = Cycloconverter, Matrix converter: It converts AC of desired frequency and/or desired voltage magnitude from a line AC supply.

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

1.6.2 AC to DC Converters or Rectifiers

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

The essential components in this rectifier include transformer, switching unit, filter and a control block.

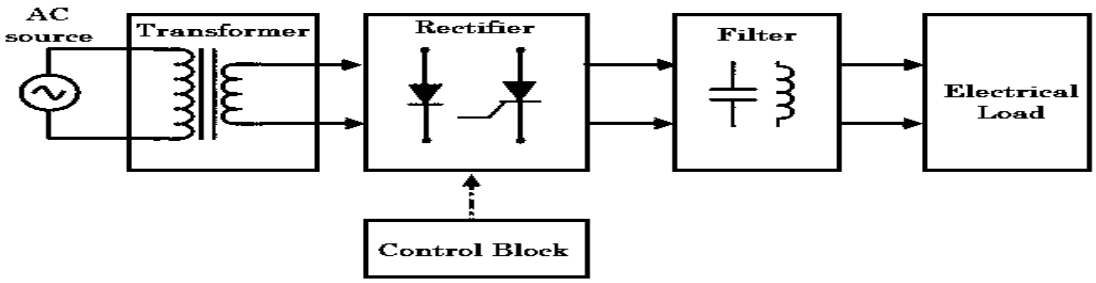


Figure 93 AC to DC Converter

The control block controls the firing angle of thyristors in case of phase controlled rectifiers. Since the diode is not a controllable device, control block is not needed in case of diode rectifiers.
Rectifiers are majorly classified into two types

- Uncontrolled diode rectifiers
- Controlled rectifiers

Uncontrolled Diode Rectifiers
This type of rectifier converts AC voltage from mains into a fixed DC voltage.
Since the diodes are uncontrollable components (which do not require any triggering), these converters are called as uncontrolled converters as they produce a fixed voltage. The input voltage can be either single phase or three-phase.

The diode rectifiers are classified into following types.

1. Single phase half-wave rectifier
2. Single phase center-tapped full-wave rectifier
3. Single phase full-wave bridge rectifier
4. Three-phase Half-wave diode rectifier
5. Three-phase Full -wave diode rectifier

1.6.3 Single phase half-wave rectifier

In this a single thyristor or SCR is connected between the secondary of the transformer and a resistive load as shown in figure. The primary of the transformer is connected to a single phase supply and consider that load is of resistive.

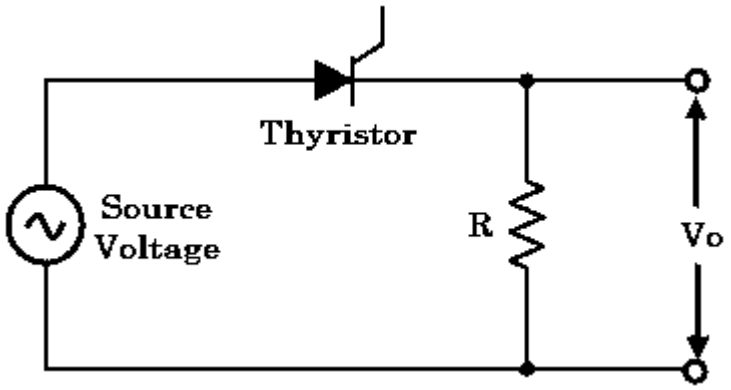


Figure 94 Single phase half wave rectifier

During the positive half cycle of the input AC supply, thyristor T1 is forward biased, and when it is triggered at some firing angle though gate terminal, it starts conducting current to the load.
Since the SCR is a unidirectional device, it turns OFF during negative half-cycle. So the output voltage is produced only for positive half cycle.
The output power delivered by this half-wave rectifier is controlled by phase control, i.e., varying firing angle to the gate terminal. The load of this rectifier can be a RL load and RLE load with freewheeling diode.

1.6.4 Single phase full wave mid-point rectifier

This converter rectifies both positive and negative half-cycles of the input supply. It uses two SCRs with center-tapped secondary transformer as shown in figure.
In positive half-cycle of the input supply, thyristor T1 is forward biased while T2 is reverse biased. WhenT1 is triggered, the supply voltage appear across the load.

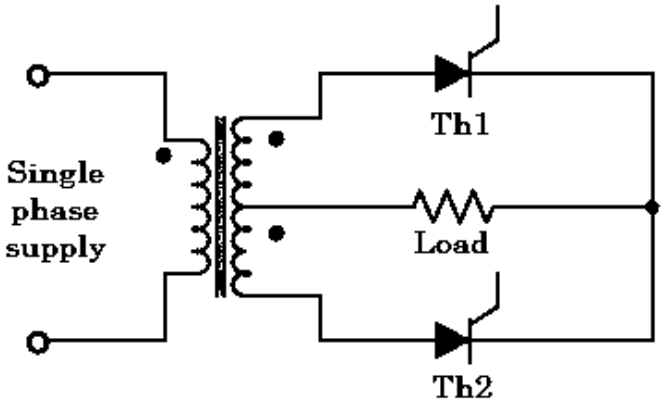


Figure 95 Single phase full wave midpoint rectifier

It conducts till 180 degrees of input supply and turns OFF due to natural commutation. During negative half cyle, thyristor T2 is forward biased and when it is triggered, it starts conducting. It conducts till next positive half cycle.
The load could be RL or RLE depending on the type of application it is employed. This type converter produces an output voltage twice that of single phase half-wave rectifier.
These are essential when one of the terminals on DC side has to be grounded. However, a center-tapped transformer with a VA rating twice that of load is required and also high voltage rating thyristors are needed in this converter.

1.6.5 Single phase full wave bridge rectifier

The circuit diagram of a full wave bridge rectifier using thyristors in shown in figure below. It consists of four SCRs which are connected between single phase AC supply and a load.

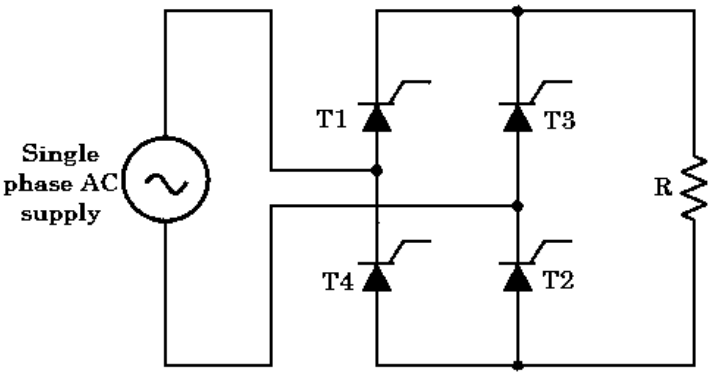


Figure 96 Single phase full wave bridge rectifier

This rectifier produces controllable DC by varying conduction of all SCRs.
In positive half-cycle of the input, thyristors T1 and T2 are forward biased while T3 and T4 are reverse biased. Thyristors T1 and T2 are triggered simultaneously at some firing angle in the positive half cycle, and T3 and T4 are triggered in the negative half cycle.
The load current starts flowing through them when they are in conduction state. The load for this converter can be RL or RLE depending on the application.
By varying the conduction of each thyristor in the bridge, the average output of this converter gets controlled. The average value of the output voltage is twice that of half-wave rectifier.

1.6.6 Three-phase half-wave converter

The output from single phase converter is small; when high power is required, three phase rectifiers are used. A three-phase half-wave rectifier with thyristors is shown in figure below.
The three-phase supply is given to this converter through a three-phase transformer with star connected secondary.

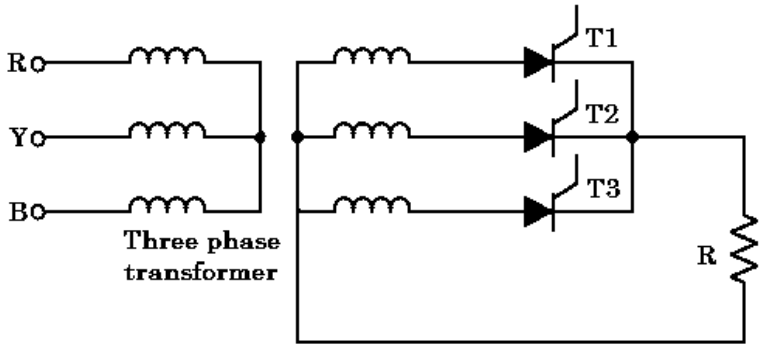


Figure 96 Three phase half wave rectifire

It works as similar to the three-phase diode bridge rectifier. In this, thyristor T1 is at highest positive anode voltage in the interval $\pi/6$ to $5\pi/6$. During this interval, T1 can be made to conduct by giving a firing pulse to its gate.
This thyristor T1 continues to conduct till thyristor T2 is made to conduct in the interval $5\pi/6 < wt < 3\pi/2$. Now the load current starts flowing through T2. Similarly, thyristor T3 is starts conducting once thyristor T2 is turned OFF.

In this, there are three pulses of output voltage during each complete cycle of supply voltage. Thus the ripple frequency is three times the supply frequency.

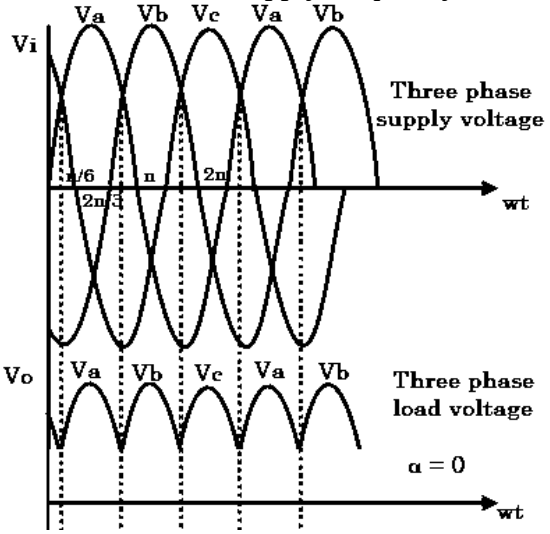


Figure 97 Wave form of three phase half wave rectifier

For this reason, this converter is also called as 3-pulse converter. This converter can be connected to different loads such as RL and RLE loads.

1.6.7 Three-phase full wave converter

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

Here the load is connected via a three-phase half wave connection to one of three supply lines. Thus, there is no need of transformer; however, for isolation purpose a transformer is connected as shown in figure.

Here thyristors T1, T3 and T5 forms a positive group, whereas thyristors T4, T6 and T2 forms a negative group. And thus positive group SCRs are turned ON for positive supply voltage and negative group thyristors are turned ON for negative supply voltages.

In this, one of the thyristors from positive, whose anode voltage is maximum positive will conduct at any instant and simultaneously one of the thyristors from negative group, whose cathode voltage is maximum negative will conduct.

This converter can be connected to RL or RLE loads. By controlling the firing angle to respective thyristor, average power delivered to the load is changed.

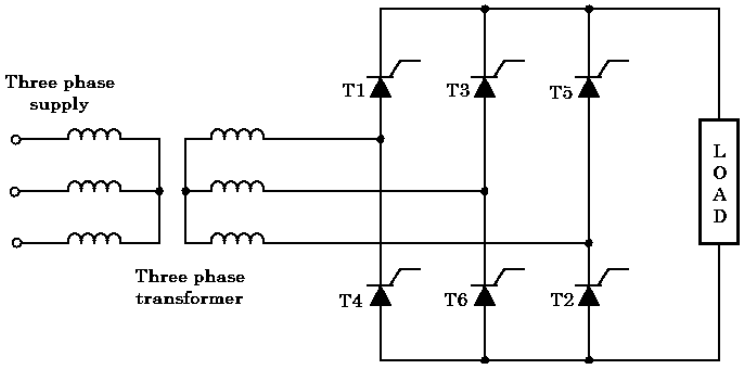


Figure 98 Three phase full wave rectifier

The firing angle of particular thyristor in positive group measured from the instant when its anode becomes maximum positive.
Similarly, the firing angle for a thyristor in negative group is measured from the instant when its cathode terminal attains a maximum negative value.

1.6.8 DC to DC Converters

Many DC operated applications need different levels of DC voltage from a fixed DC source. Some of these applications include subway cars, DC traction systems, control of large DC motors, battery operated vehicles, trolley buses, etc. They require variable DC to produce variable speed, so a power conversion device is needed.
A DC chopper is a static device that converts a fixed input DC voltage to variable DC output or a fixed DC output of different magnitude (which can be lower or higher) than input value. The block diagram of a DC chopper is shown in figure below.
The chopper circuit is connected between DC input source and DC load. This chopper consists of power electronic switching devices such as thyristors which are connected in such a way that they produce required DC voltage to the load.
The output voltage is controlled by adjusting ON time of the thyristor (or switch) which turn changes the width of DC voltage pulse at the output. This method of switching is called as pulse width modulation (PWM) control.

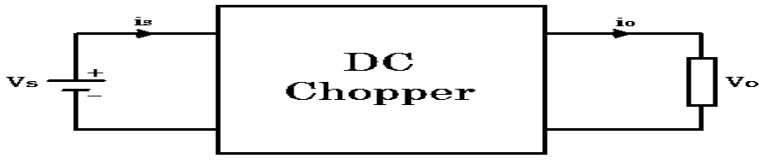


Figure 99 DC to DC chopper

The output of the chopper can be less or greater than the input and also it can be fixed or variable. These can be unidirectional or bidirectional devices based on the application it is intended for.
DC choppers are mainly used in DC drives, i.e., electric vehicles and hybrid electric vehicles.
DC choppers are classified into three basic types based on input and output voltage levels and are discussed below.

1.6.9 Step-down Chopper or Buck converter

A step-down chopper produces an average output voltage lower than the input DC voltage. The circuit for this converter is shown in figure below.
Here the switching component is a thyristor that switches the input voltage to the load when it is triggered at particular instants.
A diode acts as a freewheeling diode that allows the load current to flow through it when thyristor is turned OFF. If this diode is absent, a high induced EMF in inductance may cause damage to the switching device.

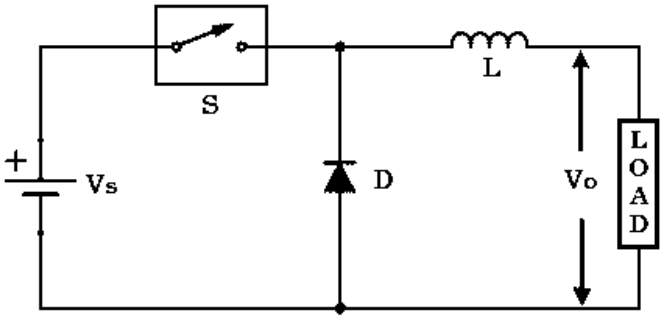


Figure 100 Step down chopper

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

1.6.10 Step-up Chopper or Boost converter

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

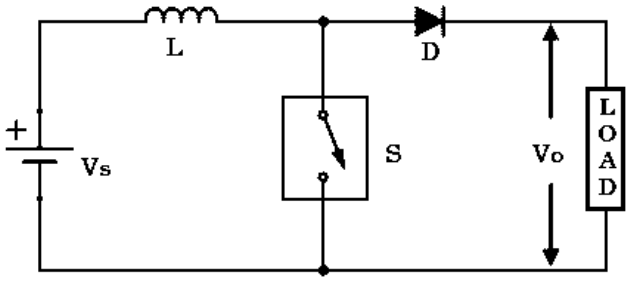


Figure 11 Step up chopper

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

1.6.11 Buck/Boost converter

This chopper can be used both in step-down and step-up modes by continuously adjusting its duty cycle. The configuration of buck-boost converter is shown in figure below that consists of only one switching device, i.e., one thyristor.
Along with an inductor and diode, additional capacitor is connected in parallel with this circuit.

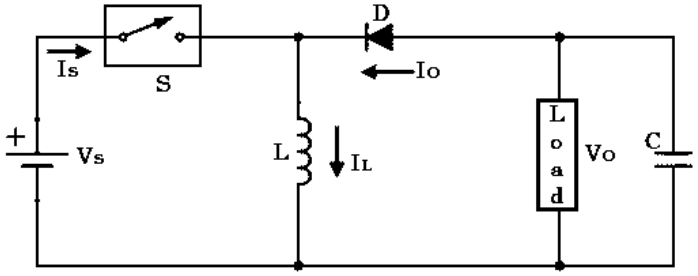


Figure 102 Buck boost converter

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

1.6.12 AC to AC Converters

AC/AC converters connect an AC source to AC loads by controlling amount of power supplied to the load. This converter converts the AC voltage at one level to the other by varying its magnitude as well as frequency of the supply voltage.
These are used in different types of applications including uninterrupted power supplies, high power AC to AC transmission, adjustable speed drives, renewable energy conversion systems and aircraft converter systems.
The types of AC to AC converters are discussed below.

1.6.13 AC/AC Voltage Converters

These converters control the rms value of output voltage at a constant frequency. The common application of these converters includes starting of AC motors and controlling power to heaters.
A single phase AC/AC voltage converter consists of a pair of anti-parallel thyristors along with a control circuit as shown in figure below.
The other names of this controller are single phase full wave converter and AC voltage controller.

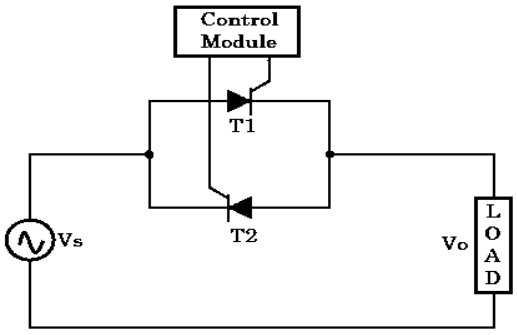


Figure 103 AC/AC Voltage converter

During positive half cycle of the input signal, thyristor-1 is forward biased and it starts conducting, when the triggering is applied. Thus the power flows from source to load.

In negative half cycle of the input, thyristor-2 is forward biased and starts conducting when it is triggered, while thyristor-1 is turned OFF by natural commutation.
By varying the triggering or conduction angel of each thyristor during each half-cycle, the magnitude of voltage appeared across the load is controlled.
The other popular form of AC voltage controller is the use of TRIAC in place of two anti-parallel thyristors. The figure below shows TRIAC based AC controller along with triggering control circuit.
Here diac controls the positive and negative triggering to the TRIAC so that average output voltage to the load is controlled.

1.6.14DC to AC Converters or Inverters

These converters are connected between DC source of fixed input, and variable AC load. Most commonly, these DC to AC converters are called as inverters. An inverter is a static device that converts fixed DC supply voltage to variable AC voltage.

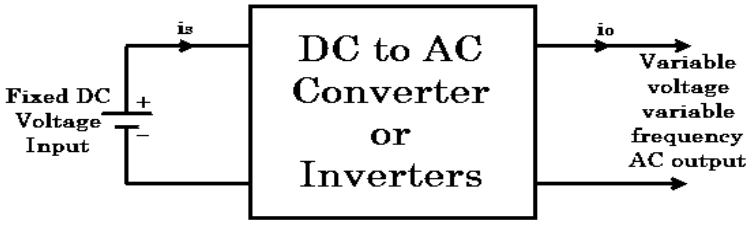


Figure 104 DC to AC converter

Here the fixed DC voltage is obtained from batteries or by DC link in most power electronic converter. The output of the inverter can be variable/ fixed AC voltage with variable/fixed frequency.
This conversion from DC to AC along with variable supply is produced by varying the triggering angle to the thyristors. Most of the thyristors used in inverters are employed with forced commutation technique.
These can be single phase or three phase inverter depending on the supply voltage. These converters are mainly divided into two groups. One is PWM based inverters and other multilevel inverters.
Further, these are classified voltage source inverter and current source inverter. Each type is subdivided into different types such as PWM, SVPWM, etc. Multilevel inverters are more popular in industrial applications.
The inverters overcome the drawbacks of PWM based inverters.

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

1.6.15INTRODUCTION

The ac motor starters are increasingly becoming popular due to its controlled soft-starting capability. The ac motor starter provides limited starting current and hence conventional electromagnetic line starters and reduced-voltage starters are replaced with ac motor starters. Thyristor-based soft starters have many desirable properties and provide a viable solution to starting problems in three phase induction motors. These power semiconductor based starters are cheap, simple, and reliable and occupies less volume. The power density of these soft starters is also very high. A three phase induction motor produces electromagnetic torque on its shaft but initial switching instants of all three phases to the supply produces pulsations on

the electromechanical torque when it is controlled by a direct-online starter. These severe pulsations in electromagnetic torque might cause shocks to the shaft and hence to the driven equipment. These pulsations might damage mechanical system components, such as shafts, couplings and gears etc. The electromagnetic torque pulsations also causes long term effects on various mechanical system components if the strength of materials is exceeded which might lead to fatigue also.

The reduced voltage starting by soft starters eliminates stress from the electrical supply and it also reduces the possibility of voltage dip and brown out conditions. Soft and smooth starters provide smooth acceleration of rotor of three phase induction motor. Reduced voltage starting reduces high amount of starting torque applied on the shaft and therefore eliminates the shock on the driven load. An instantaneous high amount of starting torque can cause a jolt on the conveyor which can damage products, pump cavitations and water hammer in pipes. Therefore, a soft starter ramps up the voltage applied to the motor from the initial voltage to the full voltage. The voltage is initially kept low to avoid sudden jerks during the start. The voltage and torque increases gradually so that the induction motor starts to accelerate. This ramp up voltage provides sufficient torque for the load to accelerate gradually and hence mechanical and electrical shocks are minimized from the system, The voltage supplied to stator windings are adjustable and it has ramp characteristics.

1.6.16 OPERATING PRINCIPLE OF SOFT STARTER

A soft starter provides reduced voltage to stator windings of three phase induction motor by controlling the acceleration of an electric motor. A three phase induction motor is a self-starting motor and electromagnetic torque is produced due to an interaction between revolving magnetic field around rotor and rotor current. Initially during starting, a rated voltage is applied which causes high current to flow through stator windings. Now this high current is greater than the rated current which can cause heating of the stator windings and eventually damaging the insulation applied on stator windings. To avoid the problem of high starting current, there is a need of motor starters in an electric motor.

Initially to perform soft starting, a firing pulseare given to the SCRs so that only the remaining part of each half period of sinusoidal voltage curve passes through them. Then the instants of firing pulses are reduced which allows larger part of the voltage to pass through SCRs. Finally, the firing pulses are applied exactly at the zero crossing of the voltage which allows 100% of the voltage to pass through. This is also seen as the ramping up of voltage from reduced voltage at starting by allowing more voltage to pass through SCRs. In this way, a full voltage is applied from reduced voltage at the starting. The opposite procedure is followed for soft stop. The full voltage is allowed to pass through the thyristors and when the stop time is about to reach, the firing pulses are delayed which allows less voltage to pass through. The instants of firing pulses are increased till the end of voltage is arrived. Then, no more voltage is applied to the motor and in this way, the motor is stopped.

1.6.17 CIRCUIT DIAGRAM

The circuit diagram of soft-starting of three phases IM is shown in Fig.1. The circuit diagram comprises of voltage regulator, zero crossing detector, bridge rectifier, 4N25 opt-Isolator,Atmega 328Pmicrocontroller and TRIAC circuit. TRIAC circuit performs the role of soft starter in each phase of three phase induction motor. TRIAC circuit basically consists of two ant parallel SCRs connected back to back. This soft starter is used to give soft starring to Induction motor. A 12 V DC regulated supply is obtained with the help of step-down

transformer and bridge circuit. The step down transformer converts 230V to 12V ac supply and then it is fed to bridge circuit. The bridge circuit in turn converts ac supply to dc supply. This dc supply is given to regulator IC to get positive 12V dc regulated supply. The main part of the circuit is zero crossing detector circuit which is made up of four diodes connected to form bridge rectifier circuit and output of bridge rectifier is fed to 4N25 optoIsolator. Then output of 4N25 optoIsolator is applied to interrupt pin ofAtmega 328P. Whenever the input AC waveform crosses the zero reference point, a high pulse signal triggered from 4N25 optoIsolator is given to interrupt pin of Atmega 328P. When Atmega 328P receives high signal from interrupt pin, it interrupts Atmega 328P by providing high signal on interrupt pin and then it initiates delay counter from that point and hence it provides triggering pulse to gate signal of TRIAC through MOC3021 optoIsolator.

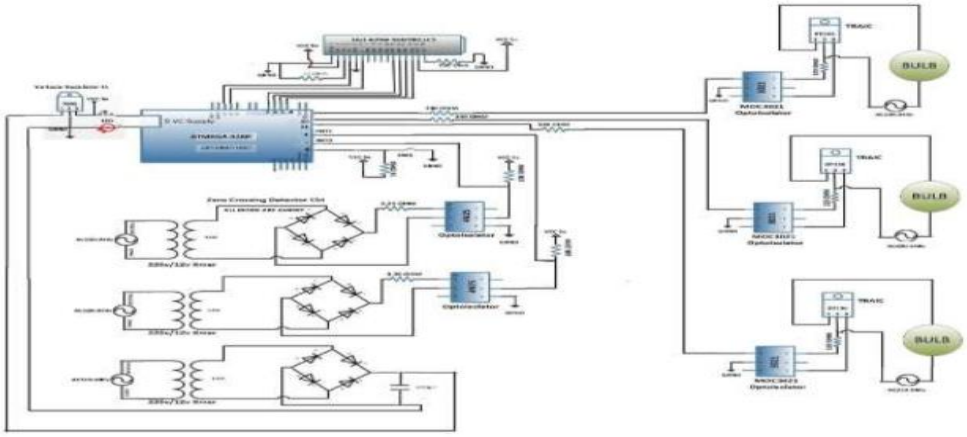


Figure 105 Circuit diagram of electronic soft starter

1.6.18HARDWARE PROTOTYPE OF SOFT STARTER OF IM

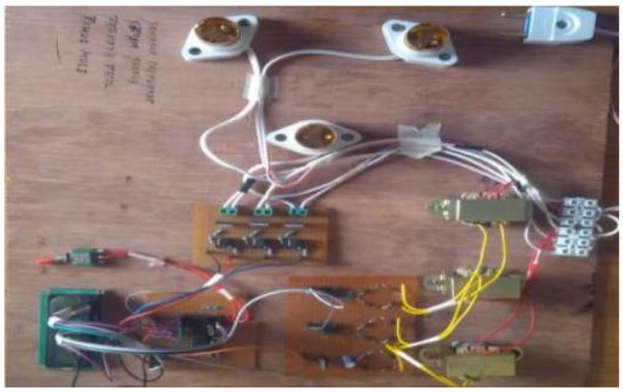


Figure 106 hardware prototype of soft starter of IM

Sr. No.	Name of component used	Rating of component	Number of components
1	Transformer	220-240/12V	3
2	Diode	1N4007	12
3	Opto-isolator	4N25	2
4	Arduino	ATMEGA328P	1
5	LCD Display	16*2	1
6	Voltage regulator IC	7805	1
7	Capacitor	470uF	1
8	TRIAC	BT136	3
9	Toggle switch	-	1
10	Resistance	120 Ω 330 Ω 1000 Ω 3.3 kΩ 10 kΩ	3 4 3 2 2
11	Bulb	60W	3

Table 21 Component use in soft starter

1.6.19 ADVANTAGES AND DISADVANTAGES OF SOFT STARTERS

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

14.2.3 Advanced Wireless Power Transfer System

1.6.20 INTRODUCTION

The Transfer of electrical power in reliable and efficient way is always challenging for the designers and engineers. Presently all electrical power from the generating stations to the distribution station is transferred by the uses of wires and underground cables. One of the major issues in these types of systems is the losses due to resistance of the material. Generally the percentage of loss of power during the transmission and distribution is 26%

Figure 107 Wardenclyffe Tower

In modern technology the use of portable device has increased such as mobile robots and electric vehicle. Mobility is the main concern of these equipment i.e. they are not connected to the main source of power.

All these problems are the main motivation for researchers. Nikola Tesla was the first who introduce the concept of wireless power transfer. But this technology from the time of Tesla is underdeveloped due to lack of funding and technology. But research from past few years has always going on and recent development has been observed in the field.

Wireless power transfer can be achieved by several methods (discussed later). Here we discussed few methods such as induction coupling, resonating coupling, LASER technology for electrical power transfer.

1.6.21 WIRELESS POWER TRANSFER METHOD

1.6.22 INDUCTIVE COUPLING

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

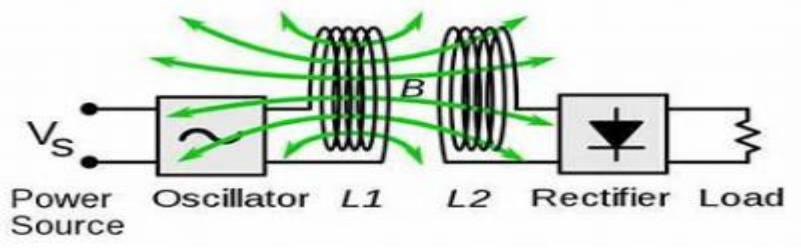


Figure 108 inductive coupling

1.6.23 MAGNETIC RESONANCE COUPLING WPT

This is also one of the important methods for transferring power based on near field technique. It generally overcomes the disadvantage of up to some extent which arise in non-resonant inductive coupling. This type of coupling used the concept of resonance. At

resonance we know that natural frequency and excitation frequency are same. This leads to the maximum amplitude that means a maximum amount of energy is transferred between two coils. Here the receiver and transmitter coils are tuned to be at same resonant frequency. This allow us to transfer significant amount of power by increasing distance between coils. These type of system are used for building mid-range power transfer. Mid-range can be specified by distance up to 10 times the diameter of the transmitting coil. Magnetic resonance coupling have several advantage such as efficiency increases with decrease in the radiation and power loss and range can be increase up to some meter and it is directional. The mainly disadvantage is that selection of resonance frequency which tunes with the natural frequency and it cannot be used for long range application.

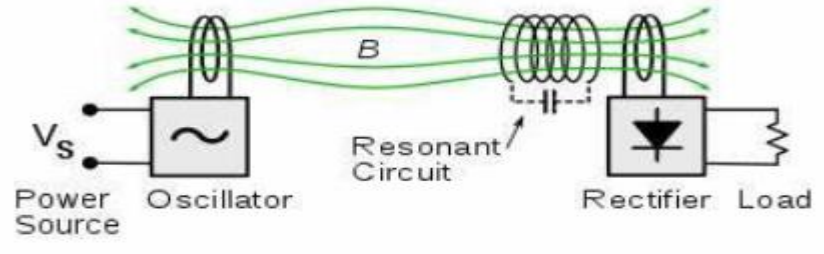


Figure 109 Magnetic resonance coupling

1.6.24MICROWAVE WPT

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

1.6.25LASER WPT

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

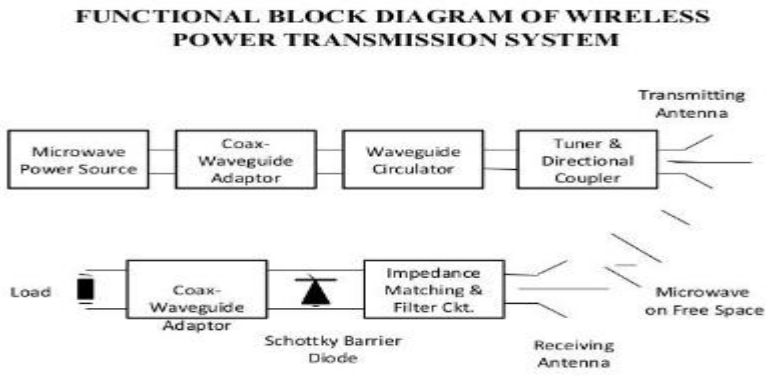


Figure 110 Functional block diagram of WPT

1.6.26 COMPARISON BETWEEN WPT METHODS

WPT METHODS	SEPERATION DISTANCE	POWER	EFFICIENCY
Inductive coupling	Few mm	Few watts	Low
Magnetic resonance couping	Few meter	Few Kilo Watts	High
Microwave WPT	Upto 100KM	Upto 100 MW	High
LASER	Few meter but with high intensity	Upto 100 MW	Low

Table 22 comparison between wpt methods

1.6.27 ADVANTAGES AND DISADVANTAGES

1.6.28 ADVANTAGE

- It gives the human comfort as there is no chording or wiring problem, so mobility is easier.
- There is no problem of power failure and extensive heating.
- Cost of overall system decreases due to no uses of wires.
- Overall efficiency increases due to decrease in the power loss.
- It offers no corrosion as there is no exposure to the atmosphere which is Ecofriendly.
- It offers ranges of power levels and separation distance between coils.
- It offers convenient, reliability, high efficiency, low cost at the same time.

1.6.29 DISADVANTAGE

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

14.2.4 Industrial Temperature Controller

1.6.30 Introduction

Several heating and cooling function exist in almost every industry for example textile miles, pharmaceuticals, power station and so on. Smart control of temperature is an important task for smooth running of industries. Each part of industry has particular temperature requirement which is to be acquired during production hour. In defines that in industries, it is very crucial to monitor and control temperature precisely. The effective solution for this problem is to develop a data logger. Earlier it was completed manually using the thermometer and manometer. Since 1990 another progress in data logging took place as people to begin to produce PC based data logging system. A single chip embedded temperature controller design programmed in a single programmable system on chip: mixed array logic consists of analog, digital and digital communication block within in it. The compressed design allows the user to select any type of control function through its computer-generated instrument program. This design can be straight connected to PCs. The web based distributed measurement and control with programmable single-wire digital temperature sensor DS18B20, an embedded system is used as field processing unit. With application mode of B/S. a remote temperature measurement and control system is designed by embedded in. In case of variable temperature requirement, manufacturing operator can also select multiple options for controlling temperature with displaying necessary information in the display. Number control applications have been already developed in electrical engineering for controlling the automatic system. Microcontroller can be also used to control light smoothly.

1.6.31 Concept of Temperature Control Technique

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

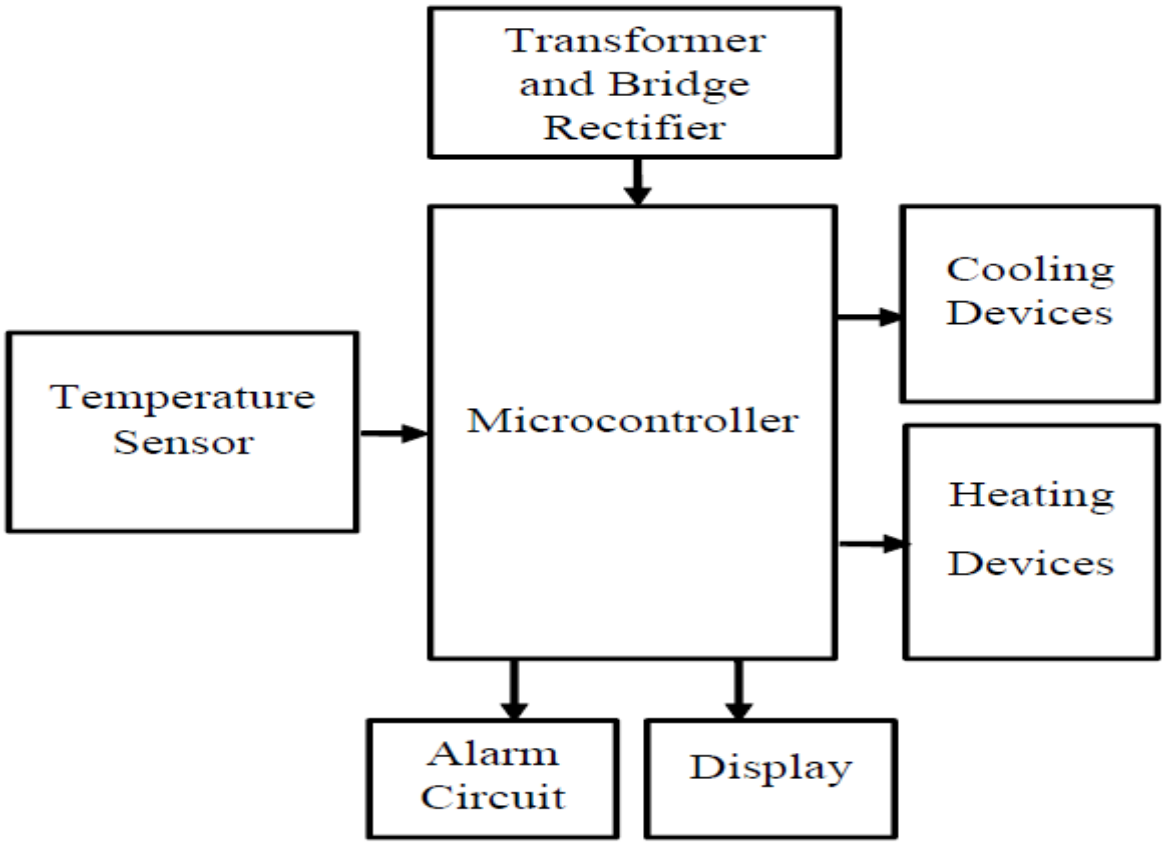


Figure 111 Block Diagram of Total System

The pseudo code for control the overall heating and cooling system can be written as:
When asking temperature > real-time temperature
Heating element = 1 for (asking temperature + 1 Degree Celsius)
Cooling element = 0 for 1 minute
When asking temperature < real time temperature
Cooling element = 1 for (real-time temperature – 1 Degree Celsius)
Heating element = 0 for 1 minute

1.6.32 Design of Temperature Control Circuits

A 220 V AC supply is stepped down to 18V by using potential transformer (TR1). Transformer (TR1) is connected with a bridge rectifier (BR1) to create pulse- setting DC where a capacitor (C1) is used to produce smooth DC. A heater coil (L1) is directly connected to power supply through relay (RL1), when relay "ON" heater would produce heat. Figure shows the complete circuit diagram of industrial temperature control system.

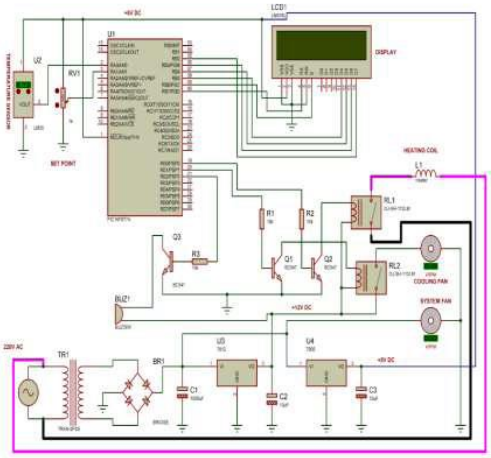


Figure 112 Complete Circuit Diagram of Temperature Control System

Two voltage regulators of 7412 and 7405 are used to get fixed DC voltages for different part of the circuit where U3 (7412) provides 12V and U4 (7405) provides 5V. Furthermore, capacitor C2 and C3 are used to filter output signal in case of presence of any oscillation into the provided DC voltage.

The Buzzer (BUZ1) is connected with 12V DC voltage supply from U3 and the relays RL1 and RL2 are also connected with 12V DC voltage supply from relays RL1 and RL2. The display (LCD1), microcontroller (U1), set point (RV1) and temperature sensor (U3) are connected with 5V voltage DC voltage supply. In temperature controller there are two fans, one is system fan or circulating fan and another is cooling fan which are indicated in Figure. System fan is directly connected with 18V and cooling fan is connected with RL2. When power is supplied to system fan is turned on whereas cooling fan is controlled by the relay (RL2). Microcontroller is connected directly with sensor (U2), set point (RV1) and display (LCD1). Microcontroller is also connected with Buzzer (BUZ1), relay (RL1) and relay (RL2) through a switching device (BJT) and a resistor. Common emitter configuration of transistor (Q1, Q2 and Q3) works as a switching device. Figure shows that printed circuit board with installing all necessary equipment.

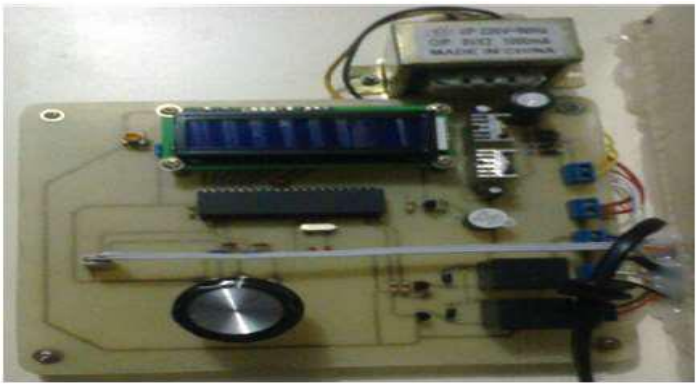


Figure 113 Printed Circuit Board to Total System

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

1.6.33INTRODUCTION

In today's world as the population increases day by day the numbers of vehicle also increases on the road and highways. This result in more accident that leads to the traffic jams and

public not get help instantaneously. This problem is due to rider's poor behaviors such as speed driving, drunk driving, riding with no helmet protection, riding without sufficient sleep etc. So road safety is one issue that needs special attention. In most of the accident cases, the victims lose their lives because of unavailability of medical facilities on the right time. The crucial time between the accident and getting victim medical attention can often be the difference between life and death. It is very difficult to know that an accident has occurred and to locate the position where it is happened. To solve problem like these, this accident detection and reporting system is used to save the lives by making the medical facilities arriving on time.

In this we are developed a wireless system using MEMS accelerometer and GPS/GSM for accident detection and reporting. IF any accident occurs, this wireless device will send automated message to Emergency medical services (EMS) and family member giving the exact position of the spot where the crash had occurred. So they can provide proper medical treatment to patients. This system is used to record information related to accident like temperature data, position data etc. So that it can be used to analyze the accident easily and to settle many disputes related to accident such as insurance settlements. This system is also used to detect whether the driver was in drunken state and the vehicle would not start thereafter. The whole system is based on arm controller. This controller is used to co-ordinate all the activities in the system.

1.6.34SYSTEM OVERVIEW

The main objective of this work is to reduce the human death rate in road accident. The paper proposed a system to give quick assistance to the people who got the accident. The fall detection and reporting system for the vehicle can gain the attention because the system will save the life and give medical treatment on time.

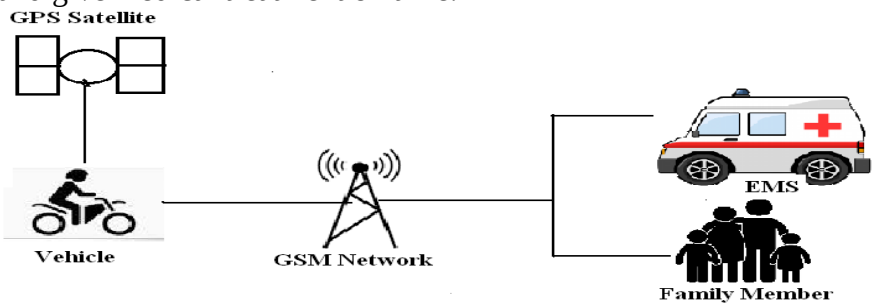


Figure 114 System Overview

The system consists of ARM7 micro-controller unit, MEMS accelerometer, GPS device, GSM module, Temperature sensor, gas sensor and Alcohol sensor. An Accelerometer is used to detect the acceleration. It is the main sensor used to detect the accident. Once the accident is detected GPS collect the current position values which include latitude (N or S), longitude (E or W), date and time. The location values are given to microcontroller. Controller gives this information to GSM module. By using GSM module we can send the message to family members or EMS. Here the serial communication interface UART is used for the communication between the microcontroller, GSM and GPS module. The RS232 communication standard is used for the electrical signal characteristics such as voltage levels. This communication enables point to point data transfer. A high performance 16/32 bit microcontroller unit is used to process and store real time signal from the accelerometer and various sensor. Through Temperature sensor we can measure temperature in vehicle and which is display on LCD continuously. Motor stop automatically when alcohol is detected through alcohol sensor. Gas sensor is used for gas leakage detection and red LED blink when

gas is detected. All the data of these sensor and GPS data are stored in memory card for analysis of accident cause. The total system is placed inside a vehicle which is not visible to others. We can implement robust package design so that system is safe from water and dust.

1.6.35 HARDWARE DESIGN

Hardware framework for accident detection and reporting is shown in fig. 2. Hardware consists of ARM, MEMS accelerometer, GSM modem, GPS device, temperature sensor, gas sensor and alcohol sensor.

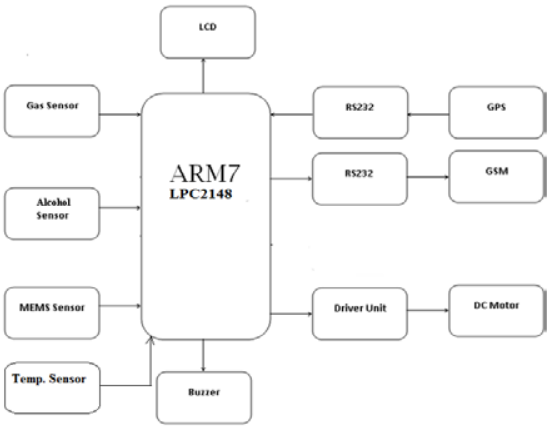


Figure 115 Basic Block diagram

1.6.36 METHODOLOGY

The system design for accident detection and reporting is based on ARM and GPS. When vehicle meets an accident, at that time the accident will be detected by accelerometer. MEMS accelerometer sensor can be used as a crash detector of vehicle during and after crash. At that time vibration sensor is used as alarm application to gain attention of people towards accident spot. According to this project when a vehicle meets with an accident, a Micro electro mechanical system (MEMS) sensor will detects the signal and sends it to ARM controller.
Immediately microcontroller sends the signal to GPS module to collect the current position co-ordinates values which contains longitude (N or S), latitude (E or W), time and date. After that the microcontroller sends the alert message to family member or emergency medical service (EMS) through GSM modem which contains GPS parameter values. Due to this alert message we can provide immediate medical treatment at accident location and victim can get the treatment as fast as possible. If the vehicle meets with a small accident or no serious injuries to people then we can send a message we are safe by pressing switch manually in order to save the valuable time of emergency medical service. Through Temperature sensor we can measure temperature in vehicle and which is display on LCD continuously. Motor stops automatically when alcohol is detected.

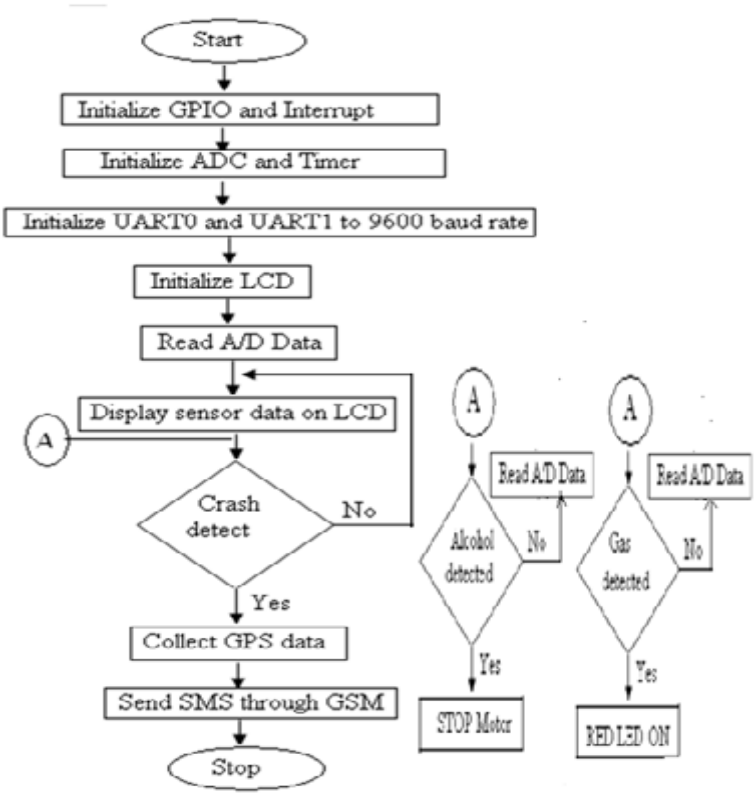


Figure 116 Flow chart of accident notification message

1.6.37WORKING MODEL

An innovative wireless system using Accelerometer and GPS tracking system has been developed for vehicle accident detection and reporting. This vehicle accident detection and reporting systems provide crucial information to emergency responders in the earliest possible time. The crucial time between the accident and getting victim medical attention can often be the difference between life and death. This system provides better safety rather than no safety.

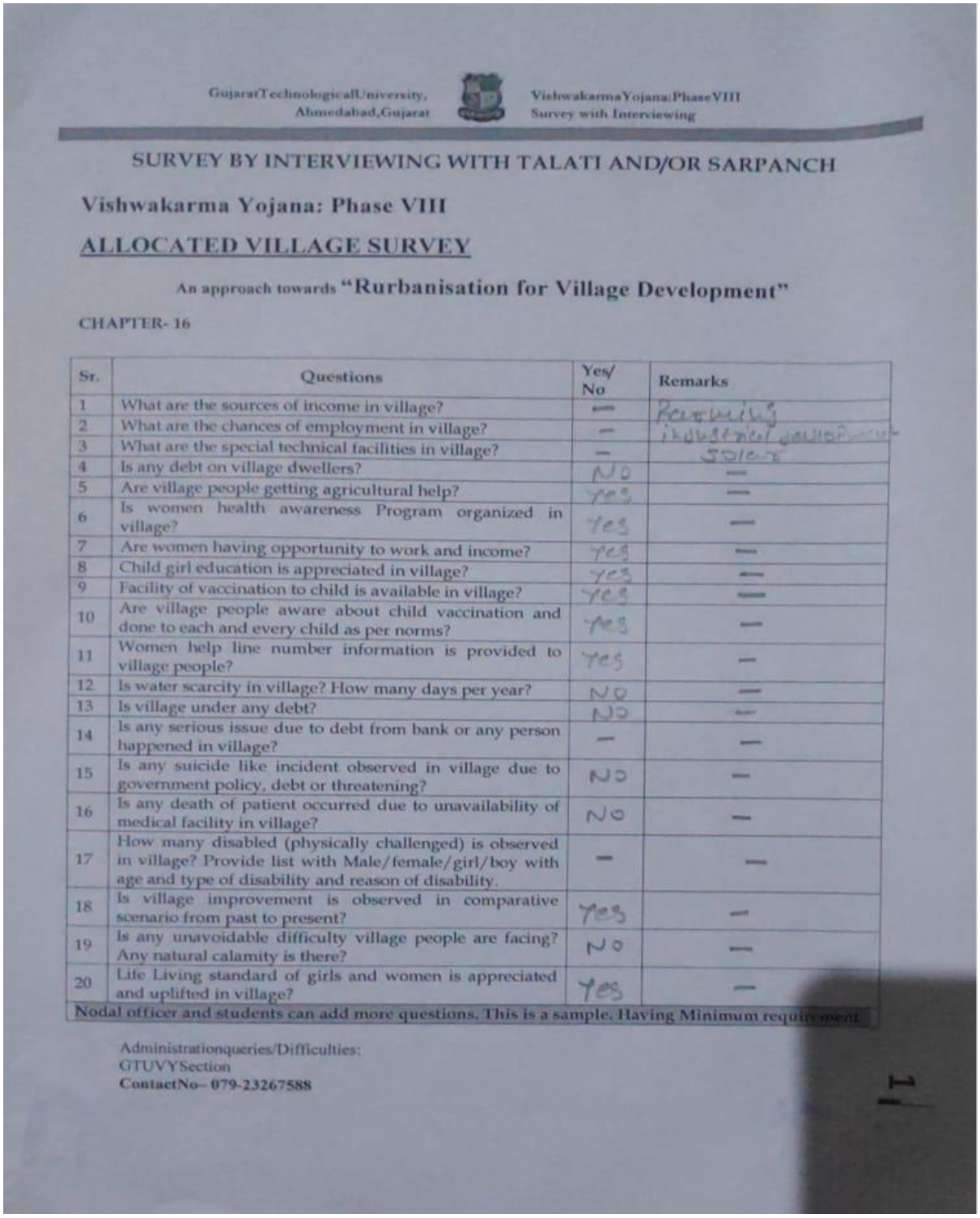
Fig 117 working model

Ch. 15: SMART AND SUSTAINABLE FEATARURE OF CHAPTER 8 AND 13 DESIGN, IMPECT ON SOCIETY

The concept of sustainable development can be interrupted in many ways, but at its core is an approach to development that looks to balance different, and often competing, needs against an awareness of the environment, social and economic limitations we face as a society.

Sr. No.	Name of design	Period	Amount expenditure	Benefit
			Part-1	
1	**Bus stop**	**2 month**	**96000 Rs.**	**In hansapore village they have bus stop but that bus stop is in not good condition so we provide new and batter design**
2	**Doodh utpadan mandali**	**7-8 month**	**1,500,000 Rs.**	**In village doodh mandala is in not good condition so we provide new and high tech design so they can store milk safely**
3	**Public library**	**7-8 month**	**6,87,000 Rs.**	**In village they don't have library so we provide library for student**
4	**Medical shop**	**5-6 month**	**3,30,000 Rs.**	**In village they don't have medical facility so we provide medical shop design**
5	**Water harvesting tank**	**2-3 month**	**11,717 Rs.**	**We provide water harvesting tank at panchayat office so they save water for gardening and other use**
6	**Gate**	**8-9 month**	**1,50,000 Rs.**	**They don't have entry gate so we provide design for aesthetic view**
			Part-2	
7	**Krishi bank**	**7-8 month**	**3,214,640 Rs.**	**We provide krishi bank so village farmers get benifts for farming**
8	**Public toilet**	**5-6 month**	**624,190 Rs.**	**In village many people don't have toilet so we provide public toilet**
9	**Community hall**	**7-8 month**	**2,347,100 Rs.**	**In village they have community hall but not in good condition so we provide design with high tech facility**
10	**Sports club**	**6-7 month**	**2,347,100 Rs.**	**In village they don't have sports club so we provide design for entertainment purpose**
11	**Garden**	**3-4 month**	**200000 Rs.**	**They have some open space in village so we provide garden in that space**
12	**Lake side development**	**5-6 month**	**500000 Rs.**	**In village they have lake for irrigation and other purpose so we suggest lake side development for aesthetic and refreshment purpose**

Ch. 16: SURVEY BY INTERVIEWING WITH TALATI AND SARPANCH



GujaratTechnologicalUniversity, Ahmedabad,Gujarat

VishwakarmaYojana:PhaseVIII
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?	—	Farming
2	What are the chances of employment in village?	—	industrial [illegible]
3	What are the special technical facilities in village?	—	[illegible]
4	Is any debt on village dwellers?	No	—
5	Are village people getting agricultural help?	Yes	—
6	Is women health awareness Program organized in village?	Yes	—
7	Are women having opportunity to work and income?	Yes	—
8	Child girl education is appreciated in village?	Yes	—
9	Facility of vaccination to child is available in village?	Yes	—
10	Are village people aware about child vaccination and done to each and every child as per norms?	Yes	—
11	Women help line number information is provided to village people?	Yes	—
12	Is water scarcity in village? How many days per year?	No	—
13	Is village under any debt?	No	—
14	Is any serious issue due to debt from bank or any person happened in village?	—	—
15	Is any suicide like incident observed in village due to government policy, debt or threatening?	No	—
16	Is any death of patient occurred due to unavailability of medical facility in village?	No	—
17	How many disabled (physically challenged) is observed in village? Provide list with Male/female/girl/boy with age and type of disability and reason of disability.	—	—
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

Administrationqueries/Difficulties:
GTUVYSection
ContactNo– 079-23267588

Ch. 17: IRRIGATION/AGRRICULTEHR ACTIVITIES AND AGRO-INDUSTRY, ALTERNATE TECHNICS AND SOLUTION

Farming methods have evolved massively over the years, from basic, hand-held tools to the modern, sophisticated machinery we use today. Farmers are now embracing modernity, which has enabled them to achieve the highest potential in whichever farming activity they choose to undertake. Technological advancements have permeated every industry across the world and agriculture is no exception. Nowadays, technology is significantly helping growers and farmers in several ways, including precise forecasting, data-driven decision making, and more. The changes have also resulted in a positive impact on the bottom line of most farmers and ultimately led to improved accesses to food products, at reasonable prices. Let‘s delve into the specific ways in which technology has revolutionized agriculture.

1. Online resources:

The proliferation of internet technology has dramatically offered farmers unprecedented access to a wealth of valuable resources and tools to make farming easier. Notably, the internet has innumerable production and planning tools to help them forecast future crops. Additionally, the World Wide Web provides several farming forums that let them exchange ideas seek advice and participate in insightful discussions. These forums offer robust support groups that can help farmers without ever setting foot on the farm.

2. GPS:

A few decades ago, the idea of tractors driving themselves on the farm was implausible. However, the entry of GPS technology has completely changed everything. GPS provides precise location information at any point near or on the earth‘s surface. So, farming machines integrated with GPS receivers can recognize their position within the farm and adapt their operation to maximize their efficiency at that location.

Now, tractors equipped with GPS technology coupled with automatic steering systems are used to improve the placement of seeds on the farm, thereby reducing wastes and costs. Additionally, GPS guided drones are increasingly being used to perform tasks such as crop spraying, livestock monitoring and 3D mapping.

The applications of GPS are many and transcend their usage in tractors. For example, farmers can use a GPS receiver to detect preselected positions in a farm field for soil sample collection. The selected soil samples are then analyzed to generate a fertility map in a geographic information system (GIS). Using the map, farmers can accurately prescribe the quantity of fertilizer required for each sampled section of the farm field. After that, the farmer can use Variable-rate technology (VRT) fertilizer applicators to distribute the precise number of fertilizers in the area.

3. Sensors:

Sensors, like GPS technology, are increasingly being used by farmers to comprehend their crops at a micro level, reduce environmental impacts, and conserve resources. Most of the sensing technologies used in precision agriculture provide critical data that helps farmers to adapt their approaches to the changing environmental factors. Location sensors use GPS satellites signals to ascertain longitude, latitude and altitude.

To effectively triangulate a position, a farmer should have a minimum of three satellites. Optical sensors are also used in precision agriculture to aggregate and process plant color and soil reflectance data. More precisely, they are used to determine the organic matter, moisture content and clay content in the soil.

Generally, sensors can monitor everything from soil temperature to humidity levels in grain silos. Also, they can offer very critical knowledge of soil health. And importantly, sensor technology helps farmers to use their irrigation waters more efficiently, minimizing on wastage, and lowering costs.

4. Mobile device:

As technology improves every day, mobile technology also has advanced, as evidenced by the number of apps popping up. This development has significantly impacted every sphere of life with agriculture too benefiting from the progress.

The actual game changes have been mobile applications. They have altered the lives of farmers and agricultural field holders, for the better. Famers have access to several mobile apps that can help them to collect information on their field farms, check the weather, and receive relevant updates.

With farmers getting insightful details from mobile apps, they are smoothly transitioning from handling fields to creating farm maps and facilitating the use of drones. The software behind the apps put them in the drivers' seat when managing everything from strategy formulation to tracking progress.

5. Smart farming:

When all the above technologies are merged, the resulting product will be a smart farming system, often referred to as precision agriculture. Smart farming involves the implementation of contemporary Information and Communication Technologies (ICT) into agriculture, resulting in what is referred to as the Third Green Revolution.

The revolution is slowly taking over the agricultural sector through the joint application of ICT solutions such as the Internet of Things (IoT), GPS, robotics, sensors and actuators, Big Data, Unmanned Aerial Vehicles (UAVs, drones), precision equipment, plus much more.

Using irrigation as an example, we can demonstrate how different technologies are combined to offer smart farming. Before watering the farm field, a farmer can mount a sensor on an irrigator to assess the moisture level of the soil. The information obtained is then used to vary the quantity of water required.

Farmers can use drones to assess plant health and enable them to take any corrective measures, where applicable. Similarly, smart farming techniques allow farmers to monitor the individual needs of their animals better and regulate their nutrition correspondingly, thereby averting disease and improving their health.

Smart farming provides farmers with limitless potential to deliver a more sustainable and productive output based on field-generated data. Also, it gives farmers an added value through better and timely decision-making.

Undoubtedly, technology is significantly altering the way we live and work. The adoption of various technologies in agriculture has brought several disruptions in the industry, with specific emphasis on agricultural jobs. Increasingly, agricultural technician jobs are now on demand to cater to the needs of the changing times.

Ch. 18: Social Activities – Any Activates Planned by Students

Due to ongoing Corona Virus, we didn‘t get any permission from sarpanch and Talati to gather any villagers for any social activities.

Ch. 19: SAGY quaternary survey

SAANSAD ADARSH GRAM YOJANA (SAGY) Baseline Household Survey Questionnaire

Village: Hansapore Gram Panchayat: Yes Ward No. ____

Block: ____ District: Navsari

State: Gujarat L S Constituency: ____

1. Family Identity and Size

Name of Head of Household	Rameshbhai	Mahendrabhai	Patel				Male/ Female	M
SECC Survey ID:		Family Size	6	Over 18	4	6 to 18	1	Under 6	1

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]
Kantiben R Patel	67	F	N	Y	-	Y	Y	No
Sonalben R Patel	32	M	N	Y	B.Com	Y	Y	—
Axitaben S Patel	30	F	N	Y	B.Com	Y	Y	

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
Nil S Patel	10	M	N	-	-	Y	-	Y

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
Pruthi S Patel	3	F	No	-	Y	Y	Y	2-

[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 / ● Adults: Yes / ●

7. Do members take Regular Physical Exercise

	Yoga	Games	Other Exercises
Adults	Yes / No	Yes / No	Yes / No
Children	Yes / No	Yes / No	Yes / No

8. Consumption of Tobacco

	Smoking	Chewing
Adults	NO	YES
Children	NO	NO

9. House & Homestead Data

Own House: Yes / ●	No. of Rooms: 1
Type: ~~Kutcha~~ / ~~Semi Pucca~~ / Pucca	
Toilet: Private / ~~Community~~ / ~~Open Defecation~~	
Drainage linked to House: Covered / ~~Open~~ / ~~None~~	
Waste Collection System: ~~Door Step~~ / ~~Common Point~~ / No Collection System	
Homestead Land: Yes / ~~No~~	Kitchen Garden : ~~Yes~~ / No
Compost Pit: ~~Individual~~/ ~~Group~~/ None	Biogas Plant: ~~Individual~~/ ~~Group~~/ None

10. Source of Water (Distance from source in KMs)

Source of Water		Distance
Piped Water at Home	Yes / ~~No~~	—
Community Water Tap	Yes / ~~No~~	—
Hand Pump (Public / ~~Private~~)	Yes / ~~No~~	—
Open Well(Public / Private)	~~Yes~~ / No	—
Other (mention):		—

11. Source of Lighting and Power

Electricity Connection to Household: Yes / ~~No~~
Lighting: Electricity/~~Kerosene~~/~~Solar Power~~
Mention if Any Other: _____
Cooking: LPG/~~Biogas~~/~~Kerosene~~/~~Wood~~/~~Electricity~~
Mention if Any Other: _____
If cooking in Chullah: Normal/ ~~Smokeless~~

12. Landholding (Acres)

1. Total	5	2. Cultivable Area	5
3. Irrigated Area	All	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
Sugarcane	tone	15
Rice		
vegitable		

17. Livestock Numbers

Cows: 2	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): 6		

18. What games do Children Play

Cricket

19. Do children play musical instrument (mention)

NO

Schedule Filled By:

Principal Respondent:

Date of Survey: 17-Feb-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: Hansapor

b. Block: _____

c. District: Navsari

d. State: Gujarat

e. Lok Sabha Constituency: Navsari

f. Number of Wards in the Gram Panchayat: _____

g. Number of Villages in the Gram Panchayat: 1

h. Names of Villages:

Demographic Information

Number of Households 565 Total Population 2250 Male 1136 Female 1114

SC HHs 265 ST HHs 757 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	Y	beside GP
b.	Nearest Primary Health Centre (PHC)	Y	-
c.	Nearest Community Health Centre (CHC)	Y	2 KM
d.	Nearest Post Office	Y	1 KM
e.	Nearest Bank Branch (Any)	Y	1 KM
f.	Nearest Bank with CBS Facility	N	-
g.	Nearest ATM	N	-
h.	Nearest Primary School	Y	1 KM
i.	Nearest Middle School	Y	1 KM
j.	Nearest Secondary School	Y	1 KM
k.	Nearest Higher Secondary School / +2 College	N	-
l.	Nearest Graduate College	N	-
m	Nearest ITI / Polytechnic Centre	N	-
n	Kisan Seva Kendra	Y	Beside GP

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	Y	5 KM
p	MSP based Government Procurement Centre	-	—
q	Milk Cooperative /Collection Centre	Y	Beside GP
r	Veterinary Care Centre	Y	5 KM
s	Ayurveda Centre	—	—
t	E – Seva Kendra	—	—
u	Bus Stop	Y	2 M
v	Railway Station	Y	1 KM
w	Library	NO	—
x	Common Service Centre	—	—

IV. Sports Facilities in the Gram Panchayat

a. Number of Play Grounds in the GP: Total 0 Public — Private —

b. Mini Stadium : NO Yes(Y) /No (N) *(Playground with equipment and sitting arrangement)*

V. Education, ICDS

a. Number of Angan Wadi Centres: 1

b. Number of villages without Angan Wadi Centres —

Names of such villages: —

c. Schools (Number)

Primary Private: — Primary Govt.: 1

Middle Private: — Middle Govt.: 1

Secondary Private: — Secondary Govt.: 1

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)	✓	—	—	—	—	—	Sanj 18 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	–	–
b.	Hand Pump Coverage in Villages:	Covered / ~~Not Covered~~	Hansapor Umrsar	–
c.	Coverage under Covered Drains:	~~Covered~~ / Not Covered	Hansapor Umrsar	–
d.	Coverage under Open Drains:	Covered / Not Covered	–	–
e.	Villages with Household Electricity Connection (Numbers)	Connected / ~~Not Connected~~	Hansapor	–

VIII. Land and Irrigation

	Private Land	Area in Acres		Common Land	Area in Acres		Irrigation Structure	No.
a.	Cultivable Land	775.91	d.	Pasture / Grazing Land	–	g.	Check Dam	–
b.	Irrigated Land	775.91	e.	Forests/ Plantations	–	h.	Wells/Bore Wells	3
c.	Un-irrigated Land	–	f.	Other Common Land	–	i	Tanks /Ponds	1

[1] Mention the number of Villages Covered and Not Covered

Saansad Adarsh Gram Yojana (SAGY) Panchayat Details Survey Questionnaire

(Note: Please aggregate information from village level questionnaires wherever relevant)

IX. Parameters relating to Households & Institutions

		Number
a)	Number of eligible Households for pension (old age, widow, disability)	300
b)	Number of Households receiving pension (old age, widow, disability)	250
c)	Number of eligible Households who are not receiving pension	250
d)	Number of Households eligible for Ration Card	375
e)	Number of eligible HHs having ration cards	375
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	–
i)	Number of Job Card holders who completed 100 days of work during 2013-14	450
j)	Number of shops selling alcohol	–
k)	Number of BPL families	200
l)	Number of landless households	–
m)	Number of IAY beneficiaries	–
n)	Number of FRA[2] beneficiaries	–
o)	Number of Community Sanitary Complexes	1
p)	Number of Households headed by single women	–
q)	Number of Households headed by physically handicapped persons	4
r)	Total number of Persons with Disability in the village	–
s)	Number of SHGs	–
t)	Number of active SHGs	–
u)	Number of SHG Federations	–
v)	Number of Youth Clubs	–
w)	Number of Bharat Nirman Volunteers	–

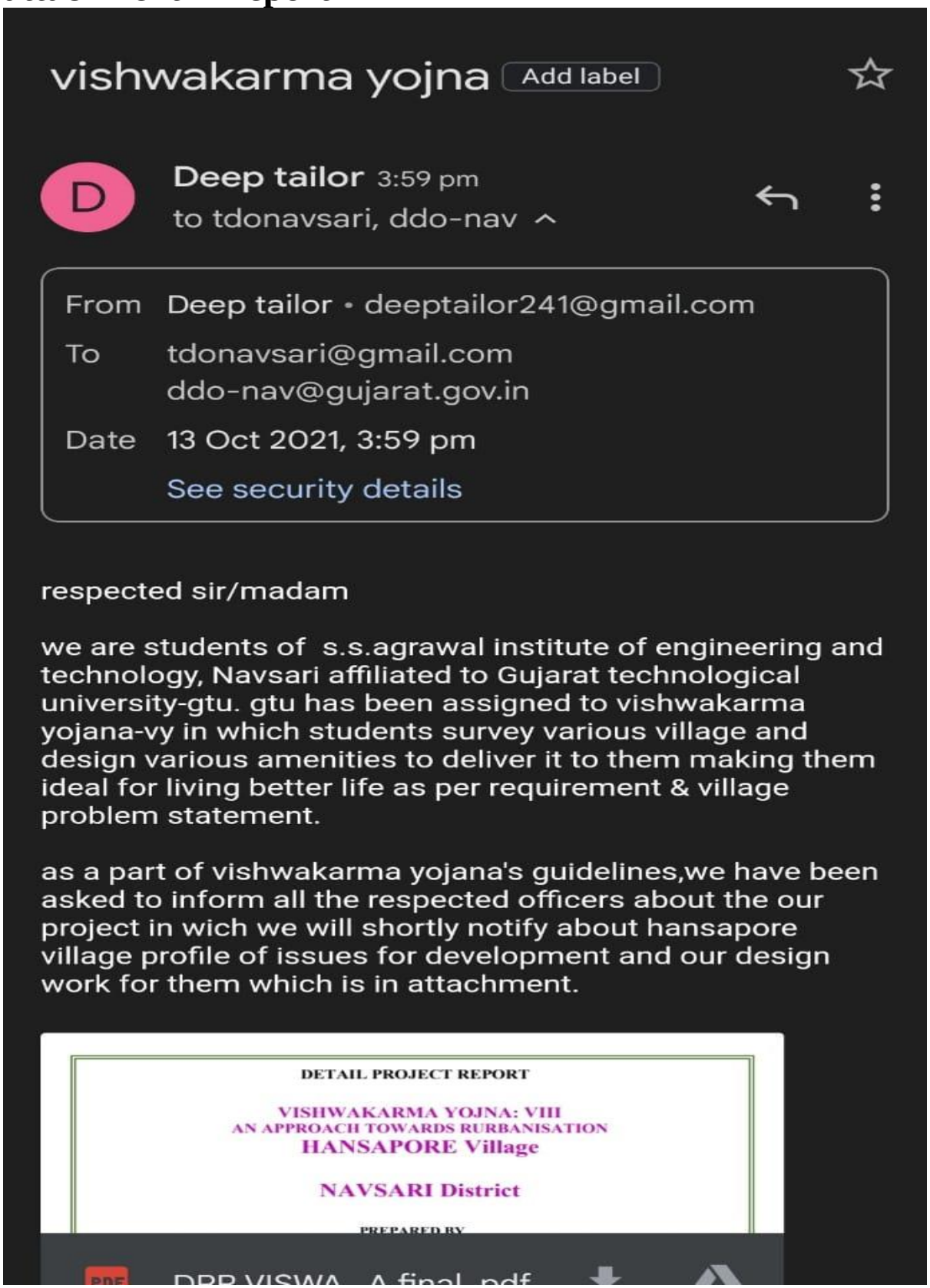
Name and Signature of Surveyor and Respondent'

Surveyor	PRI Respondent (Preferably Gram Panchayat Chairperson)	Official Respondent (Preferably seniormost Government official in the Gram Panchayat)	Date of Survey
			17 Feb 2021

[2] The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006

4

Ch. 20: TDO-DDO collector email sending soft copy attachment in report



Ch. 21: COMPREHANSIVE REPORT FOR THE ENTIRE VILLAGE

The vishwakarma yojna project focus on technical results of the problems that villagers go through from the engineer's point of view. The hurdles that are mainstream to the village are solved by the engineering students.

It is an initiator program leading the village towards rurbanizing, held by the government of Gujarat handed over to the prime developer of GTU that are students.

The students allocated as engineers and the faculty members as a guide/ Nodal Officer meet all the stakeholders of the villages to conduct survey on the existing features. After that, engineers re-think upon the present facilities andaccording to that they give the new designs for the needs.

The basic need of rural maturity program have been improvement of poverty and unemployment through creation of basic social and economic infrastructure, provision of training to rural unemployed youth and providing employment to marginal farmers/labors to discourage seasonal and permanent exodus to urban areas.

Though various government sectors are involved in different infrastructural works, a holistic view and modern remedies can be provided by new engineers under Vishwakarma Yojana. The scrutinizing of villages is done by the students with this view.

Hansapore is a minor village which allocated in jalalpor taluka. It is located 7 km towards south from district headquarter navsari, 305 km from state capital gandhinagar. Navsari, valsad, surat, pardi are the nearby cities to hansapore.

Problem faced by hansapore villagers is, lack of infrastructure facility in village. High secondary knowledge is not available in village. In village they don't have medical shop. They used to 5 km from village for medical shop. They don't have library and krishi bank seva in village.

After various survey and visit of our allocated village hansapore. We have known about existing facilities and condition of area and also amenities and need required for their economic and overall growth. We proposing a design base on our survey, knowledge and gap analysis to village for its development. Following are all design we propose for a village are:

1. Bus station
2. Doodh utpadal mandala
3. Public library
4. Medical shop
5. Water harvesting tank
6. Gate
7. Krishi bank
8. Public toilet
9. Community hal
10. Sports club
11. Garden
12. Lake side development