DETAIL PROJECT REPORT

VISHWAKARMA YOJNA: VIII
AN APPROACH TOWARDS RURBANISATION
Kalipat Village
Rajkot District

PREPARED BY

STUDENT NAME	BRANCH NAME	ENROLLMENT NO
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Assistant professor
Department of Electrical Engineering

YEAR:2020-21

GUJARAT TECHNOLOGICAL UNIVERSITY
Chandkheda, Ahmedabad– 382424 Gujarat

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ON

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Chandkheda, Ahmedabad– 382424 Gujarat

CERTIFICATE

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

Detail Project Report for,

VILLAGE KALIPAT

DISTRICT RAJKOT

Under

Vishwakarma Yojana: Phase-VIII

In partial fulfillment of the project offered by

GUJARAT TECHNOLOGICAL UNIVERSITY, CHANDKHEDA

During the academic year 2020-21.

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

STUDENT NAME	BRANCH NAME	ENROLLMENT NO
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Date of Report Submission:	
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Internal(Evaluator) Guide Name and Signature:	**Mr. Jaydeep Bhanderi** **Mr. Hardik Pandya**
College Name:	**V.V.P. Engineering College, Rajkot**
College Stamp:	

ABSTRACT

Vishwakarma Yojana provides the benefits of real work experience to engineering students and students can apply their technical knowledge in the development of infrastructure in rural development. Under this scheme, the villages are surveyed and this project was identified & selected for implementation.

Kalipat village is located in Rajkot district in Gujarat, India. It is situated 13 KM away from Rajkot. The Kalipat village has population of 2692 as per census of India 2011 reference to 2009. Total literacy rate of Kalipat village is 73.24 %.Working population of 79.13 %. Area of Village is 993.13 hector. Total no. of Households in Kalipat village is 473.

Kalipat village is located near to the Rajkot district. The facilities which are available here are very properly maintained. But some of the basic facilities are missing. The economy and culture is already higher than the other villages. It also leads in cleanliness and safety. The road of Village is kutchha and need renovation of some old buildings. Village is held on the one side of Aji-River. During night, the street light provides the feeling of safety and comforts for drivers and pedestrian both. So people can access any area of Village any time without any hesitation. The design for solar street lights is to be provided. It will create sustainable and renewable energy. The drinking water supplied to villager from Narmada canal. Villagers having good facilities of electricity supply.

We would suggest that village would have some crucial facilities like good condition of Panchayat building, Solid waste management, Waste water management, Electricity, C.C.T.V. Camera, Education Facilities and Transportation facilities etc. The physical structure like public toilet is must needed component in village. The smart village design of Agriculture Co-Operative society is to build in village because the farmer's carting charges are reduced. And surrounding villages also take facilities.

The government can develop the village in such a way that it can become an ideal as well as smart village. People get basic facility and also get secondary education and basic health facilities.

Key Words: Rural development, Smart Village, Village survey, Ideal village Infra-structure development. Roads, Street light, Solar roof top plant, Drainage solid waste management, GAP analysis, Design provision.

Aim: Bring peace of mind to the villagers by providing them the basic amenities required and still keeping the village soul intact.

Objectives: Basic Social infrastructure – Health and Education facilities should be provided and ensure proper delivery of facilities to village dwellers. Internal roads within village settlement, Efficient Mass Transportation systems to improve connectivity between urban and rural areas, Public transportation facilities that need to be developed like bus stops, transport depot etc. Identification of sanitation facilities that need improvement – sewerage and drainage line for household connection, door to door solid waste collection & dumping facilities Electricity connections like street lighting that is energy efficient and eco-friendly.

ACKNOWLEDGEMENT

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

We wish to express our deep sense of gratitude to **Prof. (Dr.) Navin Sheth**, **Hon'ble Vice Chancellor, Gujarat Technological University-Ahmedabad**, for his encouragement and giving us the wonderful project.

We also express our gratitude to **Dr. K. N. Kher**, **Registrar, and Gujarat Technological University-Ahmedabad** for giving us complete support.

We express our sincere thanks to **Commissionerate of Technical Education, Gujarat State** for appreciating and acknowledging our work.

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We are also thankful to all the experts who provided us their valuable guidance during the work. We express our sincere thanks to, **Dr. Jayesh Deshkar, Hon'ble Director of Vishwakarma Yojana project and Principal, V.V.P Engineering College and Core Committee member of Vishwakarma Yojana project Prof(Dr.)Jigar Sevalia**, Professor, SCET, Surat, **Prof. K. L. Timani,** Associate Professor, VGEC, **Prof. Rena Shukla**, Associate Professor, LD Engineering College, **Prof. Y. B. Bhavsar,** Associate Professor, VGEC, **Prof. Jagruti Shah**, Assistant Professor, BVM Engineering College for providing us technical knowledge of this project work.

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Above all we would like to thank our Parents, family members and Friends for their encouragement and support rendered in completion of the present this work.

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ABBREVIATIONS

Short name / symbol	Full name
Km	Kilometer
R.C.C.	Reinforce concrete cement
ATM	Automated teller machine
PHC	Public Health Center
LED	Light-emitting diode
EAG	Expanded Affiliated Group
Cr.	Crore
CHC	Community Health Center
APMC	Agricultural Produce Market Committee
NGO	non-governmental organizations
ICT	Information and Communication Technologies
RFID	Radio Frequency Identification
MLD	millions of liter per day

LPCD	Litre per capita day
ULBs	urban local bodies
SCADA	Supervisory Control and Data Acquisition
TPD	Total Permanent Disability
OWC	Optimal Water Content
BRTS	Bus rapid transit system
WiFi	Wireless Fidelity
ID	Identity Document
BPL	Below Poverty Line
SC	Scheduled Castes
ST	Scheduled Tribes
GHG	Greenhouse gases
IWT	Inland Water Transport
LCD	Liquid Crystal Display
IC	Integrated Circuit
IOT	Internet of Things
PB	Plinth Beam
W	Window
V	Ventilator
D	Door
G.F.	Ground Floor
Kg	Kilogram
mm	Millimeter
Cu.m	Cubic meter
Sq.m	Square meter
PCC	Plain Cement Concrete
Qty	Quantity
CS	Cantilever Slab
GB	Ground Beam
IB	Inverted beam
CZ	Confined Zone
RZ	Regular Zone
CFL	compact fluorescent lamp
°C	Celsius
kW	Kilo Watt
DC	Direct Current
AC	Alternate Current

Chapter: 1

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

1.1 Background & Study Area Location

❖ *Background*

- For observing an ideal village we visited a **Sardhar** village. This village is located at the **Rajkot to Bhavnagar highway** and **30 km** away from Rajkot in the state of Gujarat, India.
- It is well connected via road being at the crossroads of Highway 25 and Highway 122.
- This village is continuously develop every year very efficiently and now this village have all basic amenities like, R.C.C. road, underground drainage, water supply, solid waste management, Gram-panchayat, Bank, all houses are pucca, local market, transportation services, higher education, announcement facility, Post office, Hospital, Assembly hall, Petrol pump, Police station, etc.
- We met with sarpanch as well as villagers to get information about existing facility and which activity is going on, this village is completely like a **small city** many surprising facilities are there like **Petrol pump**, **Police station**, Many Dairy Industries, Large Lake, **Great Swaminarayan Temple with Accommodation facility**(Currently 800+ student living).

❖ *Area Location*

- **Gram Panchayat:** Sardhar
- **District:** Rajkot
- **State:** Gujarat
- **Pin Code:** 360025
- **Area:** 3181.33 hectares
- **Population:** 8137(4259-males & 3878- females)
- **House hold:** 1607
- **Nearest town:** Rajkot
- **Coordinated :** 22.1380° N 70.9859° E

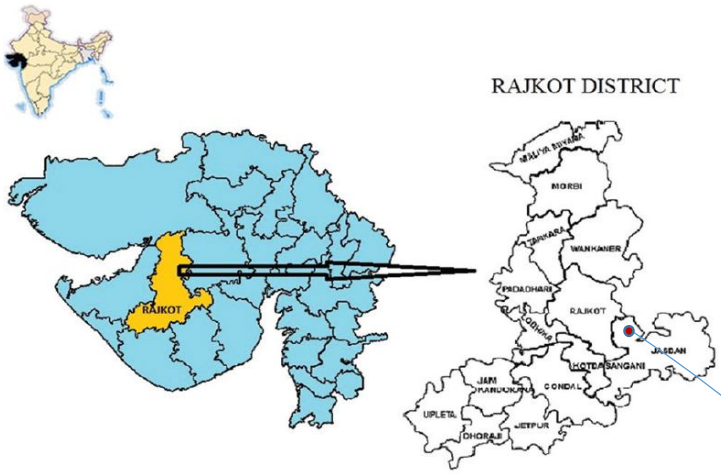


Fig: 1.1 Location of Rajkot in Gujarat

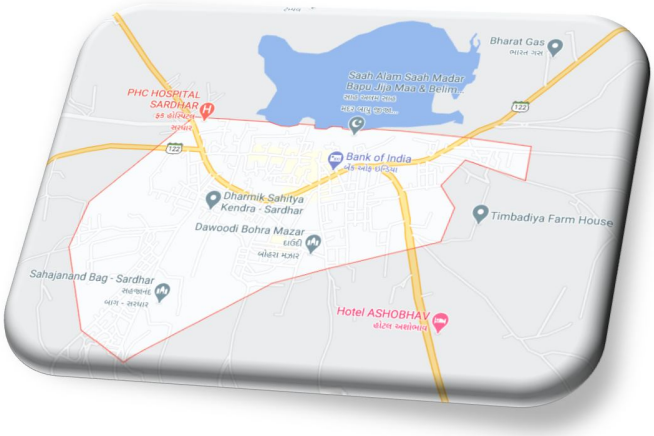


Fig: 1.2SardharVillage Map

Fig: 1.3 Sardhar Village aerialview

1.2 Concept: Ideal Village, Normal Village

1.2.1 Objectives

Fig: 1.4 Objectives

- All Required facility gives for betterment of people and prevent migration rural to urban area.
- **Communication is the key** for developing any area, so improvement in transportation facility by which employment could increase indirectly.
- Provide sustainable physical infrastructure like Water supply, Drainage facility, Solid waste management, School, Medical facility etc.
- Executives known all information about village's weaknesses and strengths, therefore village must have proper executives (Sarpanch, Talati etc.).

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

- **Kumbalangi village (Kerala):** Kumbalangi is an island village in the outskirts of Kochi city in the state of Kerala, India. A model for eco-tourism The Kumbalangi approach could be adopted by other coastal villages to boost tourism and provide livelihood to local communities Kumbalangi is essentially a fishing hamlet which has been developed as a unique rural tourist destination in Kerala's Ernakulam district.

- **Punsari village (Gujarat)**:Punsari is a village located in Sabarkantha district in the state of Gujarat, India. Punsari is considered as India's smartest village. The village is located at about 80km from the state capital, Gandhinagar.Important features of the village include:A reverse osmosis plant which supplies 20 litres of water to each household at Rs 4. Use of solar power for agricultural purposes.Accidental Insurance cover to one member of every household. Air-conditioned primary schools with no dropouts. Bus facility for all households. Focus on behavioural change through campaigns and awareness drives. For this purpose, 120 loudspeakers have been installed in different parts of the village Punsari was awarded with the Best Gram Panchayat Award from the Centre and the State in 2011.Punsari village has emerged as a model village with modern urban amenities such as 24X7 power supply, WiFi connectivity, CCTV cameras to ensure security, and pucca roads connecting the village with other villages and towns.

- **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 rainfed, 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. Women thrift groups, Milk Dairy Society and Youth Clubs are examples of such community-based organizations. 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 program, 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, multi-sectoral growth of rural parts of the country.

1.2.3 The Idea of a model/Smart Village

- Smart Village India gets its foundation from Mahatma Gandhi's vision of Adarsh Gram (model village) and Gram Swaraj (Village self-rule/independence).Gandhi in two texts, Hind Swarajand Gram (Village) Swaraj, promotes the concept of integrated rural development to impact majority of the population, as the primary initiative after India Independence in 1947.
- The Eco Needs Foundation has initiated the concept of "Smart Village". Under this project the Foundation is adopting villages and putting efforts for sustainable development by providing basic amenities like sanitation, safe drinking water, internal road, tree plantation, water conservation. The Foundation is also working for inculcating moral values in the society and for improving the standard of living of the villagers.
- In the concept of "Smart Village" the development of the village shall be based on the five paths Retrofitting, Redevelopment, Green fields, e-Pan, Livelihood. Under the concept of Smart Village, the Foundation has adopted Village Dhanora, Teh. Bari, District Dholpur, a small and remote village of Rajasthan to develop it as India's First Smart Village. The village is situated 30 km away from Dholpur district head quarter and 248 km from Jaipur.
- The population of the village is about 2,000. The village was devoid of its basic needs like sanitation, internal roads. It was also facing various other similar problems such as lack of access to potable water, non-availability of water conservation system, encroachment on the roads, power fluctuation, non-availability of employment oriented education, unemployment and poverty, so on and so forth.

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

- In the past, villages were a usual form of community for societies that practice subsistence agriculture, and also for some non-agricultural societies.
- In Great Britain, a hamlet earned the right to be called a village when it built a church. In many cultures, towns and cities were few, with only a small proportion of the population living in them.
- The Industrial Revolution attracted people in larger numbers to work in mills and factories; the concentration of people caused many villages to grow into towns and cities.
- This also enabled specialization of labor and crafts, and development of many trades. The trend of urbanization continues, though not always in connection with industrialization.
- Historically homes were situated together for sociability and defense, and land surrounding the living quarters was farmed. Traditional fishing villages were based on artisan fishing and located adjacent to fishing grounds.

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

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

❖ **Socio economic detail:**

- Sardhar has a many schools (Primary and Higher Secondary), Dairyindustries, Petrolpump, Police station, Smallstores, Local market etc. Thereforevillage growing continuously and good things is it's located at on Rajkot-Bhavnagar highway.
- This village has many features of generating employenment.it is also nearer to Rajkot city so people can also go for job.
- Due to many schools here literacy rate is also high as well as many colleges(15km) are nearer Sardhar.

Fig: 1.5 Vivekanand School-Sardhar

Fig: 1.6 S.P.S. Vidhya School-Sardhar

Fig: 1.7 Dudhsagar dairy-Sardhar

Fig: 1.8 Sahajanand Dairy-Sardhar

❖ Physical, Demographical & infrastructure Detail:

- Sardhar having 8137+ population (2011) with 4259-male while 3878-female.
- Village having many facilities like,
  - Police station
  - Petrol pump
  - Sahakari Mandali
  - Great Swaminarayan Temple with hostel facilities
  - Large Lake
  - Many Hospitals(Including Private as well as Government)
  - Bank
  - ATM
  - PHC
  - SamajVadi
  - New Gram Panchayat
  - R. C. C. Road
  - Underground Drainage
  - Complex etc. Facilities are available in present time; it's made ease of living in village.
- Many individual people have own solar water heater, most of houses are newest and Pucca.
- Because it is on the highway of Rajkot-Bhavnagar highway, so communication of rural to urban is very easy by which easily people can go for job as well as business.
- Electricity (24X7), Watersupply, Sanitation, Toilet facility (4 block), Solid waste management (Door to Door Collection) Internet connectivity is very good because many towers here.

Fig: 1.9 Police Station-Sardhar

Fig: 1.2.1 Petrol Pump- Sardhar

Fig: 1.2.2 Sahakari Mandali-Sardhar

Fig: 1.2.3 Sahakari Mandali-Sardhar

Fig: 1.2.4 Sahakari Mandali-Sardhar

Fig: 1.2.5 Gram Samajvadi

- **Medical Facility is very much important for people welfare therefore sardhar having many hospitals-Private as well as Government (PHC).**

Fig: 1.2.6 PHC- Sardhar

Fig: 1.2.7 Private Hospital- Sardhar

Fig: 1.2.8 Swaminarayan Hospital-Sardhar

- **Physical Facilities like, Bank, Complex, Gram Panchayat, other amenities etc.**

Fig: 1.2.9 Bank-Sardhar

Fig: 1.3 Complex- Sardhar

Fig: 1.3.1 Shoping Centre–Sardhar

Fig: 1.3.2 Gram Panchayat-Sardhar

Fig: 1.3.3 Temporary Bus stand-Sardhar

- **Temple and Ancients things in Sardhar.**

Fig: 1.3.4 Ancient Fort- Sardhar

Fig: 1.3.5 Lake-Sardhar

Fig: 1.3.6 Sihmoyimatanu Mandir- Sardhar

Fig: 1.3.7 Shanti dham- Sardhar

Great Swaminarayan temple-Sardhar

Fig: 1.3.8 Swaminarayan Temple- Sardhar

Fig: 1.3.9 Entry Gate of temple

Fig: 1.4 Assembly Hall of temple

Fig: 1.4.1 Student Living there

Fig: 1.4.2 Guest Living Facility

Fig: 1.4.3 Bhojnalay of temple

Fig:1.4.4 Swaminarayan Baug- Sardhar

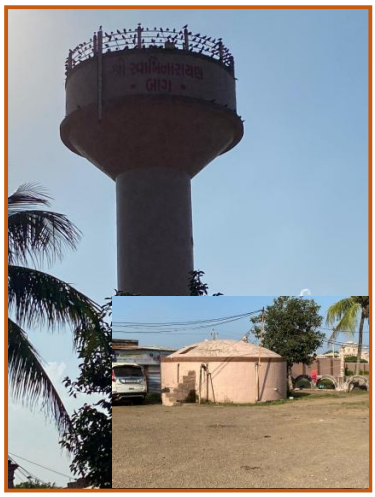


Fig:1.4.5 Water tank of temple- Sardhar

Fig: 1.4.6 Ghanshyam Gaushala-Sardhar

Fig: 1.4.7 Gaushala internal view

Fig: 1.4.8 Gobar gas of temple

Fig: 1.4.9 Observation photo

Fig: 1.5 Swaminarayan Baug Internal Views

1.4 SWOT analysis of Ideal village / Smart Village

- SWOT stands for Strengths, Weaknesses, Opportunities, and Threats, and so a SWOT Analysis is a technique for assessing these four aspects of our village.
- We can use SWOT Analysis to make the most of what we've got, to our organization's best advantage.
- And we can reduce the chances of failure, by understanding what we're lacking, and eliminating hazards that would otherwise catch our unawares.

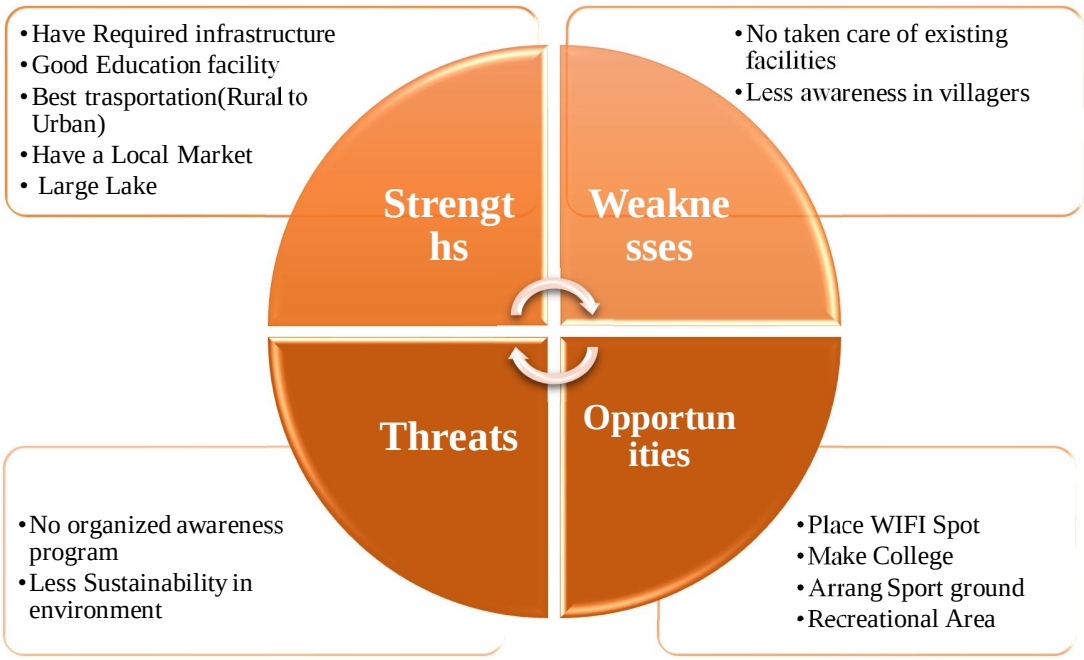


Fig: 1.5.1 SWOT analysis

1.5 Future prospects of Development of the Ideal village / Smart village

- Study with computerized education as well as provide education in English medium.
- For sustainable development develop own energy sources like Solar Energy, Bio-gas Plant, Water treatment plant.
- Develop good Executives team for maintenance of infrastructure.
- Youth should have aware by government schemes.

1.6 Benefits of the visits of Ideal village / Smart Village

- Sardhar has awesome village by which we could observed great things we can provide in allocated village.
- Its communication facilities (Rural to Urban) are very good we thought its cause of continuously development.
- By which we could compare both village (ideal &allocated village).

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

- **Electrical aspects:**
  - Solar energy is a sustainable source of electricity in village by which we can make village autonomous.
  - Arrange most of street light by solar energy as well as LED light.
  - Electricity is the driving source, so its requirement 24X7 therefore we need to our Generator by which we can produce electricity.
- **Civil aspects:**
  - Provide proper arrangement of houses and infrastructure.
  - Need to focus on water supply and design water treatment plan, so we could treat waste water.
  - Maintain roads and street regularly.
  - Create recreational center and sports ground, physical development is take place in people.

Chapter: 2

Kalipat village Literature Review – (Civil & Electrical Concept)

2.1 Introduction : Urban and Rural Village Concept

❖ **Rural Area**

- India is most probably dependent on agriculture and rural area, it consists an open swath of land with few homes and other buildings, with less population.
- Its density in population is very low because many people migrate to urban areas.
- Their standard of living is very different from urban areas. They survive with less income compare to urban area.
- People who lives in rural areas are mainly farmers, labors, land owners. Their lifestyle is not modern as compare urban areas.

❖ **Urban Area**

- Urban area consist region which includes city, heavy infrastructures and commercial buildings.
- Density of people and houses is more hence standard of living increases among people.
- Most of the corporate companies work in urban areas for better development and lifestyle.
- It consists of modern and simple solution to the problems by providing advanced facilities like road, bridges, railways etc.
- Urban area connects different towns and cities which help in transportation of goods.

2.2 Importance of Rural Development

- Rural area development has greater importance today in India than past period.
- It provides eco-friendly materials which helps to develop country in major parts, small enterprise in rural areas helps to develop big industries for making good profit and increases value.
- Government had initiated many programs and schemes for the development of rural areas for e.g., Bharatmala project, Sagarmala project, water conservation stories, Sabki yojna sab ka vikas, Gram swarajabhiyan, swachhgram.
- It gives healthy lifestyle to people by providing organic agricultural products to them.
- Rural development emphasizes on locally produced economic development strategies.
- Different policies are provided by government for better lifestyle of farmers.
- Rural area development gives better welfare to the country. It also increases economic and social level of people living in villages.
- It uplifts the thinking and living lifestyle of villages people.
- It will reduce the poverty line in India, by providing growth in rural areas.
- Providing facilities like irrigation, electricity, and good education will surely provide good outcome to our nation.
- We can say that rural development is national development, because in India people mostly live in villages.

2.3 Ancient villages / Different definition of : Rural area / villages

- Rural development is a strategy to make a specific group of people to gain for themselves what they want and need.
- It includes small scale farmers, tenants and landless.
- Process leading to sustainable development in quality of life within rural people, specially to poor.
- Rural development as improving standards of the mass of the low income population residing in rural areas and making the process of their development, self-sustaining.

2.4 Scenario: Rural/Urban village of India population growth:

- Census 2011 is the 15th Census of India since 1872
- Census 2011 was held in two phases:
- House listing & Housing Census (April to September 2010)
- Population Enumeration (9th to 28th February 2011)
- Reference Date: 0:00 Hours of 1st March 2011

2.1 Population (in crore)

	2001	2011	Difference
India	102.9	121.0	18.1
Rural	74.3	83.3	9.0
Urban	28.6	37.7	9.1

For the first time since Independence, the absolute increase in population is more in urban areas that in rural areas

- Rural – Urban distribution: 68.84% & 31.16%.
- Level of urbanization increased from 27.81% in 2001 Census to 31.16% in 2011 Census.
- The proportion of rural population declined from 72.19% to 68.84%.

2.2 Growth rate of population (in %)

	1991-2001	2001-2011	Difference
EAG	25.0	20.9	-4.1
Rural	23.5	18.7	-4.8
Urban	31.6	29.9	-1.7
Non EAG	18.9	15.0	-3.9
Rural	13.2	5.7	-7.5
Urban	31.5	32.7	+1.2

- Though the growth rate of population in rural areas of EAG States is nearly 3 times that in rural areas in non EAG States, it is for the first time that significant fall of growth rate is seen in the rural areas of EAG States.

2.3 Sex Ratio

	2001	2011	Difference
Overall			
India	933	940	+7
Rural	946	947	+1
Urban	900	926	+26
0-6 Years			
India	927	914	-13
Rural	934	919	-15
Urban	906	902	-4

- The improvement in overall sex ratio is largely in urban areas:
  - Though the Urban Child sex ratio is far worse than in the rural areas, the fall in Child sex ratio in rural areas is around 4 times that in urban areas. In fact the decline is more gradual in urban areas.
  - There is a decline of 8.9 million children in rural areas, while in urban areas has shown increase of 3.9 million.

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

2.4 Gujarat population growth

Description	2011	2001
Approximate population	6.04cr	5.07cr
Actual population	604,39,692	506,71,017
Male	314,91,260	263,85,577
Female	289,48,432	242,85,440
Population growth	19.28%	22.48%
%of total population	4.99%	4.93%

2.5 Rural and urban senior in Gujarat

Description	Rural	Urban
Population (%)	57.40%	42.60%
Total population	346,94,609	257,45,083
Male population	177,99,159	136,92,101
Female population	168,45,450	120,52,982
Population growth	9.31%	36.00%
Sex ratio	949	880
Child sex ratio(0-6)	914	852
Child population(0-6)	48,24,903	29,52,539
Child percentage(0-6)	13.91%	11.47%
Literates	214,20,842	196,72,516
Average literacy	71.71%	86.31%
Male literacy	81.61%	90.98%
Female literacy	57.78%	70.26%

2.6 Population senior in India

Description	2001	2011	Growth
India	102.9	121	18.1
Rural	74.3	83.3	9
Urban	28.6	37.7	9.1

2.7 Population growth in India

Description	1991-2001	2001-2011	Difference
India	21.5	17.6	-3.9
Rural	18.1	12.2	-5.9
Urban	31.5	31.8	0.3

2.6 Rural development issues – concerns – measures

- Economic Problems:
  - The economic conditions are tough to accept high cost technologies.
  - It's hard to afford due to high input cost.
- Agricultural related problems:
  - People don't have efficient knowledge, awareness, skills and attitude for effective farming.
  - Huge amount of land is divided in several farmers so, effective land area is decreased
  - Many people are not willing to do any work just to stay in rural area.
  - Since, most of people have some amount of land in the village so effective crop production decreases.
- Education:
  - Education is the main issue in rural areas , because people of village does not uplifts the youth , and education is also concern to improve skills and lifestyle of rural areas to get themselves out of poverty.
- Infrastructures problems
  - Due to the unavailability of facilities like water, transport, electricity, educational institutes, health etc. the rural areas cannot grow speedily.
- Administrative problems
  - Due to some bad programmers, the schemes provided by the government are not implemented in the village and people suffer.
  - Villages should be under proper guidance.
- Poverty
  - It is the main issue in rural villages, and increase in poverty line will increase hunger, health and wealth, educational etc. and several problems will increase.

2.7 Various infrastructure guidelines with the norms for villages for the provisions of different infrastructure facilities

Facilities	Planning Commission/UDPFI Norms	Required as per norms

2.8 Education

Tech. Training Institute	**Per 100000 Population**	**0**
Secondary School	Per 7500 Population	2
Primary School	Each Village	1
Higher Secondary School	Per 15000 Population	0
College	Per 125000 Population	0
Anganwadi	Each Village	1
Agriculture Research Centre	Per 100000 Population	0

2.9 Medical Facilities

PHC & CHC	**Per 20000 population**	**0**
Hospital	Per 100000 population	0
Govt./panchayatDispensaryor sub PHC or health centre	Each Village	1
Child Welfare and maternity home	Per 10000 population	1

3.0 Transportation

Pucca village approach road	**Each village**	
Bus/Auto stand provision	All villages connected by PT (ST bus or auto)	1

3.1 Drinking Water

Water Facilities		
U/G Sump	2/3 of Total Demand	3.2 lac cap
Public Latriens	Each Village	60
Post office	Per 10000 population	1
Police Station	Per 15000 Population	0
Over Head Tank	1/3 of Total Demand	1.6 lac cap
Gram Panchayat Building	Each individual/group panchayat	1
Fire Station	Per 100000 Population	0
Cremation Ground	Per 20000 population	1
Community Hall	Per 10000 Population	1
APMC	Per 100000 Population	0

2.8 Ancient/Existing Electrical Concept study as a literature review for village development

- In past, people were not aware about facilities and safety in modern electrical concepts which can help their lifestyle.
- People were just taking precautions by themselves from electric shocks and big short-circuits, but new facilities helps to reduce fear from electrical damages.
- 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.

2.9 Other Projects / Schemes of Gujarat / Indian Government

❖ **Kisan Suryodaya Yojana:**

- In a bid to provide a day-time power supply to farmers for irrigation, the BJP-led Gujarat government had recently announced the KisanSuryodayaYojana. Under this scheme, farmers will be able to avail power supply from 5 AM to 9 PM.
- The state government has allocated a budget of Rs. 3,500 crores for installing transmission infrastructure under this scheme by 2023.

❖ **Pradhanmantri fasal bima yojana:**

- To provide insurance coverage and financial support to the farmers in the event of failure of any of the notified crop as a result of natural calamities, pests & diseases.
- To stabilize the income of farmers to ensure their continuance in farming.
- To encourage farmers to adopt innovative and modern agricultural practices.
- To ensure flow of credit to the agriculture sector.

❖ **Pradhanmantri Jeevan jyotibima yojana:**

- Available to people in the age group of 18 to 50 and having a bank account. People who join the scheme before completing 50 years can, however, continue to have the risk of life cover up to the age of 55 years subject to payment of premium.

❖ **Namami Gange**

- 'Namami Gange Programme', is an Integrated Conservation Mission, approved as 'Flagship Programme' by the Union Government in June 2014 with budget outlay of Rs. 20,000 Crore to accomplish the twin objectives of effective abatement of pollution, conservation and rejuvenation of National River Ganga.

Chapter: 3

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

3.1 Concepts, definition and practices

- Smart village is about sources of earning for villagers (kamai), healthcare (dawai) and education (padhai) in the villages in order to oppose the migration to cities.
- A smart village will not only bring internet connection to the rural lands but will also provide support to the rural lands, but will also provide support to sustainable agricultural practices. A network of small scale industries linked to Agricultural and a strong network of rail and Road corridor with Civic amenities such as education and health for all including farmers will transform the face of real India.
    - Home with access to toilet, safe drinking water and regular power.
    - Smart village knows all information about its citizens available resources , applicable services in schemes
    - Every household has diversified livelihood opportunities and/or micro Enterprise. Micro enterprise a business operating on very small scales esp. One with the sole prepares a sole proprietor and fewer than 6 employees.
    - Maintain its identity, culture and heritage
    - Plants for development based on people, asset and service centric information and tracks its progress
    - It works towards revenue generation.
    - Is functional solid or liquid waste management system.
    - End all preventable maternal deaths and Infant deaths.
    - Means providing good basic health facilities in health care Centre.
    - 100% institutional deliveries
    - Interacts with government, NGO's, social entrepreneur's expert for its need.
    - Functional toilet potable water electricity available in school, health center.
    - Awareness on new technologies that can be implemented in villages, farmers, and nearby places. Example. Drip irrigation, solar panels, lightning systems on street lights etc.
    - Good facilities for domestic animals like dogs and cattle: Dispensaries and pond for cattle's, veterinary hospital and vets.

"The soul of India lives in its - **Mahatma Gandhi**"

Fig: 3.1Scalable Smart Village in India

3.2 Bench Marks-Vision-Goals, Standards and Performance Measurement Indicators

People	Plant	Prosperity	Governance	Propagation
Health	Energy & mitigation	Employment	Organization	Scalability
Safety	Materials, water and land	Equity	Community involvement	Replicability
Access to (other) services	Climate resilience	Green economy	Multi-level governance	
Education	Pollution &waste	Economic performance		
Diversity & social cohesion	Ecosystem	Innovation		
Quality of housing and built in environment		Attractiveness & competitiveness		

3.2 Standards and Performance Measurement Indicators

3.3 Technological Options

Smart Building	Detect fire, security cameras, water levels and electricity management.
Smart Weather and Irrigation	Weather forecast water levels in dams and canals.
Smart Farming	Sensors and satellite data for farm activities.
Smart Dairy	Remote supervision and monitoring through smart devices.
Smart Healthcare	Smart beds and devices to monitor patient's data.
Smart Surveillance System	Camera and sensors to detect thefts and robbery.
Smart Education	Interactive learning through videos.

3.3 Technological Options

3.4 Road Map and Safe Guards

- Mahatma Gandhi said, “The future of India lies in its villages”. Despite government’s focus on villages for many decades, villages remain poorly serviced and governed. India has been an agricultural economy yet the sector is still not a well-paying livelihood option. Generating new avenues of employment in rural areas, reviving agriculture and improving services in villages are some of the components that need to be included right away in village development policies.
- For example, Lusail City in Qatar, Masdar City in the UAE, and Songdo in South Korea are all made digital technology, networks, and apps a central part of how they operate and interact with citizens. By contrast, existing or brownfield metropolitan areas face clear challenges in moving up the ICT maturity ladder, as they need to developing their existing infrastructure with embedded sensors and control systems and retrofit old buildings a complicated and costly process.

3.5 Issues & Challenges

- Budget Constraints
- Smart Technology
- Lack of Knowledge
- Lack of confidence
- Legislation and policies.
- Existing infrastructure for energy, water and transportation systems.

3.6 Smart Infrastructure – Intelligent Traffic Management

- Effective traffic management is a top challenge in numerous urban areas.
- Using centralized access control systems ensures real-time control and thus significantly improves road safety and traffic congestions.
- The access priorities and rights of pedestrian and vehicles can be regulated according to live traffic situations. In this aspect, access points using badges, smartphones, and other RFID technologies can be set up according to user profiles and thus notifies them continuously about their access rights.
- Moreover, during days of severe air pollution or major road maintenance, smart access control systems can moderate or throttle vehicle entry to relieve traffic jams of the city more efficiently. Vehicles causing more pollutants could be forbidden to circulate.

3.7 Cyber Security

- Cyber security is a critical and growing challenge for government, businesses, and universities.
- Focusing on the infrastructure layer of the network will be key in improving security and leaders must think about what data the most valuable and how to secure are.
- Today, there are more people living in cities than in the countryside. Vehicles and energy consumption in cities are skyrocketing.

- The domestic and international mobility of citizens is significantly improved and tourists are travelling extensively from one city to another. Under such circumstances, many metropolitan cities are dealing with challenges such as overpopulation, waste management, massive energy consumption and pollution as a result of dramatic increase of migrants and travelers.
- In conclusion, the trend of adopting smarter access control systems and connecting them to a centralized network is going on in many big cities in the world.
- More research in perfecting the security of smart access control devices is expected in the near future.

3.8 Retrofitting- Redevelopment- Greenfield Development District Cooling

- **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 livable. In retrofitting, an area consisting of more than 500 acres will be identified by the city in consultation with citizens.
- **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 and increased density. Redevelopment envisages an area of more than 50 acres, identified by Urban Local Bodies (ULBs) in consultation with citizens.
- **Greenfield development** will introduce most of the Smart Solutions in a previously vacant area (more than 250 acres) using innovative planning, plan financing and plan implementation tools (e.g. land pooling/ land reconstitution) with provision for affordable housing, especially for the poor. Greenfield developments are required around cities in order to address the needs of the expanding population.
- **District cooling** covers the production and distribution of refrigeration streams District network. The goal is to improve the development of smart district cooling systems Management and use of energy demands. The design of digital devices and Innovation is critical to the progress of energy management in residential areas. In addition, the use of new technologies (Internet and digital Solutions) Thermal energy in temperature affects the optimization of energy resources Meter and chiller substation.
- **Green building or sustainable building** is accompanied by the practice of increasing efficiency which buildings and their sites use and reduce energy, water and materials Affects human health and the environment for the entire life cycle of the building. Green-building concepts extend beyond the walls of buildings and include the site Also planning, community and land use planning questions. There is a green building Designed to meet several objectives such as protecting occupational health; Improvement Employee productivity; efficient use of waste, water and other resources; And Reducing the overall impact on the environment.

3.9 Strategic Options for Fast Development

- Each shortlisted city smart city proposal is expected to include a retrofitting or redevelopment or a pan-city facility with a Greenfield development model or its

combination and smart solution. It is important to note that there is an additional facility to provide Pan-City.

- Since Smart City is taking the approach of a compact sector, it is imperative that all city dwellers feel that there is something in it as well. Therefore, plans have been put in place to include an additional requirement of some (at least one) smart solution widespread in the city.
- For the northeastern and Himalayan states, the area proposed to be developed would be half of what was suggested for any of the alternative models – retrofitting, redevelopment or Greenfield development.

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

- The problem of access to drinking water and sanitation facilities in urban areas of India is a major concern. Treated wastewater needs to be reused to meet current and future water demand.
- India's steady growth in population growth has also led to an increase in water demand, especially in urban areas where the growth rate is higher than in rural areas.
- In 2001, the urban population was 285 million and with a daily supply of 135 liters of water, the domestic water demand is approximately 38,475 million liters per day (MLD), while in 2011 the urban population with a 377 million domestic water demand was 50,895 MLD.
- It shows that an additional water demand of 12,420 MLD is required in urban areas following the growth in urban population. 135 liters of water per capita per day (LPCD) should be provided as a service level benchmark for domestic water consumption in urban local bodies. However, according to the Central Public Health and Environmental Engineering Organization (CPHEO), the average water supply in urban local bodies is currently 2.2.55 LPCD. This suggests that there is a huge gap between water demand and supply in urban areas of India.
- To meet future urban water challenges, we need to change the way we operate urban water systems. An integrated urban water management approach must be adopted which includes freshwater, wastewater and storm water using the urban area as a unit of management. This approach covers various aspects of water management, including environmental, economic, technological, political, as well as social influences and implications.
- This will be the main topic of discussion at the 4th India Water Forum (IWF) organized by The Energy and Resources Institute (TERI) in collaboration with the Ministry of Water Resources, River Development, Government of India and Ganga Rejuvenation. While the international convention has a broad objective of providing safe and sustainable water for all, there is a goal.
- Access to potable water is another gap in the peri-urban Areas, which are inadequately served by piped water Supply. This gap between demand and supply is being met by urban small water enterprises (USWE).

- These Decentralized sources can supply safe drinking water and thereby fill the wide gap until universal supply of Piped water becomes a reality. Such USWEs can reach Up to 35 million people, or 50% of the slum dwellers, offering them sustainable access to safe water.

3.11 Initiatives in village development by local self-government

- A few specific recommendations related to planning and implementation is as follows.

1. Streamline program design, sequencing, and phasing of sewerage projects in ULBs.
2. Promote sustainable sewage treatment Systems by providing an appropriate mix of Centralized and decentralized processes based on local requirements and conditions.
3. Promote the engagement of the corporate sector and provide an enabling environment for implementing innovative replicable models of supplying safe drinking water, improved sanitation, and seepage management in urban areas.
4. Promote sustainable sewage treatment Systems by providing an appropriate mix of Centralized and decentralized processes based on local requirements and conditions.
5. Provide a conducive enabling environment for decentralized USWE to ensure access to Safe drinking water for a larger proportion of Population.

3.12 Smart Initiatives by Rajkot Municipal Corporation

1. Smart Electricity:
- Smart Grid distribution with redundant power supply
- Underground cable Connectivity

2. Water Supply:
- 24x7 water supply
- SCADA & Smart meter

3. Dual Plumbing system
- 25 MLD Tertiary treatment
- Reuse of treated water

4. Storm Water Drainage:
- Collection network
- Level sensor at lakes with flood alert

5. SWM & Sanitation:
- Smart bins 5 TPD waste to energy & OWC
- 50 e – public toilets

6. Road:
- 19.5 km road network (30to 60 ft. wide) including 8.5 km BRTS
- All roads have exclusive cycle track & pedestrian path
- 5 km. exclusive green way connecting lakes

7. Other infrastructure:
- Utility duct for services
- WIFI for all
- Smart LED Street light

- Environment monitoring station

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

1. Digi locker

- The service was launched as an important facility to store crucial documents like Voter ID Card, Pan Card, BPL Card, Driving License, education certificates, etc. in the cloud.

Fig:3.2 GigiLocker webpage

2. Mygov.in

- The portal works as an online platform to engage citizens in governance through a "Discuss", "Do" and "Disseminate" approach.

Fig: 3.3Mygov Webpage

3. eSign framework

- This initiative would enable users to digitally sign a document online using Aadhaar authentication.

Fig:3.4 Aadhar Sign.

4. Digitise India platform

- This initiative will involve digitization of data and records on a large scale in the country to make easy and quick access to them possible.

Fig: 3.5 Digital India

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

- **Promoting mixed land use in area-based developments** — planning for 'unplanned areas' containing a range of compatible activities and land uses close to one another in order to make land use more efficient. The States will enable some flexibility in land use and building bye-laws to adapt to change
- **Housing and inclusiveness —** expand housing opportunities for all
- **Creating walkable localities** — reduce congestion, air pollution and resource depletion, boost local economy, promote interactions and ensure security. The road network is created or refurbished not only for vehicles and public transport, but also for pedestrians and cyclists, and necessary administrative services are offered within walking or cycling distance.
- **Preserving and developing open spaces** — parks, playgrounds, and recreational spaces in order to enhance the quality of life of citizens, reduce the urban heat effects in Areas and generally promote eco-balance.
- **Promoting a variety of transport options** — Transit Oriented Development (TOD), public transport and last mile para-transport connectivity
- **Making governance citizen-friendly and cost effective** — increasingly rely on online services to bring about accountability and transparency, especially using mobiles to reduce cost of services and providing services without having to go to municipal offices;form e-groups to listen to people and obtain feedback and use online monitoring of programs and activities with the aid of cyber tour of worksites
- **Giving an identity to the city** — based on its main economic activity, such as local cuisine, health, education, arts and craft, culture, sports goods, furniture, hosiery, textile, dairy, etc.
- Applying Smart Solutions to infrastructure and services in area-based development in order to make them better. For example, making Areas less vulnerable to disasters, using fewer resources, and providing cheaper services

3.15 Electrical concept (Design Ideal and Prototype model)

❖ **Energy Management**

- The challenges in load control for the power grid is now more severe than ever, due to advancement in communication layer and the creation of a two-way infrastructure for real-time communication between people and the utility.

- The operator of the smart grid access the information and communication technologies to enhance grid security and reliability. They enforce controllable use of energy, and incorporate various components such as green resources, distributed generator and power storage premises.
- Energy management is the process of monitoring, controlling, and conserving energy in a building or organization. It can also be defined as the strategy of adjusting and optimizing energy, using systems and procedures so as to reduce energy requirements
- Typically, this involves the following steps: Metering your energy consumption and collecting the data.
- Finding opportunities to save energy, and estimating how much energy each opportunity could save. You would typically analyse your meter data to find and quantify routine energy waste, and you might also investigate the energy savings that you could make by replacing equipment (e.g. lighting) or by upgrading your building's insulation.
- Taking action to target the opportunities to save energy. Tracking your progress by analysing your meter data to see how well your energy-saving efforts have worked.
- The Demand response (DR) scheme shows that incentives are economically balanced according to the effective change of consumer behaviour. It includes minimising or shifting consumption, and using standby generation to change of electricity use from the grid to on-site generation. Notice periods of about 2-4 hours was considered by the operators as switching time to safely implement a curtail plan with minimal impact on machineries and accessories. There are various demand response as follows
    - time of use (ToU)
    - Critical Peak Pricing (CPP) and
    - Critical Peak Rebate (CPR)

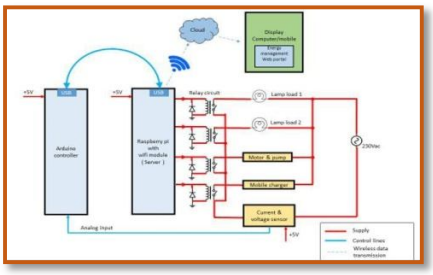


Fig: 3.6 Explains the energy management circuit diagram

❖ **Waste Management System**

- As the population in the rural areas increases, the accumulation of waste and trash level also gets increased. The conventional bins with no automation is the existing status. The time rate for dumping the waste differs for each bins bin and it doesn't provide any details about the status.
- The proper collection and disposal of these waste becomes a must. In current scenario the garbage collector physically go to each bin and check trash levels which involves more human power and wastes both time and fuel of the containers.

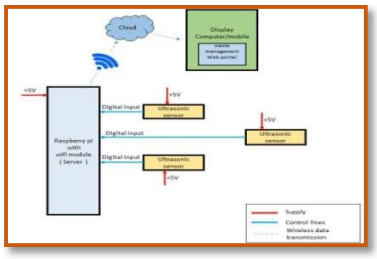


Fig.:3.7 Explains The Waste Management Circuit Diagram

- The sensors interfaced waste bins , are capable of intimating waste level status, is not a novel method, the aim is use cloud interfaced network to automate the waste bins and efficiently manages the waste collection. It is not limited to the notification alone.
- The waste management technique which is not managed efficiently may cause serious environmental problems and increase in cost occurs.
- Therefore, in this paper, by developing an optimizing route for the waste collection is extended to reduce the fuel cost, source through an IoT-based smart waste management (SWS).
- Fig.9 explains the optimized route for the smart waste collection system.
- It is achieved with the help of smart bins. The conventional bins specifically designed and allotted with the sensors behave as smart bins.
- These sensors are powered with the batteries or green energy sources can be used. These wireless sensors monitors, provide data at every instant and sends signal to the control center through the cloud.
- A specific portal is developed for the monitoring and control of the waste with the help of a centralized hub.
- Secured cloud based server has been created with the help of this central hub. This receives data from all the sensors through wireless communication which gives a limited access for the user to monitor and control his residence appliances.
- The government or the central power has full access for monitoring of all attributes and also controlling of the attributes.

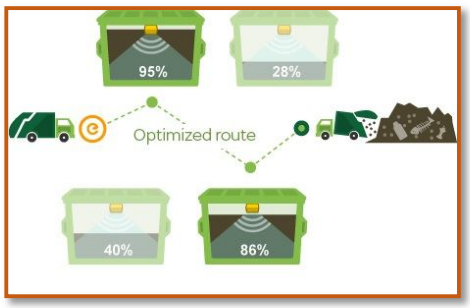


Fig:3.8 Simulation Model

Chapter: 4

About Kalipat Village

4.1 Introduction

4.1.1 Introduction About Kalipat Village detail

- Kalipat is nearer to Rajkot district (14.5km).This village have not much facilities to survive comfortably. This is very small size village. Their official language is Gujarati. This village has good source of Water because village located at nearer to AjiRiver.
- Because of high flood in river, village washed out about 40 years ago. Therefore here we take initiative to give all basic amenities to society for betterment.

4.1.2 Justification/ need of the study

- This scheme is approaches to reduce the migration rate in urban area.
- Development of basic amenities and rehabilitation in village for better infrastructure.
- Save energy by providing renewable sources like Solar street light, Bio-gas plant etc. By which we could increase our economic growth as well.

4.1.3 Study Area

- Kalipat village is located at away from the Rajkot-Bhavangar highway and 13 km away from the Rajkot district.
- It is touched the bank of Aji river.

4.1.4Objectives of the study

There are various objective like,

- To give required amenities in the village like, Transportation, Water supply, Educational, health care facilities, Sanitation etc.
- Reduce migration from rural to urban area.
- Provide Sustainable Infrastructure.
- To give comprehensive planning suited for ideal village.
- To make independent village.
- Developed modern irrigation facility to increase farming production.
- Development of underground drainage system.
- Efficient transportation system to improve connectivity rural and urban area.

4.1.5 Scope of the study

- By observing the present condition we could improve the basic amenities and facilities like agricultural facilities, milk cooperative facility, and education facility. To improve life style of villagers by helping them to develop their skill by assisting them in implementing income generating activities in close coordination and cooperation with national and international organizations.

- From the gap analysis, development tactics for village development will be proposed and planning suggestion for physical infrastructure, social infrastructure and renewable energy source will be suggested for the village. This study will focus on the development of the village.

4.1.6 Methodology Frame Work for development of your village

Fig: 4.1 Methodology Frame Work for development of your village

4.1.7 Available Methodology for development of related to Civil/Electrical

- Gram Panchayat
- School
- Bachat Mandali
- Various Government Policies etc.

4.2 Kalipat Study Area Profile

4.2.1 Study Area Location with brief History land use details

- **Gram Panchayat:** Kalipat
- **District:** Rajkot
- **State:** Gujarat
- **Pin Code:** 360020
- **Area:**993.13 hectares
- **Population:**2,692 (1,386 -males & 1306- females)
- **House hold:** 473
- **Nearest town:** Rajkot
- **Coordinated :**22.2364° N, 70.8826° E

➢ Kalipat having small population and underdeveloped village. There is many Kutcha houses because of 40 years ago floor crises, by flood native village was drawn away. Therefore, people having not its own land to make houses.

➢ Kalipat village having good source of water for make independent village.

4.2.2 Base Location map, Land Map, Gram Tal Map

Fig:4.2 Base location map

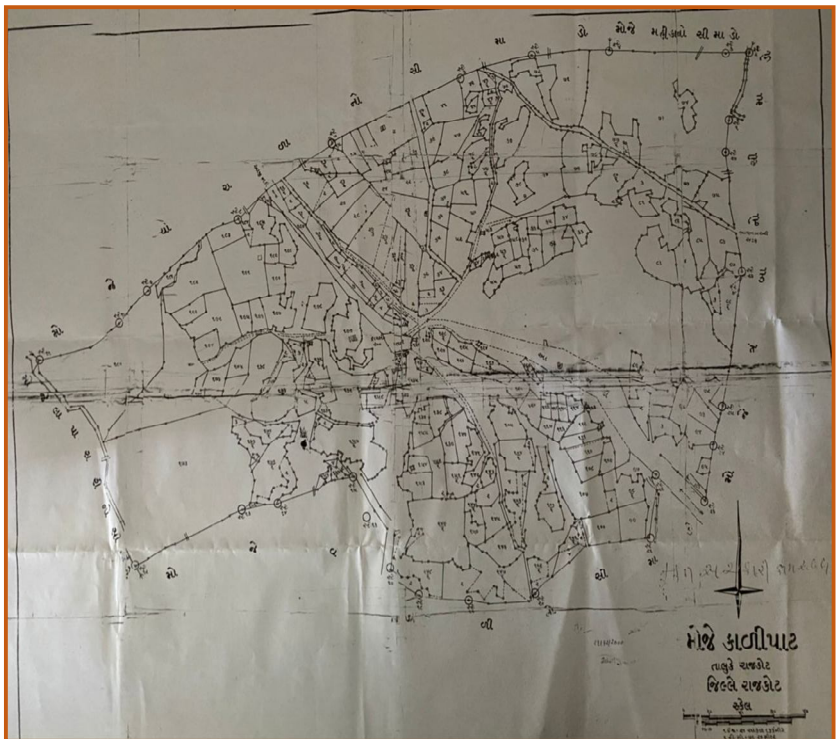


Fig:4.3 Gamtal map

4.2.3 Physical & Demographical Growth

Particulars	Total	Male	Female
Total No. of Houses	473	-	-
Population	2,692	1,386	1,306
Child (0-6)	405	213	192
Schedule Caste	415	215	200
Schedule Tribe	0	0	0
Literacy	73.24 %	81.76 %	64.27 %
Total Workers	1,198	809	389
Main Worker	948	-	-
Marginal Worker	250	29	221

3.4 Physical & Demographical Growth

4.2.4 Economic generation profile / Banks

- Village having Aji river by which it has an opportunity to take benefit of river in Farming and other criteria like by applying water treatment plant and generate his own source of drinking water.
- It's nearer to Rajkot district so Employment could easily increase.
- Incremental crop growth is possible due to good water source.

4.2.5 Actual Problem faced by Villagers and smart solution

- Village has not many basic facilities like Sanitation in Street work, so difficult to create hygienic condition.
- Not proper arrangement of street light in street so difficulty faces at night time.
- Waste collection is also not available.

➢ If we apply drainage at every street as well as street light then we can protect from breeding of mosquitoes and improve night vision.

➢ Executive should have focus on waste collection facility, we aware executive for development of village.

➢ Transportation facilities provide up to Kalipat to Rajkot.

4.2.6 Social scenario -Preservation of traditions, Festivals, Cuisine

- We were found that all the people of this village are not very much connected with today's technology. The major population is get income through the farming and there are no other job opportunities.
- The social scenario of the village is poor. The village is highly unplanned and the amenities provided in the village are not properly maintained. Also there are no facilities for proper disposal of waste due to this the aesthetic appearance of the village is reduced.
- Transportation facilities in the village will boost employment opportunity in the village and will reduce the rate of migration.

4.2.7 Migration Reasons / Trends

- Main reason is migration we found out is unemployment and unawareness of technology for using in farming.
- Because of the Proper Educational infrastructure not available in rural area.

4.3 Data Collection of Kalipat village

4.3.1 Describe Methods for data collection

- We do basic survey for collecting all required data by asking people and visiting gram-panchayat for authentic data like, Population of village, Area of village, Sources in village, Basic required amenities in village, School etc.
- Internet giving me navigational report, literacy rate, SC/ST population of Kalipat village.
- People giving us running businesses and employment.

4.3.2 Primary details of survey

- Kalipat village is in Rajkot district and it's far away from Rajkot at 13 km. It has 2692 census. Current Talati mantri is Satyajitsinh Dabhi who gives us all mandatory information regarding village.
- This village has not much facility to better survival and good infrastructure for sustainability of village.
- Many primary information we given above.

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

- Total houses are 473 in village, near about 85% houses are kutcha and 15% houses are Pucca.
- As per the Sarpanch and our survey there is no such facilities are available in the village but some people have smart phone to make calls, to capture the video and for other communications.

4.3.4 No of Human being in One House

- As per the Talati Mantri on an average 4-5 persons per House.

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

- Food source they got from farming in some amount or export from city.
- For construction of houses, material export from outside.

4.3.6Geographical Detail

- Village is nearer to Aji-River and far away from Rajkot- Bhavnagar highway 1 km and from Rajkot 13 km.
- Village Coordinated at 22.2364° N, 70.8826° E.

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

- We give in 4.2.3 required demographic detail.
- Villagers used Aadhar card as an ID proof as well as voter ID card.
- Many villagers have not much educated because of the lack of educational infrastructure.

4.3.8 Occupational Detail - Occupation wise Details / Majority business

- Mostly, 70% General community doing farming and other businesses in Rajkot city.
- Some people are connected with labor work due to backwardness.

4.3.9 Agricultural Details / Organic Farming / Fishery

- In Kalipat, more villagers are connected with agriculture field. Here main income source of from farming.
- Because of fewer cattle organic farming not possible.
- Here because of Aji river nearer to the village fishery might be possible if we could develop those areas.

4.310 Physical Infrastructure Facilities - Manufacturing HUB / Ware Houses

- In physical infrastructure, there is school and gram panchayat haven't better infrastructure.
- Bus stop
- Primary school
- Street light
- Anganwadi
- R.C.C. road

4.3.11 Tourism development available in the village for attracting the tourist

- No tourism site available in Kalipat village

4.4 Infrastructure detail

Fig: 4.4 Water tank **Fig: 4.5Water tank**

4.4.1 Drinking Water / Water Management Facilities

- The village has a piped water supply. They have two water tanks for water storage.
- Both tanks have 80000 litre capacities.

4.4.2 Drainage Network / Sanitation Facilities

- Kalipat has not any types of drainage network or sanitation facility.
- There is open drainage.

Fig: 4.6 Open Drainage

4.4.3 Transportation & Road Network

- Rajkot –Bhavnagar highway is 1 km away from Kalipat. There is no such a facility to approach Kalipat, but for Rajkot, there are various local vehicles (Auto, Jeep, Bus, Private vehicle) to travel.
- Village approach road is bituminous road.
- Some internal streets are R.C.C. road or some under construction.

Fig:4.7 Bituminous Road

Fig:4.8 R.C.C. Road

Fig: 4.9 Kutchi Street

Fig: 4.2.1 Street work

4.4.4 Housing condition

- In Kalipat 85% kutcha houses and 15% Pucca houses.
- Housing facility is not well here.

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

- Here is one Community hall but however it's closed now.
- Here small Private hospital available and nearer kalipat has B. G. Garaiya college as well which used to medication

Fig:4.2.2 Community hall

Fig:4.2.3 Private Hospital

Fig:4.2.4 Angadwadi

Fig: 4.2.5 B. G. Garaiya College

Fig: 4.2.6 Primary School

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

- Here no any public building excepted community hall we have given before.

4.4.7 Technology Mobile/ WIFI / Internet Usage Details

- Most of people having smart phone and used to with internet basic facility.
- No anymore WIFI zone as well as commercial internet facility.

4.4.8 Sports Activity as Gram Panchayat

- In Kalipat negligible sport activity.

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

- Here Aji river flowing near from village.
- Some temples are here.

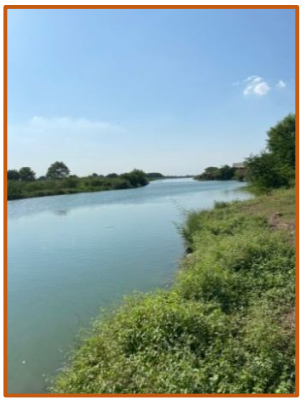


Fig: 4.2.7Aji River Fig: 4.2.8Mahakali temple bank of Aji River Fig:4.2.9RamjiMandir

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

- We give above all required facility like Foot path development etc.
- No other facilities here.

4.4.11 Any other details

- No any other required detail for structural aspects.

4.5 Electrical Concept

4.5.1 Renewable energy source planning particularly for villages

- In Kalipat no one any renewable source excepted Solar Street light.

4.5.2 Irrigation Facilitie

- Kalipat village have pumping facility for irrigation.
- Sometimes, they taking water from Aji River.

4.5.3 Electricity Facilities with Area

- All having 24X7 Electricity available.

4.6 Existing Institution like - Village Administration – Detail Profile

4.6.1 BachatMandali

- In Kalipat village Bachatmandali existing.
- Villagers gathered fund from every one and used to development of village.
- Many people could save money in Bachatmandali.

4.6.2 DudhMandali

- Kalipat has not DudhMandali.

4.6.3 Mahila forum

- Kalipat hasn’t Mahila forum.

4.6.4 Plantation for the Air Pollution

- In Kalipat many trees nearer the Aji river as well as in village also.
- Kalipat has negligible Air pollution, because they haven’t any source of pollute air.
- In School, Grampanchayat, Bank of river plantation had been done.

4.6.5 Rain Water Harvesting - Waste Water Recycling

- Such facilities have not available in village

4.6.6 Agricultural Development

- In agriculture area Kalipat village has many scope because Aji river nearer to it.
- Many people depend upon Agriculture field.
- Most of villages doing agriculture for survival and its economic growth.
- In Kalipat, production of various crops like, Ground nuts, Wheat, Sugarcane, Cash crop etc.

4.6.7 Any Other

- There people are literacy rate are less, so there mainly works depends upon grampanchayat.
- Required daily maintenance of every existing facility and mainly work on solid waste management.
- If spread awareness of technologies, Policies of government, their rights and duties, Provide better educational infrastructure etc. its leads to develop responsible and aware society.

Chapter: 5

Technical Options with Case Studies

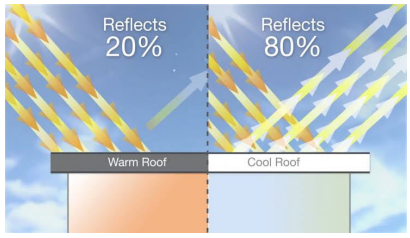
5.1 Concept (Civil):

5.1.1 *Advance sustainable construction techniques / practices and quantity surveying*

Green Insulation: The greatest concern, when it comes to construction of buildings and homes is insulation. It has been proven that the use of green insulation to become a sustainable construction technology which eliminates the need of high end finishes made from nonrenewable materials. Good insulation is what provides your plants with a controlled environment that will ensure the perfect temperature and humidity for your plants.

Solar Power: In green construction, there are two types of solar power, active solar power and another is passive solar power. Active solar power is the use of functional solar systems that absorb the sun's radiation to cater for heating and electricity provision. The use of electricity and gas is reduced by this process. Passive solar power is a design that uses the sun rays in a strategically way to warm the houses through the placement of windows and the use of heat-absorbing surface. The windows let in energy and the heat absorbed reduces the need for the house during cold periods.

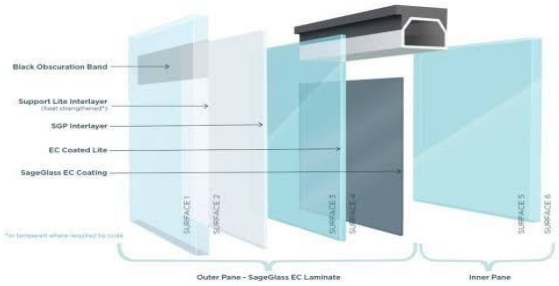
The use of smart appliances: The installation of energy saving and self-sufficient appliances is emphasized by the sustainable construction technologies. Smart grid dishwashers, refrigerators, and washing machines are example of such sustainable technologies. This technology leads us towards establishing zero-energy homes as well as commercial buildings.



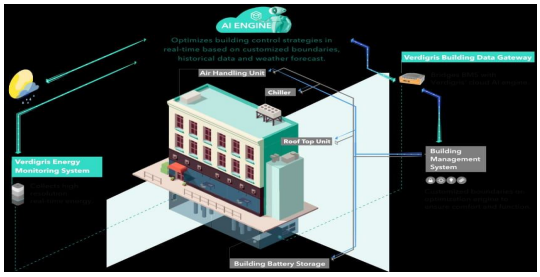
Cool roofs: A cool roof is one that has been designed to reflect more sunlight and absorb less heat than a standard roof. Cool roofs can be made of a highly reflective type of paint, a sheet covering, or highly reflective tiles. Standard or dark roofs can reach temperatures of 150°F or more in the summer sun.

Sustainable resource sourcing: Sustainable Sourcing is the integration of social, ethical and environmental performance factors into the process of selecting suppliers. The ultimate goal of Sustainable Sourcing is to build strong, long-term relationships with suppliers. The materials are remanufactured, recycled, recyclable, and obtained from sustainable sources.

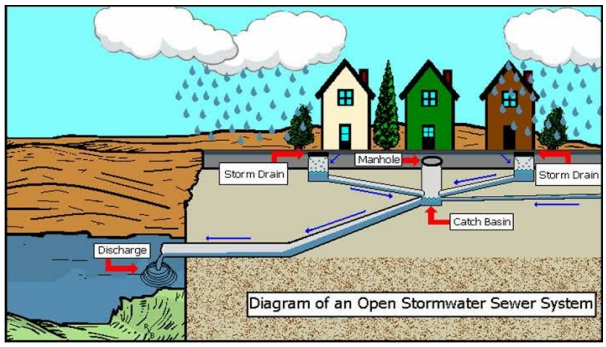
Electro-chromic smart glass: Electro chromic glass (a.k.a. **smart glass** or **dynamic glass**) is an electronically tin table glass used for windows, skylights, facades and curtain walls. Electro chromic glass, which can be directly controlled by building occupants, is popular for its ability to improve occupant comfort, maximize access to daylight and outdoor views, reduce energy costs and provide architects with more design freedom. With this technology, homes and commercial buildings can save a lot on heating, ventilating, and air conditioning costs.



Autonomous buildings : An autonomous building is a building designed to be operated independently from infrastructural support services such as the electric power grid, gas grid, municipal water systems, sewage treatment systems, storm drains, communication services, and in some cases, public roads.



Storm water management: Storm water management is the effort to reduce runoff of rainwater or melted snow into streets, lawns and other sites and the improvement of water quality. When storm water is absorbed into the soil, it is filtered and ultimately replenishes aquifers or flows into streams and rivers. However, when heavy rainwater hits, ground saturated by water creates excess moisture that runs across the surface and into storm sewers and road ditches. This water often carries debris, chemicals, bacteria, eroded soil, and other pollutants, and carries them into streams, rivers, lakes, or wetlands. In urban and developed areas, impervious surfaces such as pavement and roofs prevent precipitation from naturally soaking into the ground. Instead, water runs rapidly into storm drains, sewer systems and drainage ditches and can cause flooding, erosion, turbidity (or muddiness), storm and sanitary sewer system overflow, and infrastructure damage. However, storm water design and "green infrastructure" capture and reuse storm water to maintain or restore natural hydrology



5.1.2 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. If the pressure of the water in the pores is great enough to carry the entire 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.
- Liquefaction is more likely to occur in loose to moderately saturate granular soils with poor drainage, such as salty sands or sands and gravels containing impermeable sediments. During wave loading, usually cyclic undrained loading, e.g. seismic loading, loose sands tend to decrease in volume, which produces an increase in their pore water pressures and consequently a decrease in shear strength, i.e. reduction in effective stress.
- The effects of soil liquefaction on the built environment can be extremely damaging. Buildings whose foundations bear directly on sand which liquefies will experience a sudden loss of support, which will result in drastic and irregular settlement of the building causing structural damage, including cracking of foundations and damage to the building structure, or leaving the structure unserviceable, even without structural damage. Where a thin crust of non-liquefied soil exists between building foundation and liquefied soil, a 'punching shear' type foundation failure may occur. Irregular settlement may break underground utility lines. The upward pressure applied by the movement of liquefied soil through the crust layer can crack weak foundation slabs and enter buildings through service ducts, and may allow water to damage building contents and electrical services.

FIG.5.1: Soil Liquification

5.1.3. Sustainable Sanitation:

- Sustainable sanitation is a sanitation system designed to meet certain criteria and to work well over the long-term. Sustainable sanitation systems consider the entire "sanitation value chain", from the experience of the user, excreta and wastewater collection methods, transportation or conveyance of waste, treatment, and reuse or disposal. The Sustainable Sanitation Alliance includes five features (or criteria) in its definition of "sustainable sanitation": Systems need to be economically and socially acceptable, technically and institutionally appropriate and protect the environment and natural resources.
- Improve sanitation facilities by providing toilets and latrines that flush into a sewer or safe enclosure.
- Promote good hygiene habits through education. Proper hand washing with soap and water can reduce diarrhea cases by up to 35 percent.
- The purpose of sustainable sanitation is the same as sanitation in general: to protect human health. However, "sustainable sanitation" attends to all processes of the system: This includes methods of collecting, transporting, treating and the disposal (or reuse) of waste.
- The main objective of a sanitation system is to protect and promote human health by providing a clean environment and breaking the cycle of disease. In order to be sustainable a sanitation system has to be not only economically viable, socially acceptable, and technically and institutionally appropriate, but it should also protect the environment and the natural resources. According to the Sustainable Sanitation Alliance, when improving an existing and/or designing a new sanitation system, sustainability criteria related to the following aspects should be considered.

Fig:5.2 /Sustainable Sanitation

5.1.4 Transport infrastructure / system:

- Transport infrastructure is one of the most important factors for a country's progress. Although India has a large and diverse transport sector with its own share of challenges, they can be overcome by energy-efficient technologies and customer-focused approach. One cannot overemphasize the importance of transportation than call it the 'lifeline' of a nation.
- It has been proven by so many instances how transport infrastructure has added speed and efficiency to a country's progress. Good physical connectivity in the urban and rural areas is essential for economic growth.
- India, the seventh largest nation with over a billion populations, has one of the largest transport sectors. But not one without its own set of challenges.
- In India, there are equal number of challenges and opportunities. Rail experts believe that the rail transport systems are six times more energy efficient than road and four times more economical. The social costs in terms of environment damage or degradation are significantly lower in rail. Rail construction costs are approximately six times lower than road for comparable levels of traffic. Historically, the Indian railways have played a leading role in carrying passengers and cargo across India.
- Road transport infrastructure enables movements of people and goods within and between countries.
- It is also a sector within the construction industry that has demonstrated significant developments over time and ongoing growth, particularly in the emerging economies. This brief highlights the different impacts of the road transport infrastructure, including those from construction, maintenance and operation (use).
- The operation phase of a road transport infrastructure has the most significance in terms of environmental and economic impact. While the focus in this phase is usually on the dominant role of tail-pipe GHG emissions from vehicles, the operation of the physical infrastructure should also accounted for. In total, the road transport infrastructure is thought to account for between 8% and 18% of the full life cycle energy requirements and GHG emissions from road transport.
- Railways and roads in India are heavily congested and have always enjoyed the attention of policymakers leaving the waterways development to its own fate. Inland Water Transport (IWT) is operationally cheaper, high in fuel efficiency and environment friendly.
- Thankfully the government has opened its eyes and is ready to exploit this vast potential of waterways that can act as an alternate and supplementary mode of transportation which will not only help to rein the carbon emissions but also curb the rate of road accidents.
- 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 and West Bengal.
- The current share of IWT in total inland transport is not very significant. To uplift this unexplored area and push the share of IWT, government of India is undertaking various investment projects towards the fairway development, provision for terminals, navigational aids etc.

Fig: 5.3 Transport Infrastructure/system

5.1.5 Vertical farming:

- In vertical farming, crops are grown indoors, under artificial conditions of light and temperature. Crops are grown indoors, under artificial conditions of light and temperature. It aims at higher productivity in smaller spaces.
- It uses soil-less methods such as hydroponics, aquaponics and aeroponics. Vertical farming uses significantly less water and pesticides than traditional agricultural methods. Being indoors, the crops aren't subject to seasons and hence give high productivity year-round. Lettuces, tomatoes and green crops can be produced through this practice.
- Japan has been one of the early pioneers in vertical farming. It holds the largest share in the global vertical farming market.
- In Japan, vertical farming is born out of necessity where traditional farming is losing its face due to ageing population and rural migration. Spread is one of the companies that make a huge profit out of vertical farming.
- It annually produces almost 11 million heads of lettuce from its factory in Kyoto. Around 30,000 heads of lettuce are produced daily in the factory, under artificial conditions and with less human intervention. Machines run the lettuces to areas with ideal light, temperature and humidity for every stage of growth.

Fig:5.4Vertical Farming

Vertical farming model:-

- Vertical farming has a great scope in India, but there are challenges like acceptance of vertical farming by the Indian farming community.
- Vertical farming is definitely a solution to critical problems in Indian agriculture like lack of supply or oversupply of farm produce, over-use of pesticides, over-use of fertilizers, deteriorating soils, and even the unemployability.
- Indian farmers are facing various problems like lack of electricity supply throughout the day, assurance of minimum support prices, no control over market glut, water scarcity, etc. The initial huge cost of infrastructure for a large-scale farm is a major hurdle for implementing vertical farming in India.

Vertical farming prototype:-

- In vertical farming, crops are grown indoors, under artificial conditions of light and temperature.
- Crops are grown indoors, under artificial conditions of light and temperature. It aims at higher productivity in smaller spaces. It uses oil-less methods such as hydroponics, aquaponics and aeroponics.

- Vertical farming uses significantly less water and pesticides than traditional agricultural methods. Being indoors, the crops aren't subject to seasons and hence give high productivity year-round. Lettuces, tomatoes and green crops can be produced through this practice.

Vertical farming cost analysis:

- India is a viable market due to population growth which is growing at a very fast rate So it is the right time to produce hydroponically grown food within India. This customer market includes retail and hotel, and fast-food chains, railway catering, foreign food service companies, NGOs, and defence establishments. Hydroponics is a lucrative opportunity to deploy in India. These are the following estimated cost of purchasing a **vertical farm** in India.
- If the land is already owned for setting-up a vertical farm, then capital costs per acre every 5 years are Rs 30.5 lakhs.
- Operational costs, for example, tomatoes as the example crop, in 1 acre per year are Rs 9 lakhs but the revenue can be on an average around 33.5 lakhs.
- If the land is independently owned the profit potential of 15 lakhs per year is slightly less than if it were leased, averaging around 16.5 lakhs per year.

5.1.6 Corrosion mechanism, prevention & repair measures of RCC structure:

- ❖ Corrosion is the inevitable process that occurs when refined metals return to their more stable combined forms as oxides, carbonates and sulphides.
- ❖ The corrosion process may be defined as the surface wastage that occurs when metals are exposed to reactive environments. Costs associated with corrosion damage and control can be substantial, being as much as 3.5% of the GNP of some industrial countries.
- ❖ Reinforced concrete structures have not been immune to the ravages of corrosion despite the protection that concrete provides to embed steel.
- Reasons for the increasing incidence of corrosion damage to reinforced concrete structures include the use of deicing salts and calcium chloride set-accelerators, increased construction in aggressive environments, fast-track construction practices, changing cement composition resulting in finer grinding and lower cement contents, lower cover depths and poor construction practice including inadequate supervision.
- Reinforcement corrosion is particularly pernicious in that damage may occur rapidly and repairs are invariably expensive. Furthermore by the time visible corrosion damage is noticed, structural integrity may already be compromised.
- There is currently considerable debate about the merits of the various systems for the repair of reinforcement corrosion.
- This monograph attempts to clarify some of the important issues by drawing on international experience as well as local findings. Ultimately the effectiveness of repair systems should be measured in terms of cost, risk of failure and long-term performance.
- As such no single system is appropriate for all repairs but will depend on the type of structure, service conditions, and level of deterioration and financial constraints of the project.

5.1.7 Sewage treatment plant:

- SEWAGE TREATMENT PLANT (STP). STP plant treats the sewage to make it fit for safe disposal, agricultural use or domestic use in toilets etc. Sewage usually contains a high quantity of organic and inorganic wastes. It is essential to treat sewage before it enters into any water body.
- Sewage then flows into tanks where solids in the wastewater will separate into sludge and water. The sewage water then transfers to a treatment plant where oxygen is added to the water to promote the growth of microorganisms.
- These microorganisms consume the leftover waste and settle into the bottom of the tank. There are four common ways to treat wastewater include physical water treatment, biological water treatment, chemical treatment, and sludge treatment.
- Water leaving our homes generally goes either into a septic tank in the back yard where it seeps back into the ground, or is sent to a wastewater-treatment plant through a sewer system.
- Using internal mechanisms, a sewage treatment plant works by breaking down solid waste to produce a cleaner, more environmentally friendly effluent.
- Wastewater and sewage are supplied to the primary tank, where the solids and liquids disperse. The resulting liquor flows into the biozone chamber. In the chamber, a pump airs the waste and encourages friendly bacteria to condense the organic matter.
- This breaks down and purifies the result. As it leaves the final waste chamber, the waste left over is 95% clean and ready for dispersal into local ditches or soak away systems, subject to consent from the relevant environmental agency.

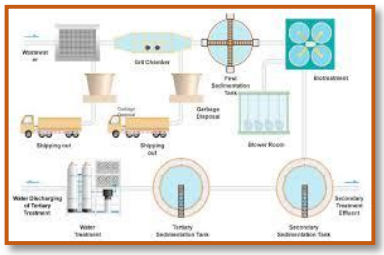


Fig:5.5 Sewage treatment plant

5.2 Concept (Electrical)

5.2.1 Programmable Load Shedding

- Electricity is one of the most important requirements of modern civilization. Without which various Indispensable applications will bind to bring to a standstill. As we know that demand of electricity is Increasing now days. So electric utilities prefer load shedding when the demand exceeds the supply. Thus in a Distribution system it needs to be precisely measured for specific period of time.

- Programmable load shedding Time management system is a reliable & effective load shedding technique that takes over the manual task of Switch ON/OFF the electrical supply with respect to time .
- It uses real time clock (RTC) interfaced to the 8051 family microcontroller. The paper "effective load shedding technique for utility department" will provide Real & competent load shedding techniques such that distribution substation can be monitored & load shedding from one particular place.
- The project is an automatic load operation system that controls load operation, multiple numbers of times According to programmed instruction.
- The project eliminates the manual ON/OFF switching of load. A real Time clock (RTC) is used to track the time and automatically switch ON/OFF the load. This project is required for load shedding time management which is used when the electricity demand Exceeds the supply and there comes a need for manually switching ON/OFF the electrical devices in time.
- Hence this system eliminates the manual operation by automatically switching the load ON/OFF. A matrix Keypad is interfaced with the microcontroller from where the specified time is input to the microcontroller When this input time equals to the real time, based on the commands the microcontroller initiates that Particular relay to switch ON/OFF the load. The time is displayed on a seven segment display.

❖ **Components**

1. Regulator
2. RTC(Real time clock)
3. LCD
4. Keypad
5. Relay
6. Arduino
7. Transformer
8. LED

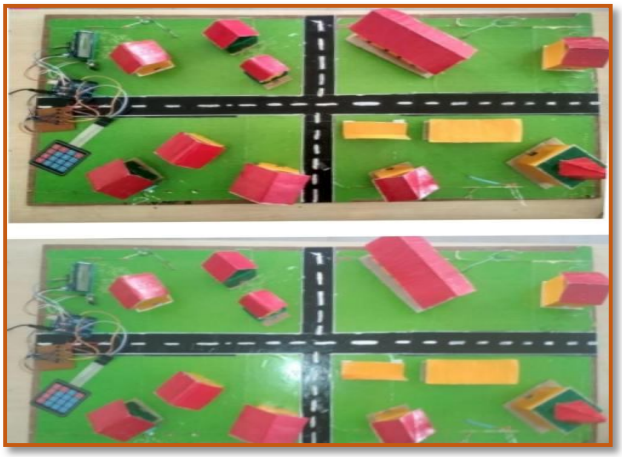


Fig:5.6 Programable road shedding

5.2.2 Railway Security System using IOT

❖ **Smart security system for Indian rail wagons using IOT**

- The objective of this project is to create a Security System for the goods that are Carried in open top freight trains. The most efficient way to secure anything from thieves is to Have a continuous observation. So for continuous observation of the open top freight train, Camera module2 has been used.Passive Infrared Sensor (PIR) 1 has been used to detect the Motion or to sense movement of people, animals, or any object.
- So whenever a motion is Detected by the PIR sensor, the Camera takes a picture of that particular instance. That picture Will be send to the Raspberry PI which does Skin Detection Algorithm and specifies whether That motion was created by a human or not. If a human makes it, then that picture will send to The drop box.
- Any Official can have a look at the same. The existing system has a CCTV Installed at various critical locations like bridges, railway stations etc. but they does not Provide a continuous observation. This paper describes about the Security System that provides Continuous observation for open top freight trains so that goods can be carried safely to its Destination.
- The proposed model has a motion detection sensor Which detects the motion of the object which performs skin detection and then sends the image to the Railway server using IoT. So that immediately an action can be taken to avoid coal thief. The Conceptual diagram is given in the Figure.

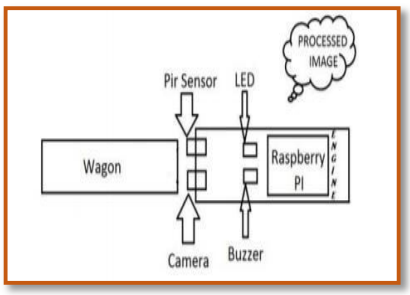


Fig:5.7 Conceptual diagram System Integration

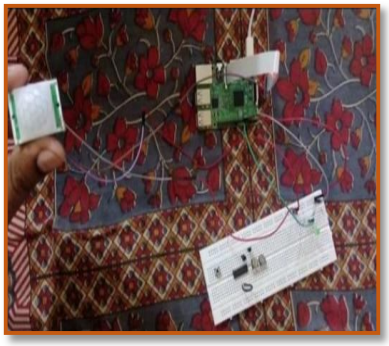


Fig:5.8 Working model of smart security system

5.2.3 Management through Energy Harvesting Concept

- Then it proposes devices that combine energy harvesting and data acquisition. Then it explores novel approaches for optimizing the power extracted using piezoelectric materials. The final one explores kinetic and thermal energy harvesting from human users' activities.
- We usually use energy harvesting systems to convert and collect the environment's energy flows. A new wearable computing concept is considering these energy flows to be data flows as well.
- Current piezoelectric energy harvesting research falls into two key areas: developing optimal energy harvesting structures and highly efficient electrical circuits to store the generated charge or present it to the load circuit.
- Our research focuses primarily on the first area, in which the goal is to create small, lightweight structures that couple very well to mechanical excitation and converts the most usable electrical energy.

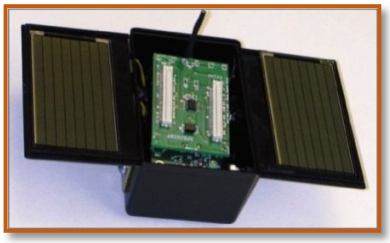


Fig.:5.9 A Heliomote, An Energy-Harvesting Sensor Node

5.2.4 Moisture Monitoring System

- Planting a tree in an environment where the seed or the plant would not get water adequately through natural sources like rain or ground water in its initial phases has been always a matter of concern for tree planters. This is where an autonomous moisture monitor for plants system can help.
- The system timely monitors the moisture level of the soil. If at the time of monitoring it comes to know that the moisture level of the soil is lower than recommended then it will raise an audio visual alert. This alert is then received by the care taker of the plant. When the care taker waters the plant the alarm goes off and the monitoring cycle continues.
- In this system we use a timer IC to time the monitoring process. A moisture level sensor is used to detect the moisture level of the soil. An LED is used to give visual alarm and a Buzzer is used to give audio alarm to the care taker of the plant. Thus in this project with the help of a simple combinational circuit and a sensor we can help save a plant by maintaining the moisture level of the soil of the plant, thus keeping the plant healthy.

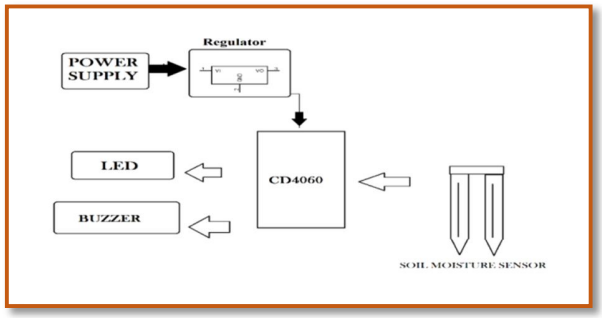


Fig:5.2.1 Block diagram-Moisture monitoring system

❖ **Specifications :**

- IC CD4060
- Water level Sensor
- Resistors
- Capacitors
- Transistor
- LED
- Buzzer

5.2.5 IOT Home Automation Using Raspberry Pi

- Internet of things is a technology of the future that has already started to touch our homes. Here we propose an IOT based home automation system using raspberry pi that automates home appliances and allows user to control them easily through internet from anywhere over the world.
- Our proposed system consists of a microcontroller based circuit that has lights and fan connected to it along with LCD display and Wifi connector interfaced with raspberry pi. Our system interacts with out online IOT system that IOT Gecko free web interface for controlling our home appliances with ease. After linking with IOT Gecko, the user is allowed to send load switching commands over IOT to our circuit.
- The circuit receives the commands over IOT by connecting to internet using wifi connector and then the raspberry processor processes these commands
- After this the processor now processes these instructions to get user commands. It then displays these on an LCD display.
- Also it operates the loads (lights and fan) for switch them on/off according to desired user commands. Thus we automate home appliances over internet using raspberry pi.

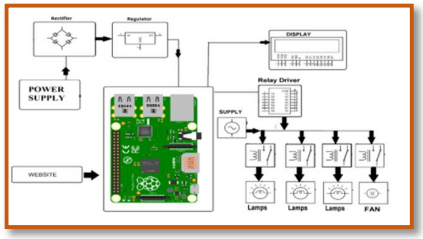


Fig:5.2.2 Block diagram of Home automation

❖ **Hardware Specifications**

- Rectifier
- Regulator
- LCD Display
- Relay Driver
- Power Supply
- Lamps
- Fan
- Wifi Connection Modem
- Resistors
- Capacitors
- Diodes

❖ **Software Specifications**

- Linux OS
- Programming Language: Python

5.2.6. PC based electrical load control system

- The PC based electrical load control system can be built with 8051 series Microcontroller, Level Shifter IC, DB Connector, Relays, Relay Driver, Transformer, Diodes, Capacitors, Resistors, LED, Crystal, Lamps, Keil compiler and Language: Embedded C or Assembly.
- Keil an ARM Company makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulators for ARM7/ARM9/Cortex-M3, XC16x/C16x/ST10, 251, and 8051 MCU families.
- Compilers are programs used to convert a High Level Language to object code. Desktop compilers produce an output object code for the underlying microprocessor, but not for other microprocessors.
- i .e the programs written in one of the HLL like 'C' will compile the code to run on the system for a particular processor like x86 (underlying microprocessor in the computer).
- For example compilers for Dos platform is different from the Compilers for Unix platform So if one wants to define a compiler then compiler is a program that translates source code into object code.

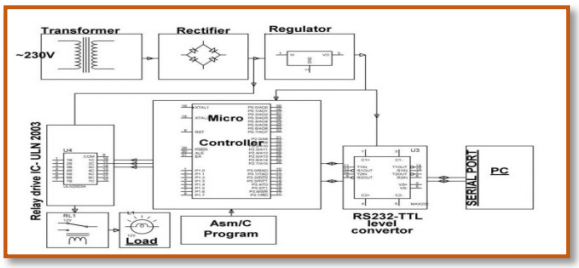


Fig:5.2.3 Block diagram electrical load control system

Chapter: 6

Swatchh Bharat Abhiyan (Clean India)

❖ **Swachh Bharat Abhiyan (Clean India):**

Swachh Bharat Mission is a massive mass movement that seeks to create a Clean India by 2019. The father of our nation Mr. Mahatma Gandhi always puts the emphasis on swachhta as swachhta leads to healthy and prosperous life. Keeping this in mind, the Indian government has decided to launch the swachh bharat mission on October 2, 2014.The mission will cover all rural and urban areas. The urban component of the mission will be implemented by the Ministry of Urban Development, and the rural component by the Ministry of Drinking Water and Sanitation.

6.1 Swachhta needed in Kalipat village – Existing situation with photograph:

- Good quality of water is to be provided in the village for daily use of public for household as well as commercial work.
- Dustbin should be there in particular area of the village for keeping the roads neat and clean.
- Awareness of cleanliness should be given to the locals of the village.
- Public toilets to be provided and used for sanitation purpose. There should not be waste of water in any manner.
- Facilities should be provided for solid and liquid waste management.
- Appropriate irrigation methods should be implemented for decrease in waste of water.
- Manpower should be used to clean the roads and water bodies of the village.

Fig: 6.1 Kalipat villages

6.2 Guidelines-Implementation in allocated village with photograph:

- The swachhbharatabhiyan mission is divided into two parts: in urban areas and in rural areas.
- In rural areas, the zilla parishads& gram panchayat will work for this mission. They will provide the proper functional water supply in households, toilet facilities and other facilities for welfare of the village.
- The effectiveness of the Program is predicated upon generating demand for toilets leading to their construction and sustained use by all the household members. It also aims to promote better hygiene behavior amongst the population and improve cleanliness by initiating Solid and Liquid Waste Management (SLWM) projects in the villages of the country. This is to be bolstered with adequate implementation capacities in terms of trained personnel, financial incentives and systems and procedures for planning and monitoring.
- The emphasis is on stronger focus on behavior change intervention including interpersonal communication; strengthening implementation and delivery mechanisms down to the GP level; and giving States flexibility to design delivery mechanisms that take into account local cultures, practices, sensibilities and demands.

Fig: 6.2Kalipat village Notice

6.3 Activities done by students for allocated village with photograph:

- Initially they didn't allow us to visit the village but after number of request and promise of following covid guidelines they allow us to visit village.
- It was not allowed to gather people so activities were difficult to perform so we will do the same in next phase.
- As we saw the condition of the village regarding the cleanliness of roads, we asked to head of gram panchayat for using the manpower for daily cleaning of the roads.
- We suggested providing dustbins in roads and in some main areas as well as to the houses for reducing the solid waste.

Chapter: 7

Village condition due to Covid-19

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

- Awareness provided by using social media as well as Microphones.
- Citizens are also being told not to touch their eyes, nose, and mouth, wash hands with soap frequently and maintain personal distance.
- Along with ration distribution to villagers, fodder for abandoned cattle is also being provided by a social service organization.
- "The villagers have voluntarily postponed the wedding till next year. Only 10-15 members are buried. "we personally advised six families in Ahmedabad and Surat over the telephone not to return until the epidemic is under control," said Sarpanch Chaganbhai and Talati Satyajeetsinh.
- Congregation of villagers for any purpose is strictly prohibited. Villagers can ill-afford pandemics," said Yuvrajsinh Jadeja, upsarpanch of Kalipat village.

Fig: 7.1 Sanitizing Kalipat Village

7.2 Activities Done by Students for allocated village Clean with Photograph

- Talking to the Sarpanch and Talati of Kalipath village, he said that the Gram Panchayat has already hired 4 janitors to clean the public roads.
- And outside the shops in the village, the Gram Panchayat has placed garbage bins under Swachh Bharat.
- We told him to do village cleaning and they told us that no one else in this situation could endanger his life.

7.3 Any other steps taken by the students/villagers

- Considering the situation of covid 19 by the gram panchayat, Circle have been drawn for social distance outside all the grocery stores.
- And outsiders who come to the village have been urged to enter the village only after undergoing corona test. And when coming to the Gram Panchayat office, it is mandatory for the villagers to wear masks and maintain social distance as per the guideline of the government.

Fig:7.2 Social distancing

Chapter: 8

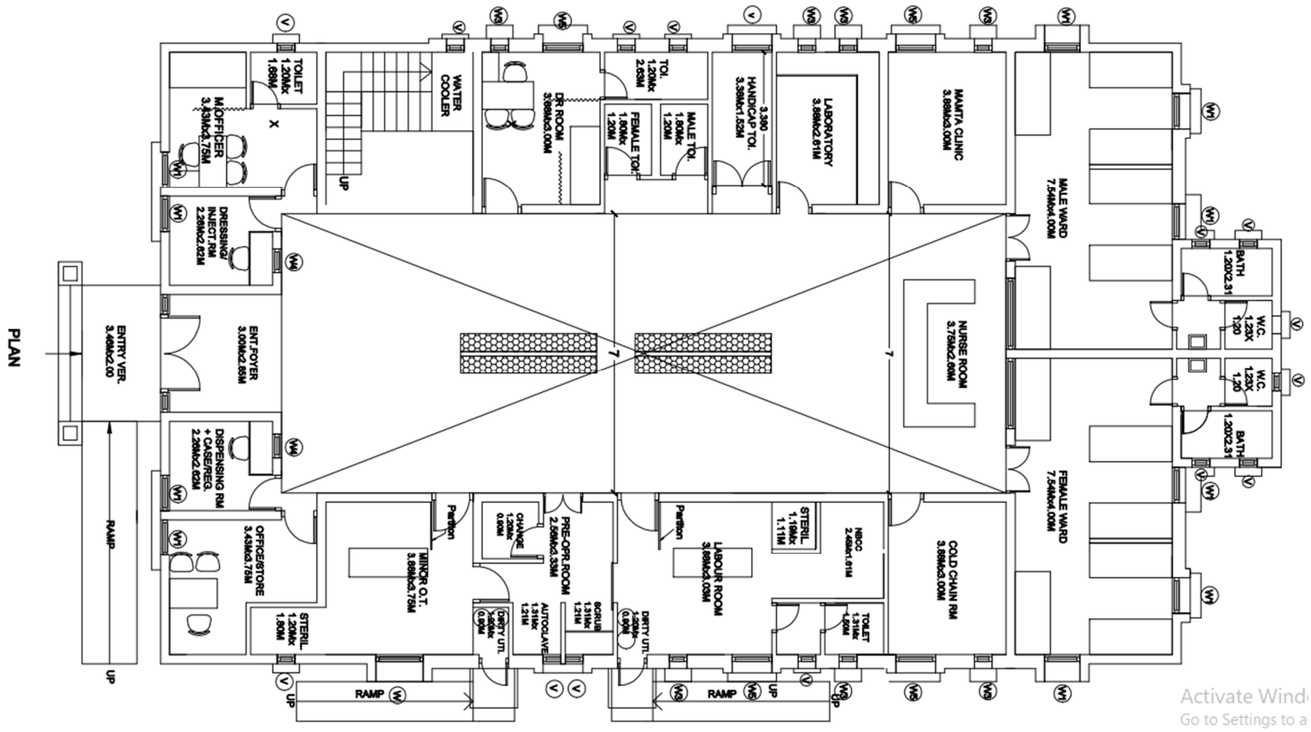
Sustainable Design Planning Proposal (Prototype Design) - Part- I

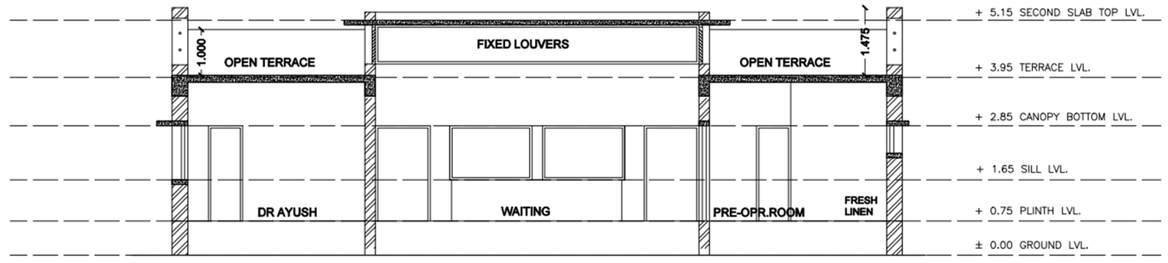
(Scenario / Existing Situation / Proposed Design in Auto cad / Recapitulation Sheet / Measurement Sheet / Abstract Sheet / Sustainability of Proposal / Any other software)

8.1 Design Proposals

8.1.1 Sustainable Design (Civil)

- **Public Healt**





SECTION-1-1

Name of Work : PHC Building		
Sr.No.	**Particular**	**Amount in Rs.**
1	Civil work	4046651.84
2	Electrical work	560625.00
	Total - A	**4607276.84**
3	Add 3% Contingency charges (B)	138218.31
	Total A + B	**4745495.15**
4	Add 2% Work charge est. Charge on A + B	94909.903
5	Add 1% quality control charge on - A+ B	47454.95
6	Labour cess Rs. 30 Sq.m. On - A+ B	15868.20
	528.94 x 1 = 528.94 X 30	
	Total Rs.	4903723.20
	Say Total Rs.	**49040000.00**

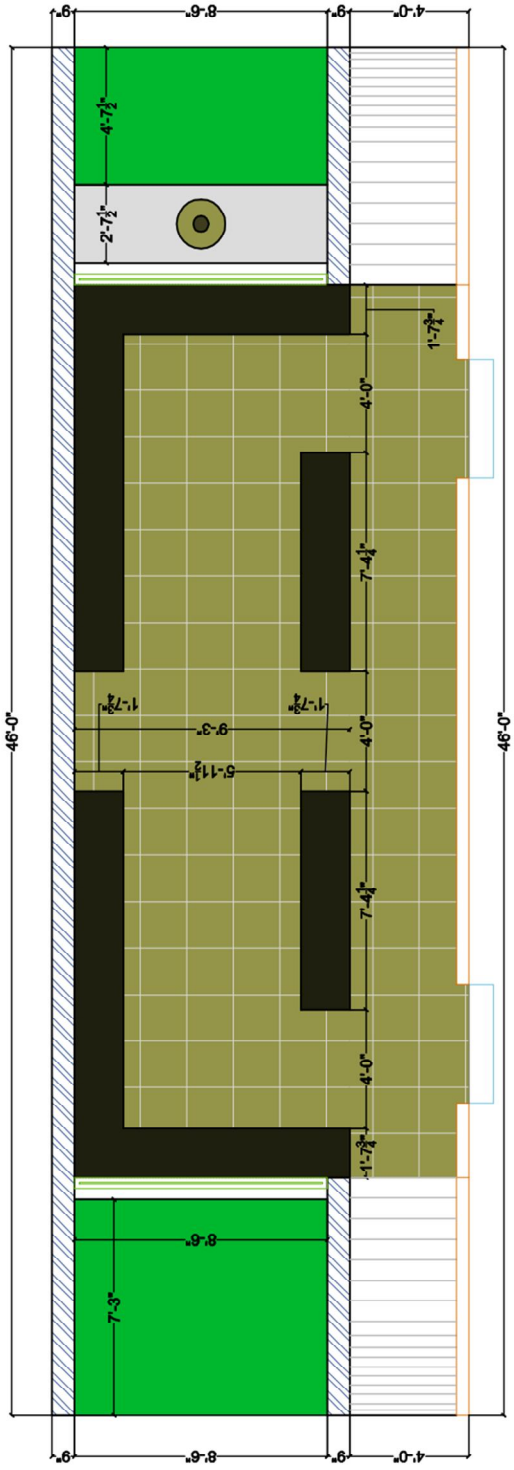
Abstract sheet-PHC				
PHC Bldg. Qty	**Item Work & Rate**		**Unit**	**Total AMT**
127.00	Excavation for foundation up to 1.5 Meter depth including sorting out and stacking of useful materials and disposing of excavated stuff up to any lead. (a) Loose or soft soil	**67.20**	Cu.m.	**14801.47**
44.08	Providing and Laying controlled cement concrete M-25 including finishing smooth with curing complete including the cost of form work but excluding the cost of reinforced concrete work in foundation FOOTING and mass concrete. A. FOOTING	**3991.00**	Cu.m.	**175923.28**
31.87	Providing and Laying controlled cement concrete M-25& including finishing smooth with curing complete including the cost of form work but excluding cost of reinforcement concrete for PLINTH BEAM for any cross sectional area of beam B. PLINTH BEAM	**4936.00**	Cu.m.	**157310.32**
40.08	Providing and Laying controlled cement concrete M-25 and with curing etc. Complete. Including the cost of formwork but excluding the cost of reinforcement for R.C.C work in Column having any cross section area of Column. For column ABOVE PLINTH	**6390.00**	Cu.m.	**256111.20**
40.18	Providing and Laying controlled cement concrete M-25 and with curing etc. Complete. Including the cost of formwork but excluding the cost of reinforcement for R.C.C works in beam having any cross section area of BEAM.For beam	**5210.00**	Cu.m.	**221789.70**

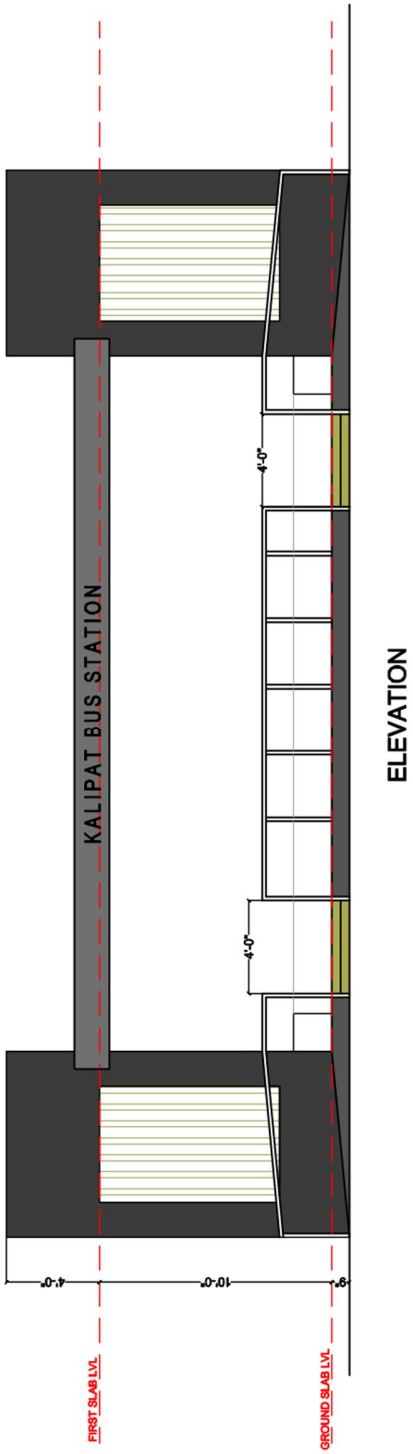
4.79	Providing and Laying controlled cement concrete M-25 and with curing etc. Complete. Including the cost of formwork but excluding the cost of reinforcement for R.C.C work in Lintel. F. For lintels	**5821.00**	Cu.m.	**33237.91**
2.01	Providing and Laying controlled cement concrete M-25 for reinforced concrete CHHAJJAS not exceeding 10cm thickness up to floor two level including finishing the exposed surface with cement mortar 1:3 (1 cement : 3 fine sand) to give a smooth surface ,centring and formwork and curing complete. Excluding cost of reinforcement for ALL FLOOR. G. For chajja	**5578.00**	Cu.m.	**12550.50**
50.06	Providing and Laying controlled cement concrete M-25 Finishing smooth with curing etc. Comp including the cost of formwork but excluding the cost of reinforcement for RCC work in SLAB having thickness of 10cm up to 15cm	**4975.00**	Cu.m.	**281535.25**
2.07	Providing and Laying controlled cement concrete M-25 and with curing etc. Complete. Including the cost of formwork but excluding cost of reinforcement concrete work in Staircase upto floor level For all floors.	**6220.00**	Cu.m.	**12875.40**
305.23	Filing in foundation and plinth with murrum or selected soil in layers of 20 cm. thickness including watering, ramming and consolidating etc. complete.	**288.00**	Cu.m.	**107233**
80.00	Filling in plinth with sand under floors including watering ramming, consolidating and dressing etc. complete.	**398.00**	Cu.m.	**35951.34**
35222	Providing Thermo mechanical Treated bar Fe-500 steel Reinforcement for RCC work including bending binding and placing in positing completed up to for two levels.	**45.00**	Kg.	**1585008**
32.00	Brickwork using common burnt clay building bricks having crushing strength not less than 35 Kg./Sq.Cm. in foundation and plinth in cement Mortar 1:6 (1-Cement :6-finesand) (B) Conventional with frog	**2820.00**	Cu.m.	**447675**
130.71	Brickwork using common burnt clay building bricks having crushing strength not less than 35 Kg./Sq.Cm. in super structure in cement Mortar 1:6 (1-Cement :6-finesand) (B) Conventional with frog	**2981.00**	Cu.m.	**621031**
672.39	Providing 15mm thick Cement Plaster in single coat on brick/concrete wall	**96.30**	Sq.m.	**75258**
40.00	Providing & laying 40 mm thick cement concrete flooring 1:2:4	**174.00**	Sq.m.	**6960**
363.87	Providing and laying polished Kota stone slab flooring over 20mm	**607.00**	Sq.m.	**231898.28**
				Rs.4046651

8.2 Abstract sheet-PHC

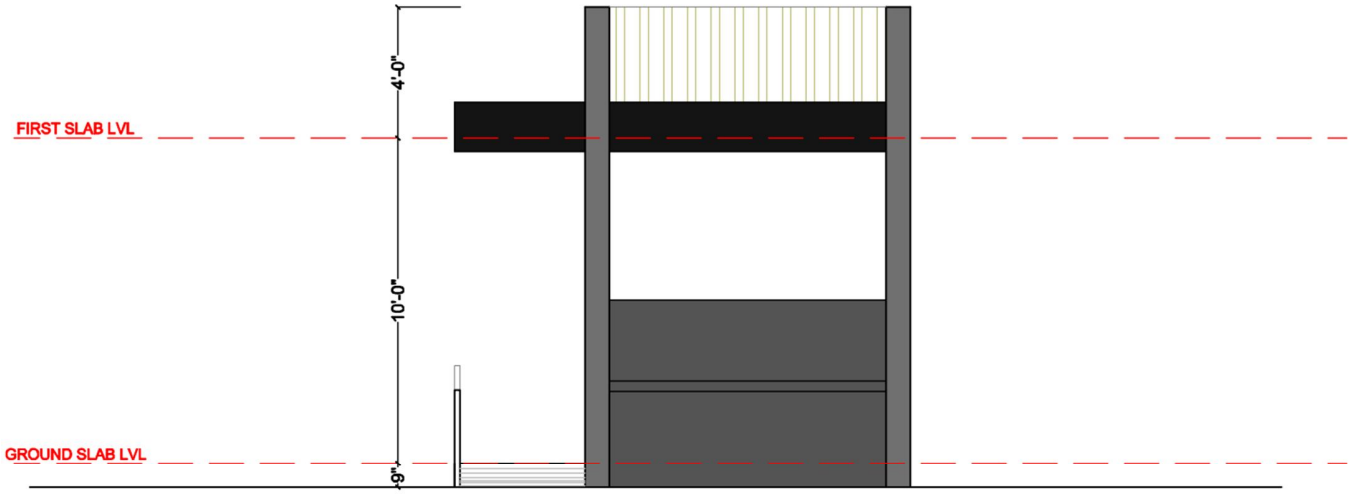
8.1.2 Physical design (Civil)

- **BUS STATION:**

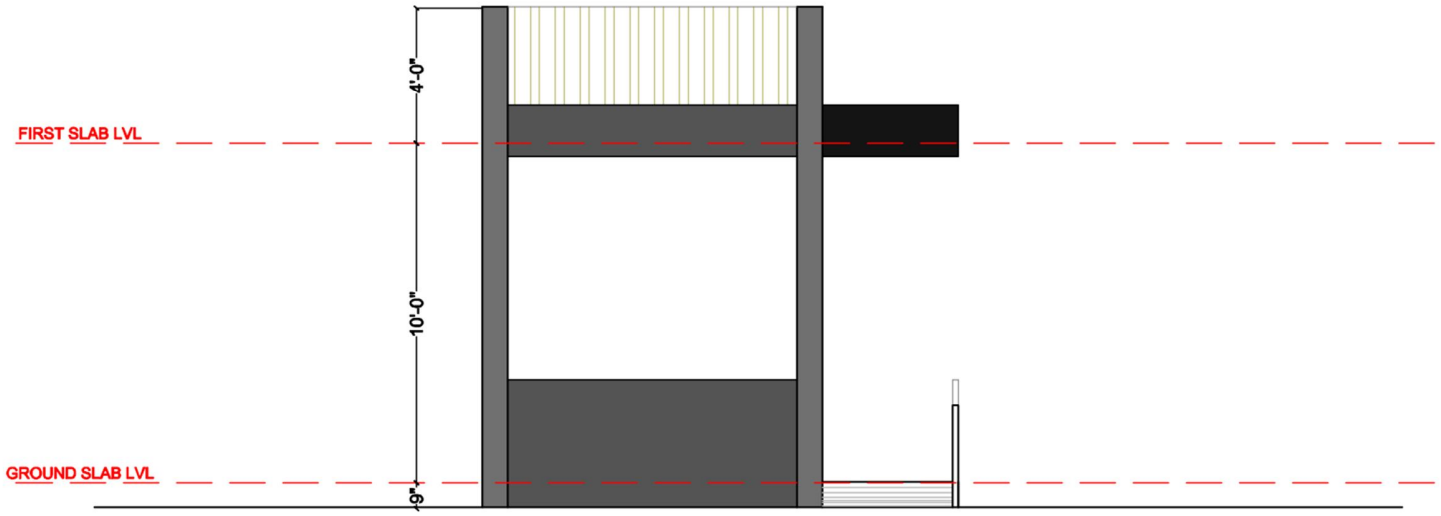




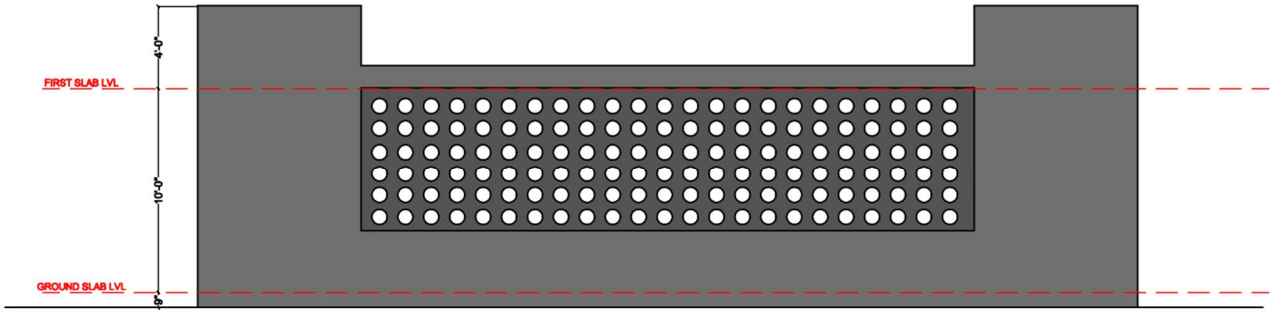
ELEVATION



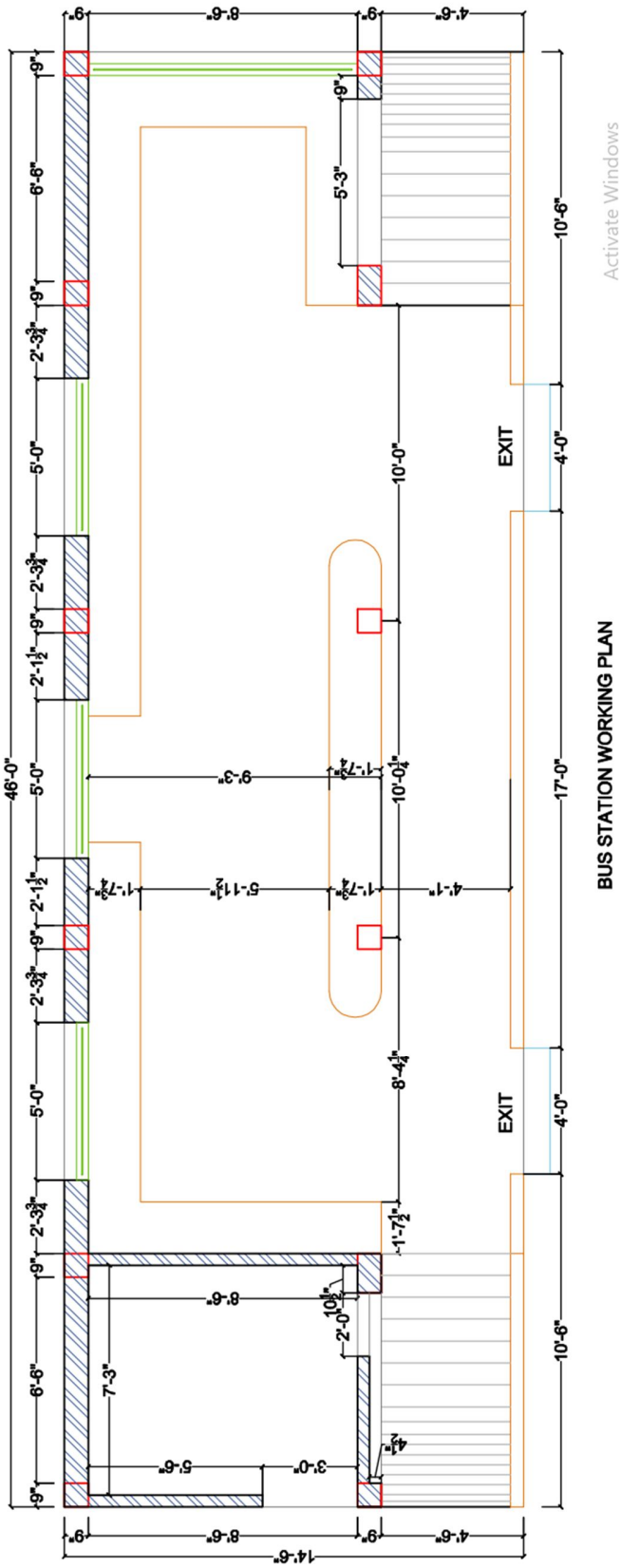
RIGHT SIDE ELEVATION



LEFT SIDE ELEVATION



BACK SIDE ELEVATION


BUS STATION WORKING PLAN
EXIT
EXIT
46'-0"
14'-6"
17'-0"
10'-6"
10'-6"
4'-0"
4'-0"
10'-0"
10'-0¼"
8'-4¼"
5'-3"
7'-3"
2'-0"
3'-0"
5'-6"
9'-3"
5'-11½"
4'-1"
8'-6"
4'-6"
Activate Windows

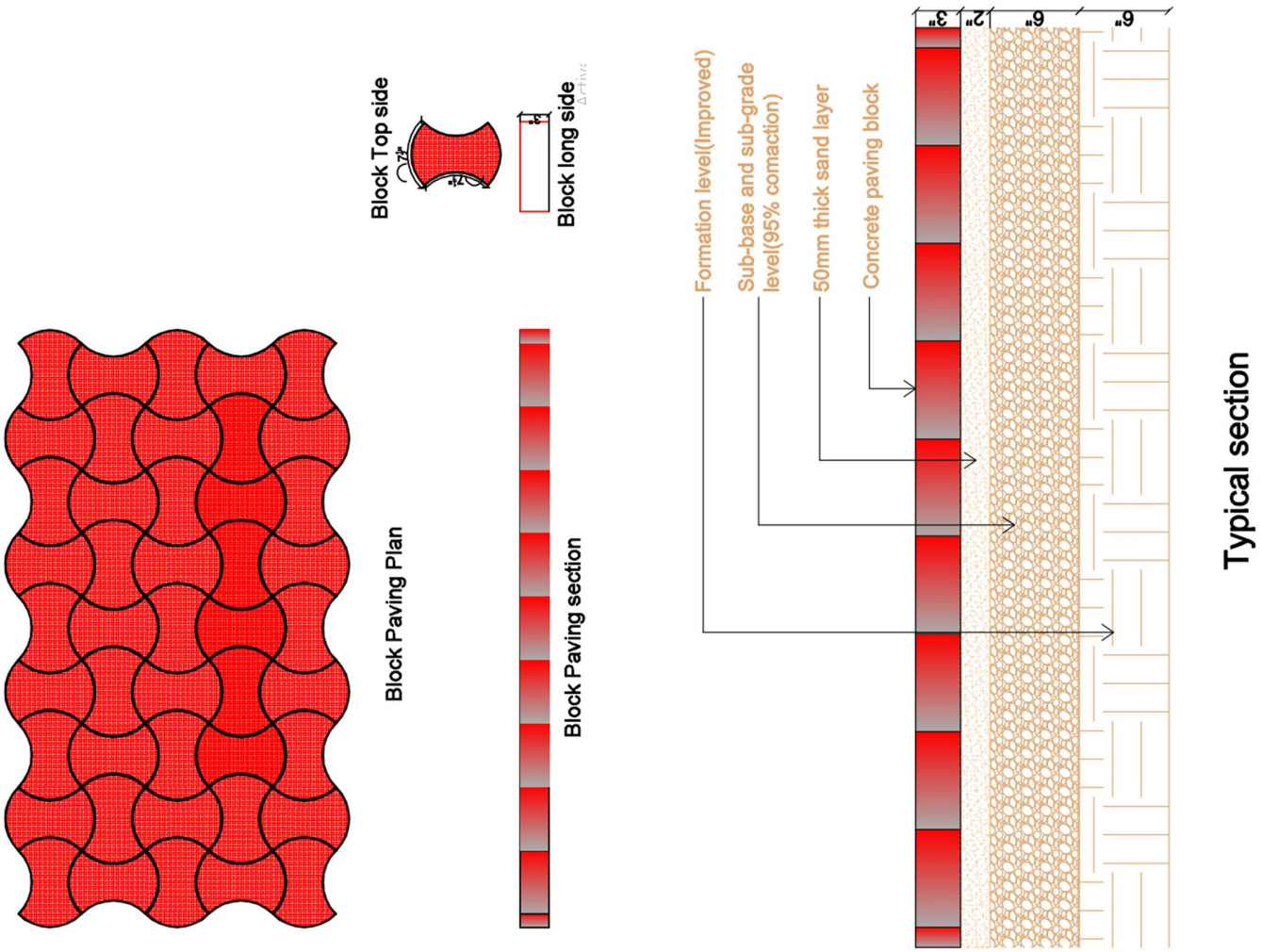
Name of Work : BUS STATION		
Sr.No.	**Particular**	**Amount in Rs.**
1	Civil work	**159127.82**
	Total - A	**159127.82**
2	Add 3% Contingency charges (B)	4773.83
	Total A + B	**163901.65**
3	Add 2% Work charge est. charge on A + B	3278.03
4	Add 1% quality control charge on - A+ B	1639.01
5	Add 10% contractor profit	16390.16
	Total Rs.	185208.85
	Say Total Rs.	**185500**

8.4 Abstract sheet-Bus stand

Abstract sheet				
QTY	**Item Work & Rate**		**Unit**	**Total AMT**
32.77	Excavation for foundation up to 1.5 Meter depth including sorting out and stacking of useful materials and disposing of excavated stuff up to any lead	**145**	Cu.m.	**4751**
3.27	Providing and Laying controlled Plain cement concrete M-10 including finishing smooth with curing	**2543**	Cu.m.	**8315**
2.13	Providing and Laying controlled cement concrete M-20 including finishing smooth with curing complete including the cost of form work but excluding the cost of reinforced concrete work in foundation FOOTING and mass concrete.	**4052**	Cu.m.	**8630**
3.06	Providing and Laying controlled cement concrete M-20 and with curing etc. Complete. Including the cost of formwork but excluding the cost of reinforcement for R.C.C work in Column having any cross section area of Column.	**6590**	Cu.m.	**20165**
2.85	Providing and Laying controlled cement concrete M-20 & including finishing smooth with curing complete including the cost of form work but excluding cost of reinforcement concrete for PLINTH BEAM for any cross sectional area of beam	**5036**	Cu.m.	**14352**
4.71	Providing and Laying controlled cement concrete M-20 and with curing etc. Complete. Including the cost of formwork but excluding the cost of reinforcement for R.C.C works in beam having any cross section area of BEAM.	**5310**	Cu.m.	**25010**
6.37	Providing and Laying controlled cement concrete M-20 Finishing smooth with curing etc. Comp including the cost of formwork but excluding the cost of reinforcement for RCC work in SLAB having thickness of 10cm up to 15cm	**5035**	Cu.m.	**32072**
15.59	Brickwork using common burnt clay building bricks having crushing strength not less than 35 Kg./Sq.Cm. in foundation and plinth in cement Mortar 1:6	**2925**	Cu.m.	**45600**
2.3	Providing 12mm thick Cement Plaster in single coat on brick/concrete wall	**100**	Sq.m.	**230**
				159127

8.1.3 Physical design:

- **Pavement design:**



Block Pavement design							
MEASURMENT SHEET							
Item no.	**Description**	**Nos.**	**L**	**B**	**H**	**Qty.**	**Total Qty.**
1	Preparing sub-grade	1	5355	3	0.20	3213	3213
2	Preparing base-course	1	5355	3	0.15	2410	2410
3	Preparing sand course	1	5355	3	0.05	804	804
4	Laying paver blocks	1	5355	3	0.08	1285.2	1285.2

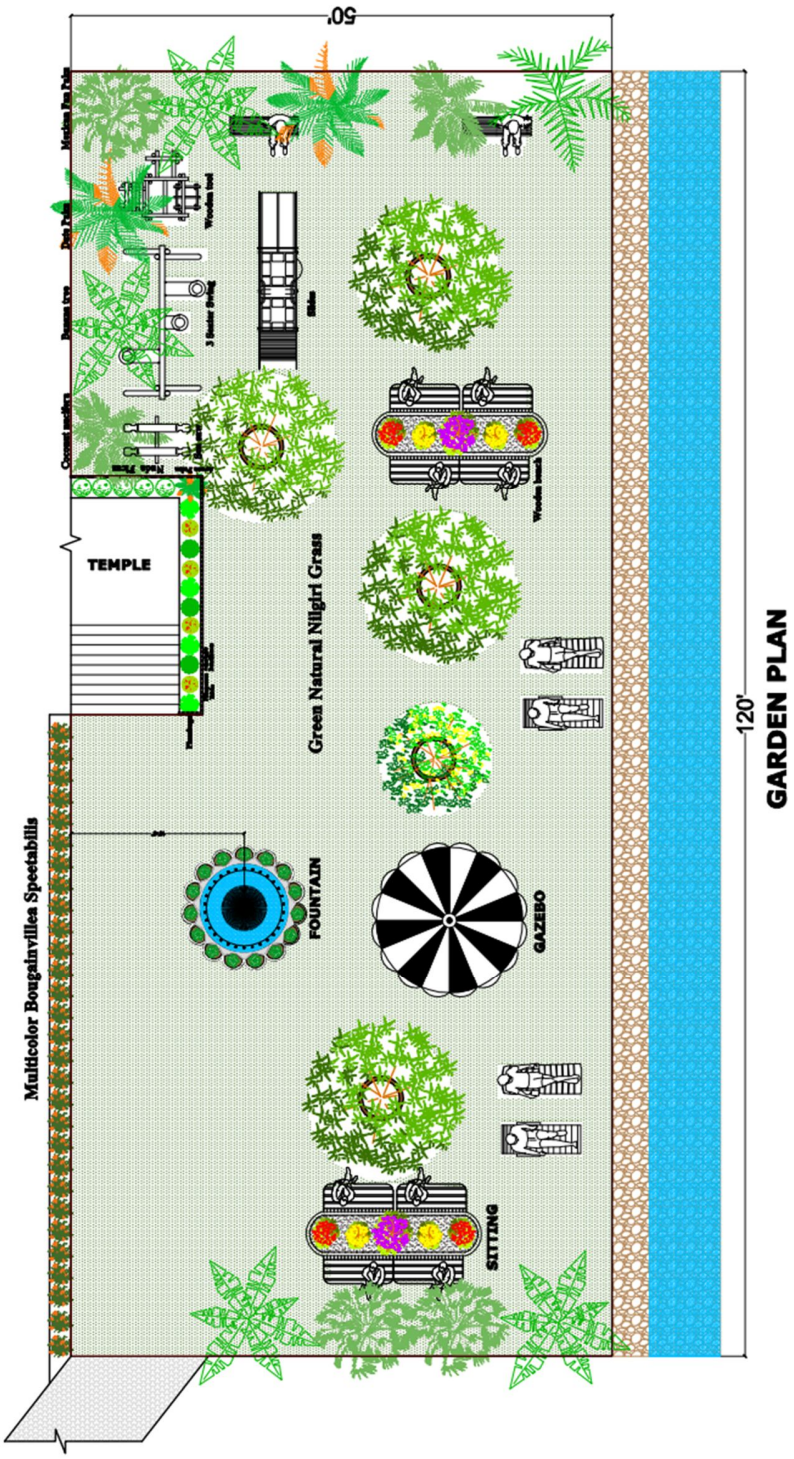
8.5 Measurement sheet-Pavement design

Block Pavement design				
QUANTITY SHEET				
Item no.	**Description**	**DENSITY**	**COVERAGE**	**Total Qty.**
1	Paver block, M30 grade, ARC DUMBLE BLOCK, RED(color), dimensions-7.5INCH ARC LENTH	Total 4.5 nos. block required per sq.ft.	Total area of construction = 172923	Total number of paver block required is 778154
2	Laying fined aggregate/stone powder, dimensions laying at approx. 5cm of height i.e. 5cm=0.005m	2250 kg/cu.m.	Total volume of laying aggregate/stone powder = 81	Total quantity of fined aggregate/ stone powder is 182250KG
3	Laying soft murrum on required basis	1700 Kg/cu.m.	Total volume of soft murrum= 46 Cu.m.	Total quantity of soft murrum is 78200KG
4	Laying machine crushed aggregates – Dimension – 20-30mm size of aggregate. Height:- 20cm =0.2m	1800Kg/cu. m	Total volume of machine crushed 20-30mm aggregates=3213Cu.m	Total quantity of machine crushed 20-30mm aggregates is 5783400

8.6& 8.7 Quantity sheet & Abstract sheet-Pavement design

Abstract sheet				
QTY	**Item Work & Rate**		**Unit**	**Total AMT**
3213	Preparing sub-grade	550	Cu.m.	1767150
2410	Preparing base-course	880	Cu.m.	2120800
804	Preparing sand course	2520	Cu.m.	2026080
1285.2	Laying paver blocks with cost and labor work	15262	Cu.m	19614722.4
Add 1% water charge				**255287.52**
Add 10% contractor's profit				**2552875.24**
Total amount (RS.)				**28336915.16**
SAY (RS.)				**28337000**

8.1.4 Social design (Civil): **Garden**



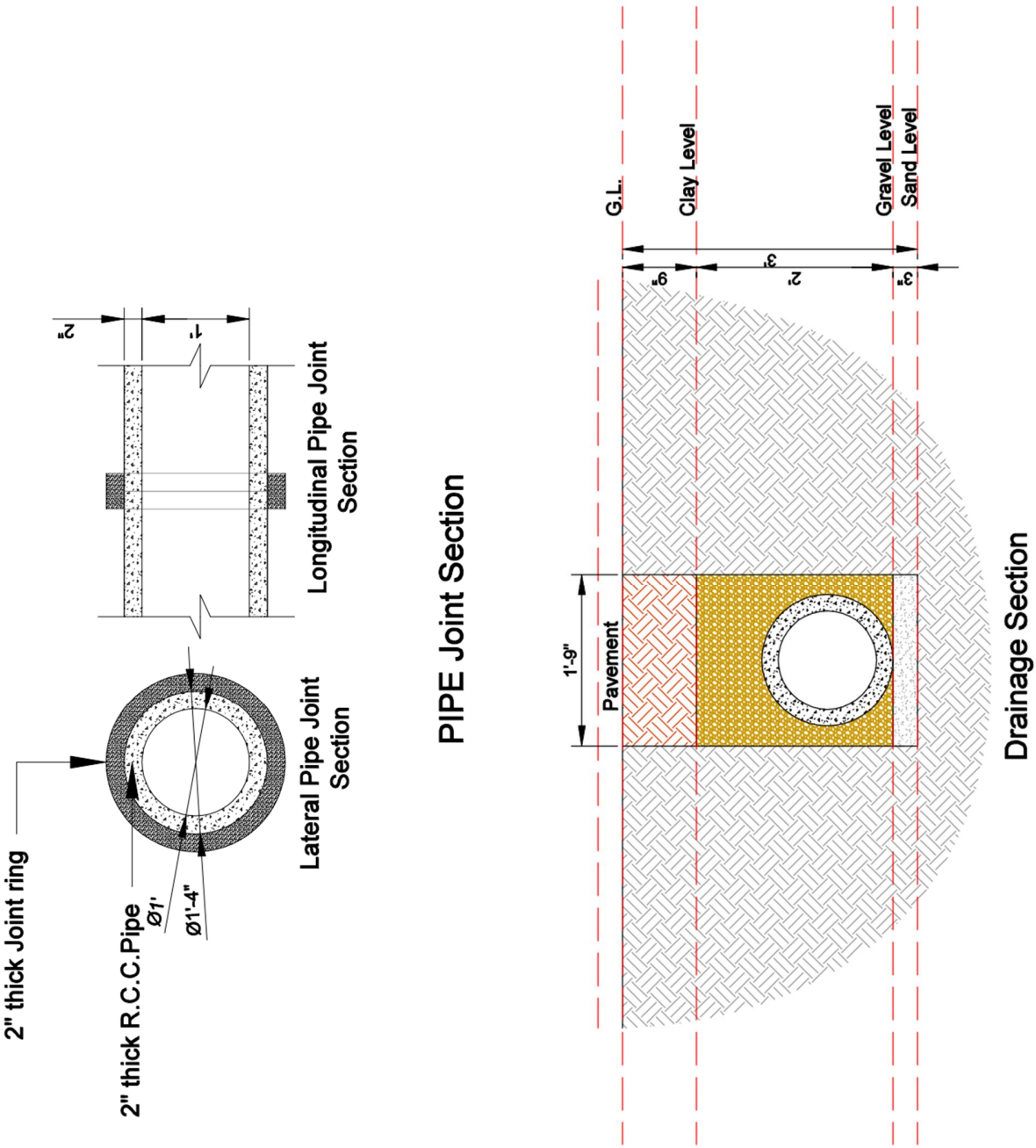
Garden-Abstract sheet				
QTY	**Item Work & Rate**		**Unit**	**Total AMT**
70.80	Excavation and Levelling/Clearing site	225	Cu.M.	15930
225.1	Providing Green Natural Nilgiri Grass	107.58	Sq.M.	24216.26
27	Multicolour Bougainvillea Speetabilis	1290	Nos.	34830
5	NudaFicus	170	Nos.	850
1	Areca Palm	250	Nos.	250
4	Plumbago	140	Nos.	560
4	PittosporumTobira	449	Nos.	1796
3	Asparagus Densifloroussd	300	Nos.	900
2	Coconut nucifera	2500	Nos.	5000
2	Date Palm	555	Nos.	1110
4	Banana tree	250	Nos.	1000
3	Mexicon Fan Palm	3301	Nos.	9903
1	Fountain	35500	Nos.	35500
15	Wooden Bench	1100	Nos.	16500
1	Gazebo	50000	Nos.	50000
1	4 Seater Sea saw	15000	Nos.	15000
1	3 Seater Swing	29276	Nos.	29276
1	Wooden tool	5000	Nos.	5000
2	Slides	57300	Nos.	57300
26.77	Bolder	200	Cu.M.	5354
26.77	R.C.C.Work	2543	Cu.M.	68076.11
1000	Brick	10	Nos.	10000
				Rs.464987.63

8.8 Abstract sheet-Garden

Name of Work : GARDEN		
Sr.No.	**Particular**	**Amount in Rs.**
1	Trees & Plant Plantation	**280127.52**
2	Civil Work	**184860.11**
	Total - A	**464987.63**
3	Add 3% Contingency charges (B)	13949.62
	Total A + B	**478937.26**
4	Add 2% Work charge est. charge on A + B	9578.74
5	Add 1% quality control charge on - A+ B	4789.37
6	Add 10% contractor profit	47893.72
7	Add 20% Maintenance charge	95787.45
	Total Rs.	636986.54
	Say Total Rs.	**637000**

8.1.5 Physical design(Civil):

- **Drainage design:**



MEASURMENT SHEET						
Item no.	Description	Nos.	L	B	H	Qty.
1	**Earthwork in excavation**	1	5355	1.50	3.00	**24098 cu.m.**
2	**Hire &Labour charge for 5cm thick timbering**	1*2	5355	-	3.00	**16065 sq.m.**
3	**Cement concrete (1:2:4) with aggregate for bedding of pipe**	1	5355	1.40	0.34	**2549 cu.m.**
4	**Deduction of pipe segment**	1	5355	2/3(2*0.243*0.19)		**330 cu.m.**
				TOTAL = 2219 cu. M.		
5	**Providing timber shuttering for concrete work**	1*2	5355	-	0.34	**1821 sq. m.**
6	**Supplying & laying NP3 pipe with collar joint**	2142	2.5	-	-	**5355 m**
7	**Providing collar joint for concrete pipe**	2141	-	-	-	**2141nos.**
8	**Earth filling of the trenches**	(24098 -2219)	.			**20828 Cu.m**

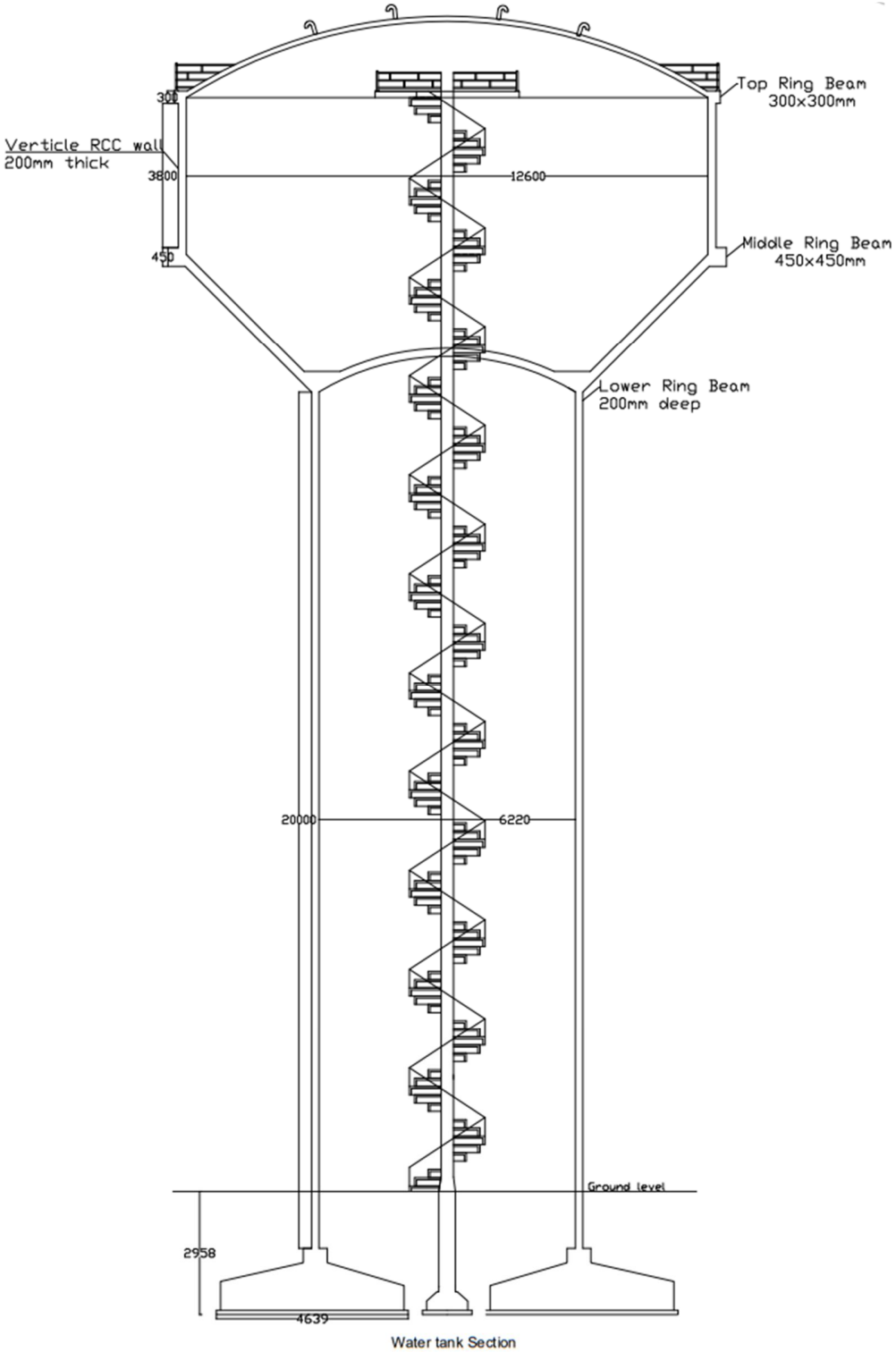
8.9 Measurement sheet-Drainage

Garden-Abstract sheet				
QTY	**Item Work & Rate**		**Unit**	**Total AMT**
24098	Earthwork in excavation	320	Cu. M.	7711360
16065	Hire &Labour charge for 5cm thick timbering	480	Sq. m.	7711200
2219	Cement concrete (1:2:4) with aggregate for bedding of pipe	645	Cu. M.	1431255
1821	Providing timber shuttering for concrete work	255	Sq. m.	464355
5355	Supplying & laying NP3 pipe with collar joint	980	M	5247900
2141	Providing collar joint for connecting pipe	160	Nos.	342560
20828	Earth filling of the trenches	220	Cu. M	4582160
Total				**Rs.27490790**
Add 1% water charge				274907.9
Add 10% contractors profit				2749079
Total amount				30514776.9
Say				**Rs.30515000**

9.1 Abstract sheet-Drainage

8.1.6 Physical design:

- **Water tank:**



Water tank Section

➢ Water tank:

- **General Dimensions:(Capacity: 6.00 Lac Liters)**

▪ Shaft: Inner Dia. = 6.22 m

Bottom Dome: Inner Dia. =6.2m, Rise = 0.90m Conical

Container: Angle With horizontal = 45.0deg.

Dia.at fl.lvl. =6.95 m, Height=2.85 m

Dia. at top =12.6m

CylindricalContainer:	Inner Dia. =12.6m	Height= 3.80m
TopDome:	Inner Dia. =12.6m	Rise = 1.90m
StairShaft:	Outer Dia. =2.3m	Height= 6.50m

- **Tank Capacity:**

Vol. of conical Container, V1 = 208.1 m3
Vol. of Cylindrical Container, V2 = 436.9m3

Vol. of Stair Shaft (o/o), V3 = 26.7 m3
Vol. of Ring Beam, V4 = 11.6 m3

Vol. of DS, V5 = 5.9m3

Vol. of Dom rise, V6 = 5.1m3

Net Capacity =601.9m3 (V1+V2-V3-V5-V6-plaster vol)
Provided Capacity = 601930 Liters

Capacity =600000Liters O.K.

Abstract sheet				
QTY	**Item Work & Rate**		**Unit**	**Total AMT**
98.56	Excavation for foundation up to 3 Meter depth including sorting out and stacking of useful materials and disposing of excavated stuff up to any lead	**530**	Cu.m.	**52236.8**
9.41	Providing and Laying controlled Plain cement concrete M-10 including finishing smooth with curing	**5565**	Cu.m.	**52366.65**
91.56	Providing and Laying controlled cement concrete M-30 including finishing smooth with curing complete including the cost of form work but excluding the cost of reinforced concrete work in foundation FOOTING and mass concrete.	**8650**	Cu.m.	**791994**
0.285	Providing and Laying controlled cement concrete M-30 including finishing smooth with curing complete including the cost of form work but excluding the cost of reinforced concrete work in foundation FOOTING and mass concrete in stair shaft.	**5650**	Cu.m.	**1610.25**
74.02	Providing and Laying controlled cement concrete M-30 & including finishing smooth with curing complete including the cost of form work but excluding cost of reinforcement concrete for Water tank shaft.	**15169**	Cu.m.	**1122809.38**
4.49	Providing and Laying controlled cement concrete M-30 and with curing etc. Complete. Including the cost of formwork but excluding the cost of reinforcement for R.C.C works in stair shaft.	**12056**	Cu.m.	**54131.44**
4	Providing and Laying controlled cement concrete M-30 Finishing smooth with curing etc. Comp including the cost of formwork but excluding the cost of reinforcement for RCC work in Conical shape having thickness of 12cm up to 18cm	**20659**	Cu.m.	**82636**
27.47	Providing and Laying controlled cement concrete M-30 Finishing smooth with curing etc. Comp including the cost of formwork but excluding the cost of reinforcement for RCC work in CONTAINER WALL having thickness of 12cm up to 18cm	**20362**	Cu.m.	**559344.14**
2.87	Providing and Laying controlled cement concrete M-30 Finishing smooth with curing etc. Comp including the cost of formwork but excluding the cost of reinforcement for RCC work in Top dome having thickness of 12cm up to 18cm	**25036**	Cu.m.	**86734.557**

1.82	Providing and Laying controlled cement concrete M-30 Finishing smooth with curing etc. Comp including the cost of formwork but excluding the cost of reinforcement for RCC work in Bottom dome having thickness of 12cm up to 18cm	25035	Cu.m.	**45563.7**
5.83	Providing 18mm thick Cement Plaster in single coat on concrete wall including form work and curing.	10225	Sq.m	**187958.617**
14.54	Providing and Laying controlled cement concrete M-30 Finishing smooth with curing etc. Comp including the cost of formwork but excluding the cost of reinforcement for RCC work in Beam.	8523	Cu.m.	**123924.42**
				Rs.3161309.95

9.2 Abstract sheet--Water tank

Name of Work : Water Tank		
Sr.No.	**Particular**	**Amount in Rs.**
1	Civil work	**3161309.95**
	Total - A	**3161309.95**
3	Add 3% Contingency charges (B)	94839.29
	Total A + B	**3256149.25**
4	Add 2% Work charge est. charge on A + B	65122.98
5	Add 1% quality control charge on - A+ B	32561.49
6	Add 10% contractor profit	325614.92
	Total Rs.	3679448.65
	Say Total Rs.	**3680000**

8.1.7 Electrical Design 1

➢ Primary Energy Audit (Gram panchayat, Kalipat)

Kalipat has old building of Gram Panchayat which provide social services to villagers.

Electrical Supply: - PGVCL provides domestic electricity in Gram panchayat.

10.1 Billing Detail

Sr. No.	Particular	Average Value
1.	Units per two month	180
2.	Amount per two month	810

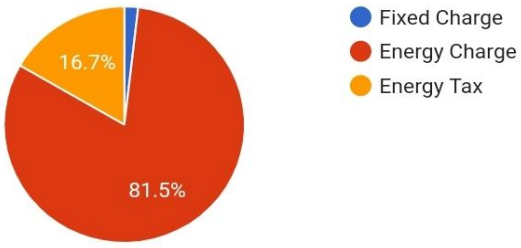


Fig.8.4 Electricity Bill

Fig.8.5 Energy Charge - Slab Wise

Equipment	Rating in Watt	Usage in hour
Fan * 2	50	9
CFL bulb * 3	36	9
Tubelight * 1	40	9
Computer * 1	100	9
Printer * 1	40	9

10.2 Equipment rating and usage

- Total kWh consumption of one day (when all equipment are in operation i.e. summer) = 7.241 units (approx. 8 unit

Sr No.	Equipment	Saving per year
1.	Replace 40 Tube lights with 22 W LED tube lights	299
2.	Replace 50W fan with BEE 5 star rated 20 W BLDC fan	497
3.	Replace 36 W CFL bulbs with LED 11 W	500
4.	Replace desktop computer with laptop	1265

10.3 Equipment and saving

- **Suggestions:**
  - Optimum use of day light can further reduce electricity bill of the bank. Make design of proper window for sun light during day time.
  - Approximate Total Saving is Rs.2600
  - During winter and monsoon season bill would reduce more.

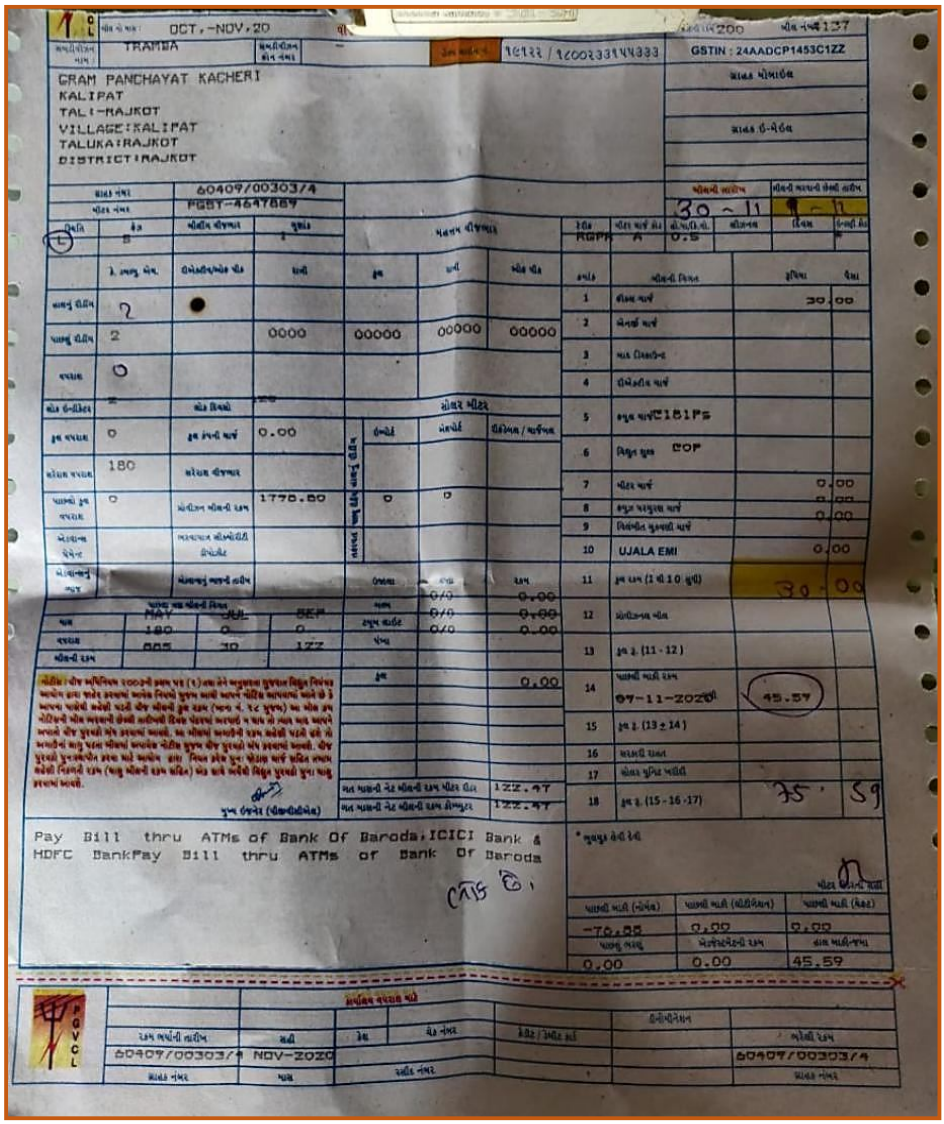


Fig. 8.6 Electricity Bill of Grampanchayat Kalipat village

8.1.8 Electrical Design 2

➢ Sustainable/ Renewable Energy source Planning/Costing:

- There is solar street light in Kalipat village but it is not in working condition.
- Some street light batteries were missing and some did not have panel.
- Talking to the Sarpanch and Talati in the village, he said that the solar street light has been running smoothly for 6 months and batteries and panels have been stolen from it in some remote areas of the village.
- The villagers said that you should arrange something so that the street light is not stolen and it will work for a long time.
- So we found this of design that can be fitted there to suit the current situation of the village. This solar street light is more beneficial for areas where there is no electricity connection such as access road to farm, river bank area and village border.

➢ **Integrated solar street light :**

Fig.8.7 Solar street light and actual view after installation

❖ **Technical Specifications :**

1. **Solar panel**
   - **Type**=Mono Crystalline
   - **Specifications**=18V 40Wp
   - **Life Time**=25 Years

2. **LED Lamp**
   - **Type**=OSRAM
   - **Specifications**=Lumen 2900 lm
   - **Life Time**=50,000 hours
   - **Color temp**=2700-6500

3. **Lens**
    - Batwing
    - PIR Sensor=Yes available
4. **Battery**
    - **Type**= LiFePo4
    - **Specifications**=12.8V 12Ah
    - **Life Time**=2000 cycles under standard condition
    - **Warranty**=3 years
5. **Housing Material**
    - Aluminum Anodized
    - **Visual Angle**=140° X 70°
6. **ChargingTime**
    - 6-8 hours (by sun)
    - **Working Time**=12 hours
7. **Operation**
    - Auto dusk to dawn
    - **Working Mode=**Dimming
8. **Working Temp**
    - **Charging**=-20 ~ +60°C
    - **Discharging**=-20 ~ +70°C
9. **Weight**
    - **Net**= 10Kg
    - **Gross=**11-12 Kg

- **Recommended Pole OD (Outer Diameter)=**60-63 mm (2.5 inch)
- **Recommended Pole Thickness=**2 to 3 mm
- **Recommended Distance (Pole to Pole)=**12~15m
- **Recommended Mounting Height=**4~5m
- **Certifications=**MNRE / ROHS / IP65
- **Product Warranty=**5 Years

(An ISO 9001:2015 Certified company)

- **STREET LIGHT ARRANGEMENT:**
    - Distance between each Street Light Pole:
        - Road Details: The width of road is **10.5Feet**
        - Pole Details: The height of Pole is **15 feet**
        - Space between two pole is **85 feet**
        - Approx. road length of Kalipat village is **4700 feet**
        - So, required no. of poles = **4700 / 100 = 47**

- Number of street light poles required in village is **47**
- **Approx. 47 solar street light installations require in Kalipat village.**

❖ **Warranty:**

- 5 years for Complete Solar Street Light.
- 25 years for Solar Panel

Sr. No. & Model no.	Description	BasicPrice/Unit(Rs)	Qty.	Amount(Rs) PRICE
bp45SSI	20 Watt All In one Solar Street Light Luminary Fixture with PIR Sensor (LiFePo4 Battery) -3 Years warranty	Rs.13,979/-	47Set	Rs. 6,57,013/-
	Box Contains Inside Street Light, mounting structure, Camera, Mounting Nuts & tools, Warranty Card, User Manual	Rs.4,800/-	47Nos.	Rs. 2,25,600/-
	TRANSPORT DOOR TO DOOR DELIVERY			Rs. 50,000/-
			47Set	Rs.9,32,613/-
Grand Total				
GST 5% FOR Street light			47Set	Rs. 32,850.65/-
GST 18% FOR Pole & Transport			47Nos.	Rs. 99,608/-
TOTAL AMOUNT				Rs. 1,065,071.65/-
Note: Inclusive of Supervision of Installation				

10.4 Abstract sheet-Solar street light

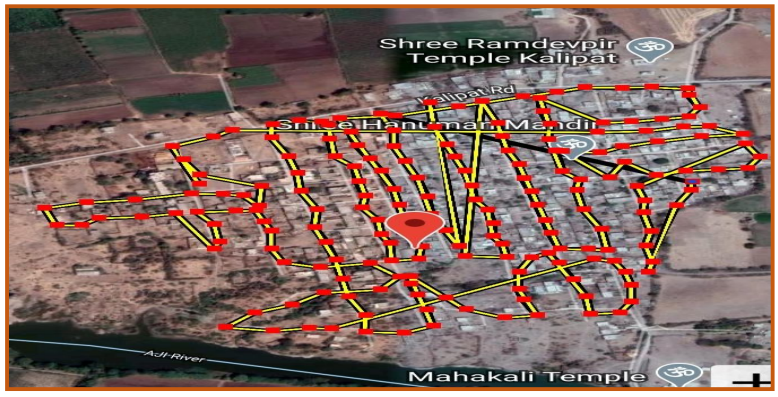


Fig:8.8 Planning of solar Street light installation in village map

8.1.9 Electrical Design 3

- **Renewable Energy source Planning/Costing :**

❖ Design of Off-Grid 50kW Solar System:

- We planned solar system for first 50 houses after successfully working of this.
- We implement this system in another 450 houses.
- Due to Covid-19 situation here we assume 1 KW electrical load of each house of village because of Sarpanch not give permission for home to home survey.
- An off-grid solar power system store the electricity produced by solar energy in batteries and utilize the stored energy when required.
- The reduction in solar panel prices over the years has further brought the system price down.
- The power generated by this system can be used as the excess power cannot be deal back to the government.

Fig:8.9 50 kW off grid solar panel system

Fig:8.2.1 Solar plant installed in farm

❖ **No. of components required for 50 kw off grid system**

- Solar panel in watt=335 watt
- Solat panel qty.=45 nos.
- Off-Grid solar inverter=50 KVA
- Solar structure=50 kW**,**
- Solar battery=30 nos.
- Junction box=1 nos.
- DC cable=400 meter
- AC cable=300 meter
- Space required=400 Sq meter
- Solar Accessories=Crimping Tool,Earthing Kit,Lighting Arrestor
-

Price = Rs. 32, 50,000/-
*(Latest price including installation)

- **Warranty**=5 years for complete system and 25 years for solar panel.
- **Average generation:** 200 units per day
- **Govt. Subsidy:** Yes Subsidy is available on off-grid Solar Power System.
- **Solar Net-Metering:** No, Solar Net-Metering is not applicable on this system.

10.5 Total cost of all three electrical design implementation in village

Sr. No.	Design details	Amount (Rs.)
1.	Energy audit and energy conservation	Rs. 2600/-
2.	All in one solar street light	Rs. 10,65,071.65/-
3.	Off grid 50kw solar plant	Rs. 32,50,000/-
	Total cost of design	**Rs. 43,17,671.65/-**

Approximate time for all Electrical design implementation in village area=8 months

8.2Reason for Students Recommending this Design

- This design helps the village to grow in every manner it can. All designs will help the public of the village for their welfare and growth in their lifestyle.
- Basically the village needs public health center for hygienic life of the public as village people are not much aware about clean and neat lifestyle.
- PHC will help the public for cheap medical services and medicines.
- As the public of rural area does not have medical insurance, then PHC will help them.
- Then for better transport facilities, we have provided a bus stand at the highway (turn) of the village. This bus stand is far better than past because it has some added facilities (Like, drinking water, watch, sitting arrangement, dustbin, etc.)So that people can wait easily.
- This bus stand helps to get noticed in the highway, and people can get updates of the coming bus.

- After than we have provided a garden in the village near the lake. Garden will improve the environment of the village.
- Garden will help the public of village to communicate with each other, so they can increase their contacts. Garden has facilities like gazebo, fountain, swings, etc. so that every age person can do some activity over there.
- For whole village, the main thing they wanted was good quality roads. Right now most part of the village is of bad roads.
- We are going to provide paver blocks in whole village for better roads , as it gives better view, durability , compatibility and many plus points gets covered. Blocks help to stay in any kind of weather.
- Cleanliness is required in any kind of place nowadays and if it comes to village then good drainage is must require.
- Current situation of the drainage is open gutters, which is not safe and bad for health, so we have provided covered pipelines.
- Water is the important source for human in daily life. So we are going to provide water tank to the village.
- Right now the old construction work does not provide good quality of water and also there are patches which losses the water.
- So new construction work will provide good quality water in increase the capacity.

8.3About designs Suggestions / Benefit of the villagers

- All designs which are provided are for the benefit of village and villagers.
- This all designs have its own specification for being helpful to people and village.
- These designs will increase the comfort level of people and make lifestyle a little bit smooth.
- In India, most of rural area does not have any idea about medical insurance.
- So PHC will help the public for cheap treatment and better medical facilities. PHC is the backbone of Indian rural areas for healthy life.
- Different govt. schemes also helpful for surgeries, treatment and medicines.
- Transportation in several modes is available in India, but for people in rural areas is not getting still benefits of transportation.
- Our village is 2-3 km away from highway, and bus stop is at the corner of entrance of village and not in good condition.
- So we decided to provide a good quality bus stand which comes in consideration in highway and people can have easy transportation to the nearby metro city.
- Facilities provided in bus stop will increase the standard of the village, and local transportation facility may increase in the village and people can also get employments.
- To clean up the environment of the village and increase social life of the public, we have decided to provide garden near the lake-end.
- Garden is the place where every person of any age can have their own activities to do.
- Kids can play by their own or we have provided swigs over there, teenagers can do exercise and maintain their fitness and old age people can spend their time in garden and can have different types of contacts through communication.

- Roads are the main feature of the rural areas. Right now in village, most of the roads are kuchha.
- So we are going to provide paver blocks in whole village, so that people can go smoothly anywhere without any fear of slipping of skidding.
- Paver blocks will help to complete the construction work speedily and it will resist every season.
- It will allow providing good drainage facility.
- Paver blocks will also help to maintain the cleanliness of the village and people can clean the roads easily.
- Drainage is the main and needed facility in the village, because right now there are open gutters, which is not suitable for better hygiene and clean life and may increase the chances of having different disease.
- Closed pipeline drainage will be provided in the village for better removal of the waste and easy clean up.
- It will also help for healthy lifestyle of public and better facilities in the village will come.
- Water is one of the main source without which a person cannot live.
- Good quality and proper quantity of water should be provided to the person.
- Current situation of the water tank is not proper, the quality of water is bad and there are patches from where the water is leaking.
- So providing water tank is must in the village for better day to life use of the public.

Chapter: 9

Proposing designsfor Future Development of the Village for the PART-II Design

- The Purpose of project is to provide urban amenities in rural area and maintaining the rural area well.
- This will help in developing villages in a sustainable manner, reduce migration from villages and prevent the cities from the urban pressure.
- After we surveyed Kalipat village many design we given in Part-I for development of village.
- For the good literacy we need to arrange one library there for holistic development of villagers.
- There is one Assembly hall but it is in bad condition right now, it needs maintenance for use.
- We have to make better Gram-panchayat.
- Also we can give them Post office, R.O. water filter, Waste management, Dairy, Playground, Development of River etc.
- Mainly there is two or three design are proposed,
    - Library, by which we can increase literacy rate in village.
    - Solid waste management…etc

Chapter: 10

Conclusion of the Entire Village Activities of the Project

- Village plays an important role in growing country.
- We have to provide services in areas of marketing, providing agricultural inputs such as fertilizer and agricultural machinery, municipal services such as health care and cleaning of village.
- By observing all village we can get good society if we apply all amenities whatever they needs.
- We get the idea of a model village. We got the idea about the future development and real image clear in our mind.
- By visiting ideal village our perception has completely change.
- Ideal village become more prosper and some village growth has stuck.
- We all focus on growth of village and its make independent.
- We gone for observing Ideal village, Smart village, and allocated village. There we could see lot of differences in three villages about facilities, People, Farming, Infrastructure etc.

We came on conclusion after visiting Smart village and ideal village, our village facilities are not enough for better living being. Villagers must have aware about the village facilities they have use. So we have to focus on many facilities provide in village and give as much they need. Our focus on completion of villagers needs.

Chapter: 11

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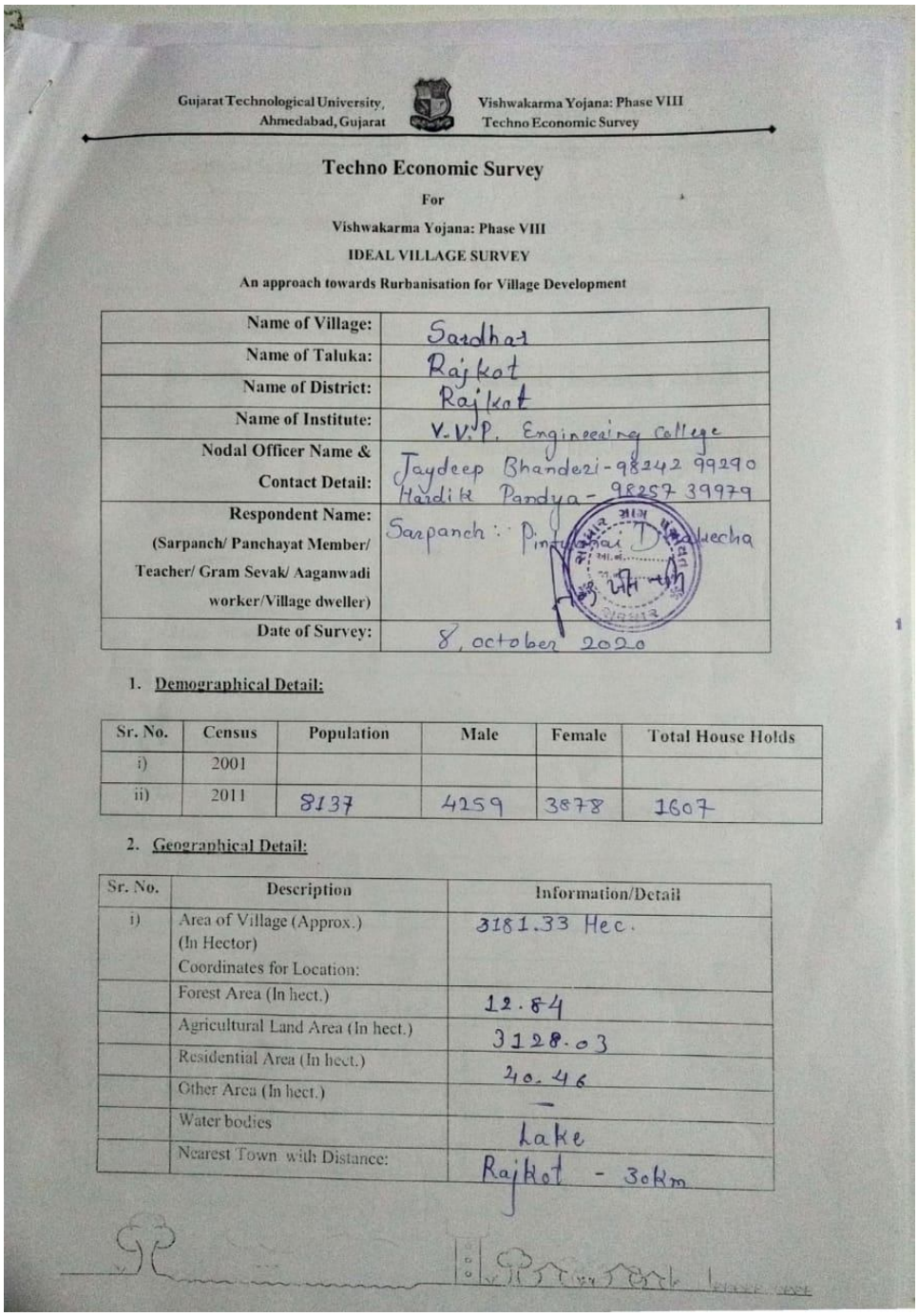
Chapter: 12

Annexure attachment

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



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:	Sardhar
Name of Taluka:	Rajkot
Name of District:	Rajkot
Name of Institute:	V.V.P. Engineering College
Nodal Officer Name & Contact Detail:	Jaydeep Bhanderi-98242 99290 Hardik Pandya - 98257 39979
Respondent Name: (Sarpanch/ Panchayat Member/ Teacher/ Gram Sevak/ Aaganwadi worker/Village dweller)	Sarpanch : Pin[illegible]ai D[illegible]vecha
Date of Survey:	8, october 2020

1. Demographical Detail:

Sr. No.	Census	Population	Male	Female	Total House Holds
i)	2001				
ii)	2011	8137	4259	3878	1607

2. Geographical Detail:

Sr. No.	Description	Information/Detail
i)	Area of Village (Approx.) (In Hector) Coordinates for Location:	3181.33 Hec.
	Forest Area (In hect.)	12.84
	Agricultural Land Area (In hect.)	3128.03
	Residential Area (In hect.)	40.46
	Other Area (In hect.)	-
	Water bodies	Lake
	Nearest Town with Distance:	Rajkot - 30Km

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3. Occupational Details:

Name of Three Major Occupation groups in Village	1.	Farming (Agriculture)
	2.	Business
	3.	Labour work

4. Physical Infrastructure Facilities:

Sr. No.	Descriptions	Detail	Adequate	Inadequate	Remarks
A.	**Main Source of Drinking water**				
	• Tap Water (Treated/ Untreated)	Treated	✓		
	• RO Water	No.			
	• Well (Covered/ Uncovered)	Covered	✓		
	• Hand pumps	No.- 3			
	• Tube well/ Borehole	yes	✓		
	• River/ Canal/ Spring/ Lake/ Pond	Lake (1)	✓		
Suggestions if any:					
B.	**Water Tank Facility**				
	Overhead Tank	Capacity:	2,00,000Lit		
	Underground Sump	Capacity:	2,00,000Lit	90,000Lit	
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	No			
	Whether drain water is discharged directly in to Water bodies/ Sewer plants	Water bodies			
Suggestions if any:					

E.	**Road Network :All Weather/ Kutchha (Gravel)/ Black Topped pucca/ WBM**				
	Village approach road	All weather			
	Main road	All weather			
	Internal streets	R.C.C. Road	✓		
	Nearest NH/SH/MDR/ODR Dist. in kms.	S.H.	✓		
Suggestions if any:					
F.	**Transport Facility**				
	Railway Station (Y/N) (If No than Nearest Rly Station---Kms)	No. Bhakti Nagar, 28.6 km		✓	
	Bus station (Y/N) Condition: (If No than Nearest Bus Station---Kms)	Yes, Good	✓		
	Local Transportation (Auto/ Jeep/Chhakda/ Private Vehicles/ Other)	All types of transportation available on S.H.	✓		
Suggestions if any:					
G.	**Electricity Distribution**				
	(Y/N) Govt./ Private (Less than 6 hrs./ More Than 6 hrs)	Yes. Govt. More than 6 hrs	✓		
	Power supply for Domestic Use	Yes	✓		
	Power supply for Agricultural Use	Yes	✓		
	Power supply for Commercial Use	Yes	✓		
	Road/ Street Lights	Yes	✓		

	Electrification in Government Buildings/ Schools/ Hospitals	Yes	✓		
	Renewable Energy Source Facilities (Y/ N)	Yes	✓		
	LED Facilities	Yes	✓		
Suggestions if any:					
H.	**Sanitation Facility**				
	Public Latrine Blocks If available than Nos.	Yes (1) 1	✓		
	Location Condition	Near Main Road Good	✓		
	Community Toilet (With bath/ without bath facilities)	Yes with bath at Smashan	✓		
	Solid & liquid waste Disposal system available	Yes	✓		
	Any facility for Waste collection from road	Yes Door to Door	✓		
Suggestions if any:					
I.	**Irrigation Facility:**				
	Main Source of Irrigation (Stream/River/ Canal/ Well/ Tube well/ Other)	Well, tubewell, Borewell	✓		
Suggestions if any:					
J.	**Housing Condition:**				
	Kutchha/Pucca (Approx. ratio)	5/95 Ratio	✓		

5. **Social Infrastructural Facilities:**

Sr. No.	Descriptions	Information/ Detail	Adequate	Inadequate	Remarks

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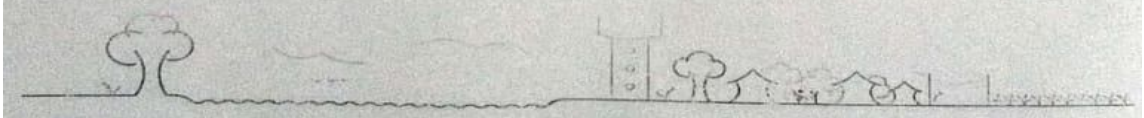
K.	**Health Facilities:**				
	Sub center/ PHC/ CHC /Government Hospital/ Child welfare & Maternity Homes (If Yes than specify No. of Beds) Condition:	1- PHC 2- Sub centre Better	✓		
	Private Clinic/Private Hospital/ Nursing Home	Private 12 (Approx)	✓		
	If any of the above Facility is not available in village than approx. distance from village: .....kms.				
Suggestions if any:					
L.	**Education Facilities:**				
	Aaganwadi/ Play group	6	✓		
	Primary School	5	✓		
	Secondary school	3	✓		
	Higher sec. School	3	✓		
	ITI college/ vocational Training Center	26km at Rajkot		✓	
	Art, Commerce& Science /Polytechnic/ Engineering/ Medical/ Management/ other college facilities	R.K. University Tramba, Rajkot			
	If any of the above Facility is not available in village than approx. distance from village: .....kms.				
Suggestions if any:					
M.	**Socio- Culture Facilities**				
	Community Hall (With or without TV) Location:	Yes Without TV SPS. School	✓		



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	Condition:	Good	✓		
	Public Library (With daily newspaper supply: Y/N) Location: Condition:	No.		✓	
	Public Garden Location: Condition:	No.		✓	
	Village Pond Location: Condition:	Yes Near S.H. Good	✓		Name of lake. Siddharaj Jaysinh.
	Recreation Center Location: Condition:	No		✓	
	Cinema/ Video Hall Location: Condition:	No		✓	
	Assembly Polling Station Location: Condition:	4 (Primary School) At All primary School Good	✓		
	Birth & Death Registration Office Location: Condition:	Yes, Panchayat Near S.H. Extremely 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	7	✓		

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Techno Economic Survey

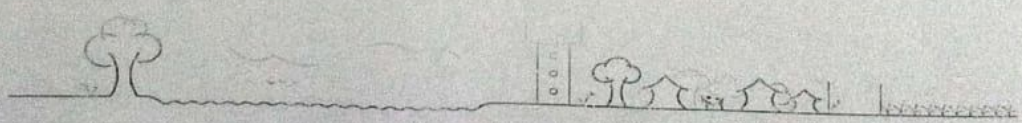
	General Market	1	✓		Near Bus Stand
	Shops (Public Distribution System)	Sahakari mandli - 1	✓		
	Panchayat Building	1	✓		
	Pharmacy/Medical Shop	7	✓		5-private 2-generic
	Bank & ATM Facility	2	✓		
	Agriculture Co-operative Society	Yes	✓		
	Milk Co-operative Soc.	Yes	✓		
	Small Scale Industries	Yes			12
	Internet Cafes/ Common Service Center/Wi Fi	No		✓	
	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	Yes, Most of household having solar water heter.	✓		
P.	Bio-Gas Plant Solar Street Lights Rain Water Harvesting System	Yes. Yes No	✓ ✓	 ✓	
Q.	Any Other				

7. **Data Collection From Village**

Village Base Map Available: Hard Copy/Soft Copy	



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Recent Projects going on for Development of Village	Over head tank construction, Drainage System in Some place
Any NGO working for village development	Yes, Swaminarayan temple - Sardhar

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)	Secondry School Building.	
2.	Additional Information/ Requirement	Many thing are good	

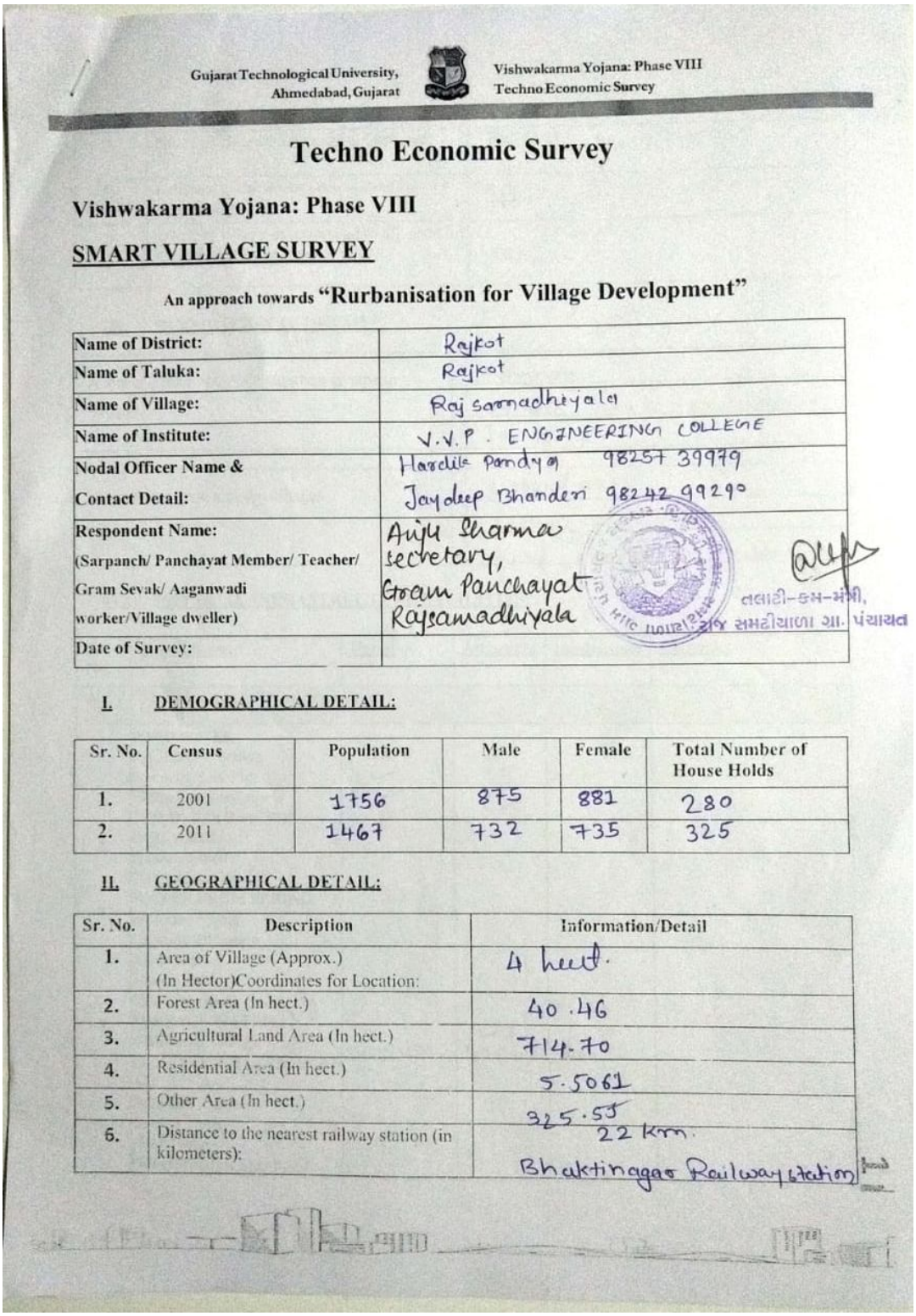
9. **Smart Village Proposal Design**

Sr. No.	Descriptions	Information/ Detail	Remarks
1.			

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

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

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



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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:	Rajkot
Name of Taluka:	Rajkot
Name of Village:	Raj samadhiyala
Name of Institute:	V.V.P. ENGINEERING COLLEGE
Nodal Officer Name & Contact Detail:	Hardik Pandya 98257 39979 Jaydeep Bhanderi 98242 99290
Respondent Name: (Sarpanch/ Panchayat Member/ Teacher/ Gram Sevak/ Aaganwadi worker/Village dweller)	Anju Sharma Secretary, Gram Panchayat Rajsamadhiyala
Date of Survey:	

તલાટી-કમ-મંત્રી, સમઢીયાળા ગ્રા. પંચાયત

I. DEMOGRAPHICAL DETAIL:

Sr. No.	Census	Population	Male	Female	Total Number of House Holds
1.	2001	1756	875	881	280
2.	2011	1467	732	735	325

II. GEOGRAPHICAL DETAIL:

Sr. No.	Description	Information/Detail
1.	Area of Village (Approx.) (In Hector)Coordinates for Location:	4 hect.
2.	Forest Area (In hect.)	40.46
3.	Agricultural Land Area (In hect.)	714.70
4.	Residential Area (In hect.)	5.5061
5.	Other Area (In hect.)	325.55
6.	Distance to the nearest railway station (in kilometers):	22 km. Bhaktinagar Railway station

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7.	Name of Nearest Town with Distance:	Rajkot - 22 km
8.	Distance to the nearest bus station (in kilometers):	Yes
9.	Whether village is connected to all road for the any facility or town or City?	Yes

III. OCCUPATIONAL DETAILS:

Name of Three Major Occupation groups in Village	1. Farming 2. Small scale Industries 3. Job work.
Major crops grown in the village:	1. Ground nut 2. cotton 3. wheat, chana, Vegetables.

IV. PHYSICAL INFRASTRUCTURE FACILITIES:

Sr. No.	Descriptions	Detail	Adequate	Inadequate	Remarks
A.	**Main Source of Drinking water**				
1.	**PIPED WATER** Piped Into Dwelling Piped To Yard/Plot Public Tap/Standpipe Tube Well Or Bore Well	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓		
2.	**DUG WELL** Protected Well Un Protected Well				
3.	**WATER FROM SPRING** Protected Spring Unprotected Spring				
	Rainwater Tanker Truck Cart With Small Tank				
4.	**SURFACE WATER (RIVER/DAM/ LAKE/POND/STREAM/CANAL/** Irrigation Channel Bottled Water Hand Pump Other(Specify)**Lake/ Pond**	10 river	49 check dam		

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Suggestions if any:

B.	**Water Tank Facility**				
	Overhead Tank	Capacity:			
	Underground Sump	Capacity:	1,00,000		

Suggestions if any:

C.	**The Type of Drainage Facility**				
	A. UNDERGROUND DRAINAGE 1 close drainage 2 B. OPEN WITH OUTLET C. OPEN WITHOUT OUTLET	✓ ✓			only 5% open drainage system

Suggestions if any:

D.	**Road Network :All Weather/ Kutchha (Gravel)/ Black Topped pucca/ WBM**				
	Village approach road	All weather Road			
	Main road	C.C Road			
	Internal streets	C.C Road			
	Nearest NH/SH/MDR/ODR Dist. in kms.	Rajkot-Bhavnagar S.H.			

Suggestions if any:

E.	**Transport Facility**				
	Railway Station (Y/N) (If No than Nearest Rly Station---Kms)	No, Bhaktinagar 22km.			
	Bus station (Y/N) Condition: (If No than Nearest Bus Station---Kms)	Yes good.			
	Local Transportation (Auto/ Jeep/Chhakda/ Private Vehicles/ Other)	All types of transportation vehicle available on High road.			

Suggestions if any:

F.	**Electricity Distribution**				
	(Y/N) Govt./ Private (Less than 6 hrs./ More Than 6 hrs)	Yes Govt. 24 Hrs.	✓		

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Vishwakarma Yojana: Phase VIII
Techno Economic Survey

	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)	Y			
	LED Facilities	✓			
Suggestions if any:					
G.	**Sanitation Facility**				
	Public Latrine Blocks If available than Nos.	✓ 5			
	Location Condition	3			
	Community Toilet (With bath/ without bath facilities)	Cricket ground -1 Community bath at shantidham.			
	Solid & liquid waste Disposal system available	Yes			
	Any facility for Waste collection from road	Yes from grampanchyat workers. D to D			
Suggestions if any:					
H.	**Main Source of Irrigation Facility:**				
	TANK/POND	10 Lakes, 49 Checkdams			
	STREAM/RIVER				
	CANAL				
	WELL	Well			
	TUBE WELL	tubewell			
	OTHER (SPECIFY)	Borewell-2 River			
Suggestions if any:					
I.	**Housing Condition:**				
	Kutchha/Pucca (Approx. ratio)	5/95			

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V. SOCIAL INFRASTRUCTURAL FACILITIES:

Sr. No.	Descriptions	Information/ Detail	Adequate	Inadequate	Remarks
J.	**Health Facilities:**				
	ICDS (Anganwadi)				
	Sub-Centre	✓			
	PHC	✓			
	BLOCK PHC	X			
	CHC/RH	X			
	District/ Govt. Hospital	X			
	Govt. Dispensary	X			
	Private Clinic	X			
	Private Hospital/	X			
	Nursing Home	X			
	AYUSH Health Facility	X			
	sonography /ultrasound facility	X			
	If any of the above Facility is not available in village than approx. distance from village: ...7.....kms.	Sardhar & Kasturbadham.			
Suggestions if any:					
K.	**Education Facilities:**				
	Aaganwadi/ Play group	✓			
	Primary School	✓			
	Secondary school	✓			
	Higher sec. School	-	Sardhar & Kasturbadham.		
	ITI college/ vocational Training Center	22 km Rajkot.			
	Art, Commerce& Science /Polytechnic/ Engineering/ Medical/ Management/ other college facilities		R.K.	University Tramba.	
	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)	with TV.			
	Public Library (With daily newspaper supply: Y/N)	Building			No.
	Public Garden	Good.		Yes.	
	Village Pond			Yes.	
	Recreation Center			Yes	
	~~Cinema~~/ Video Hall	Good		Yes	
	Assembly Polling Station	Good	Primary School (From Panchyat		
	Birth & Death Registration	Good.			

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

Suggestions if any:

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

Suggestions if any:

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

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VI. SUSTAINABLE /GREEN INFRASTRUCTURE FACILITIES:

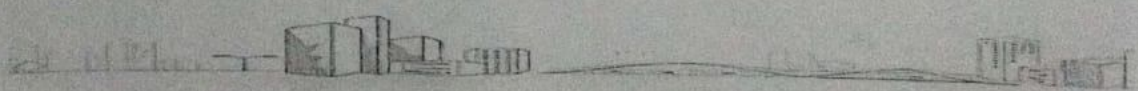
Sr. No.	Descriptions	Information/ Details	Adequate	Inadequate	Remarks
1.	Adoption of Non-Conventional Energy Sources/ Renewable Energy Sources	Yes Solar Rooftop at house.			
2.	Bio-Gas Plant Solar Street Lights Rain Water Harvesting System	- Yes Yes			
3.	Any Other	Solar Rooftop & Solar heater			

VII. DATA COLLECTION FROM VILLAGE

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

VIII. ADDITIONAL INFORMATION/ REQUIREMENT:

Sr. No.	Descriptions	Information/ Detail	Remarks



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1.	**Repair & Maintenance of Existing Public Infrastructure facilities,** **School Building** **Health Center** **Panchayat Building** **Public Toilets & any other**	 ✓ × × ×	
2.	**Additional Information/ Requirement**		
3.	**During the last six months how many times CLEANING** ....Regularly....weekly **FOGGING**...15...days...and...Anti...animals **Drive was undertaken in the village?**		

IX. Smart Village / Heritage Details

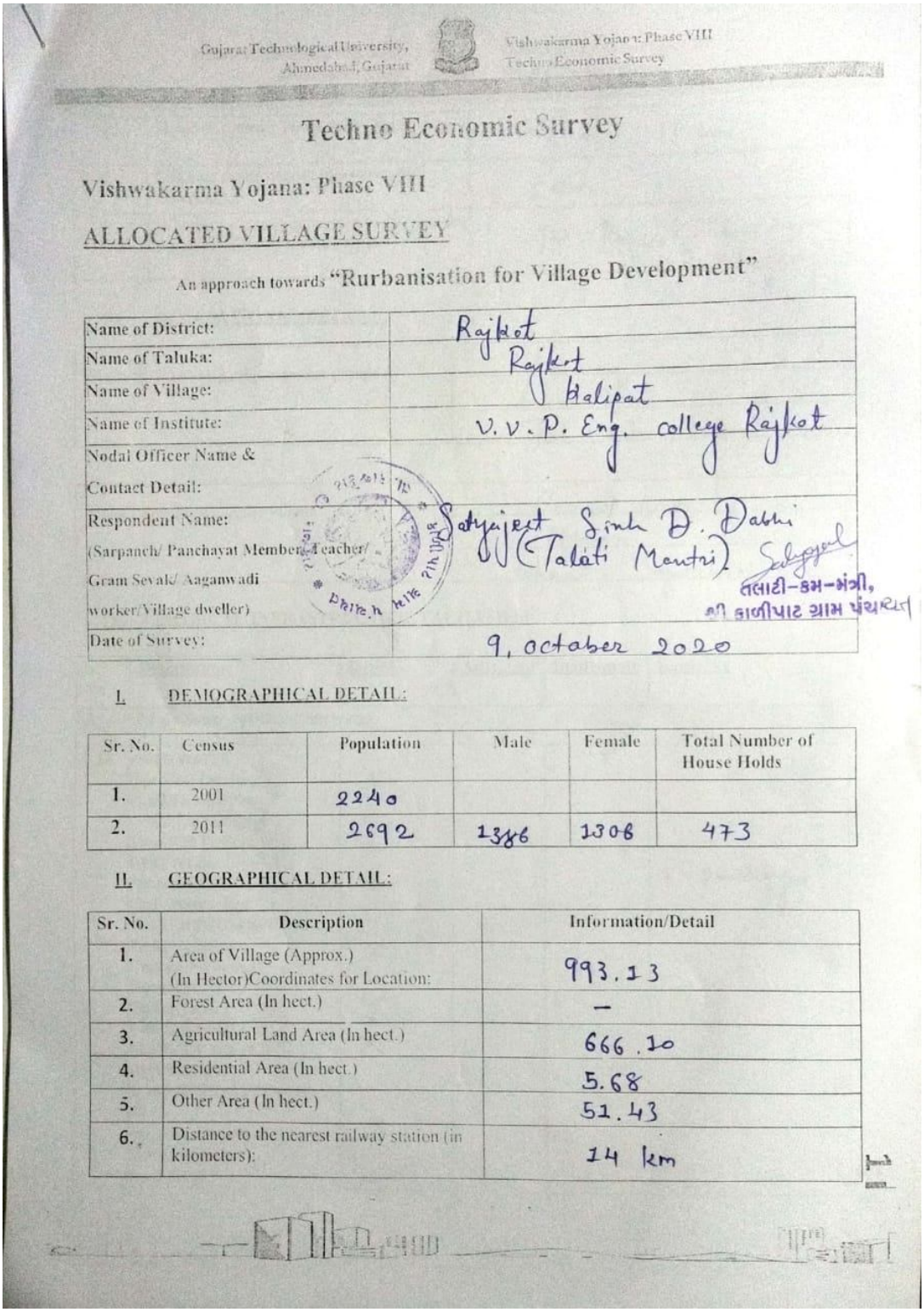
Sr. No.	Descriptions	Information/ Detail	Remarks
1.	IS THEIR ANY THING FOR THE VILLAGE ENHANCEMENT POSSIBLE ?		

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

તલાટી-કમ-મંત્રી,
રાજ સમઢીયાળા ગ્રા. પંચાયત

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



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Vishwakarma Yojana: Phase VIII
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Techno Economic Survey

Vishwakarma Yojana: Phase VIII

ALLOCATED VILLAGE SURVEY

An approach towards "Rurbanisation for Village Development"

Name of District:	Rajkot
Name of Taluka:	Rajkot
Name of Village:	Kalipat
Name of Institute:	V. V. P. Eng. college Rajkot
Nodal Officer Name & Contact Detail:	
Respondent Name: (Sarpanch/ Panchayat Member/ Teacher/ Gram Sevak/ Aaganwadi worker/Village dweller)	Satyajeet Singh D. Dabhi (Talati Mantri) Satyajeet તલાટી-કમ-મંત્રી, શ્રી કાળીપાટ ગ્રામ પંચાયત
Date of Survey:	9, october 2020

I. DEMOGRAPHICAL DETAIL:

Sr. No.	Census	Population	Male	Female	Total Number of House Holds
1.	2001	2240			
2.	2011	2692	1386	1308	473

II. GEOGRAPHICAL DETAIL:

Sr. No.	Description	Information/Detail
1.	Area of Village (Approx.) (In Hector)Coordinates for Location:	993.13
2.	Forest Area (In hect.)	–
3.	Agricultural Land Area (In hect.)	666.10
4.	Residential Area (In hect.)	5.68
5.	Other Area (In hect.)	51.43
6.	Distance to the nearest railway station (in kilometers):	14 km

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7.	Name of Nearest Town with Distance:	Rajkot - 11 km
8.	Distance to the nearest bus station (in kilometers):	1 km
9.	Whether village is connected to all road for the any facility or town or City?	Yes, Rajkot - Bhavnagar State highway

III. OCCUPATIONAL DETAILS:

Name of Three Major Occupation groups in Village	1.	Farming
	2.	Labour
	3.	Job (Immitation)
Major crops grown in the village:	1.	Ground Nut.
	2.	Cotton
	3.	wheat, Vegetables 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	✓			
2.	**DUG WELL**				
	Protected Well	✓			1 - panchayat
	Un Protected Well				
3.	**WATER FROM SPRING**				
	Protected Spring	X			
	Unprotected Spring	✓			
	Rainwater	✓			
	Tanker Truck	X			
	Cart With Small Tank	X			
4.	**SURFACE WATER (RIVER/DAM/ LAKE/POND/STREAM/CANAL/**				
	Irrigation Channel	X			
	Bottled Water	X			
	Hand Pump	✓			2

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	Other(Specify)Lake/ Pond				
Suggestions if any:					
B.	**Water Tank Facility**				
	Overhead Tank	Capacity:	30000	50000	20
	Underground Sump	Capacity:			
Suggestions if any:					
C.	**The Type of Drainage Facility**				
	A. UNDERGROUND DRAINAGE 1 Closed	✓			Closed
Suggestions if any:					
D.	**Road Network :All Weather/ Kutchha (Gravel)/ Black Topped pucca/ WBM**				
	Village approach road	BTP			
	Main road	R.C.C.			
	Internal streets				Under Constn.
	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 14 Km			
	Bus station (Y/N) Condition: (If No than Nearest Bus Station---Kms)	Yes Good			
	Local Transportation (Auto/ Jeep/Chhakda/ Private Vehicles/ Other)	Auto & Private Vehicle			
Suggestions if any:					
F.	**Electricity Distribution**				
	(Y/N) Govt./ Private (Less than 6 hrs./ More Than 6 hrs)	Yes Gov. More than 6 hrs			

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	Power supply for Domestic Use	Yes			
	Power supply for Agricultural Use	Yes			
	Power supply for Commercial Use	Yes			
	Road/ Street Lights	Yes			
	Electrification in Government Buildings/ Schools/ Hospitals	Yes			
	Renewable Energy Source Facilities (Y/ N)	No			
	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)	In Smasken (with bath)			
	Solid & liquid waste Disposal system available	Yes By Dustubin			
	Any facility for Waste collection from road	Ruda			

Suggestions if any:

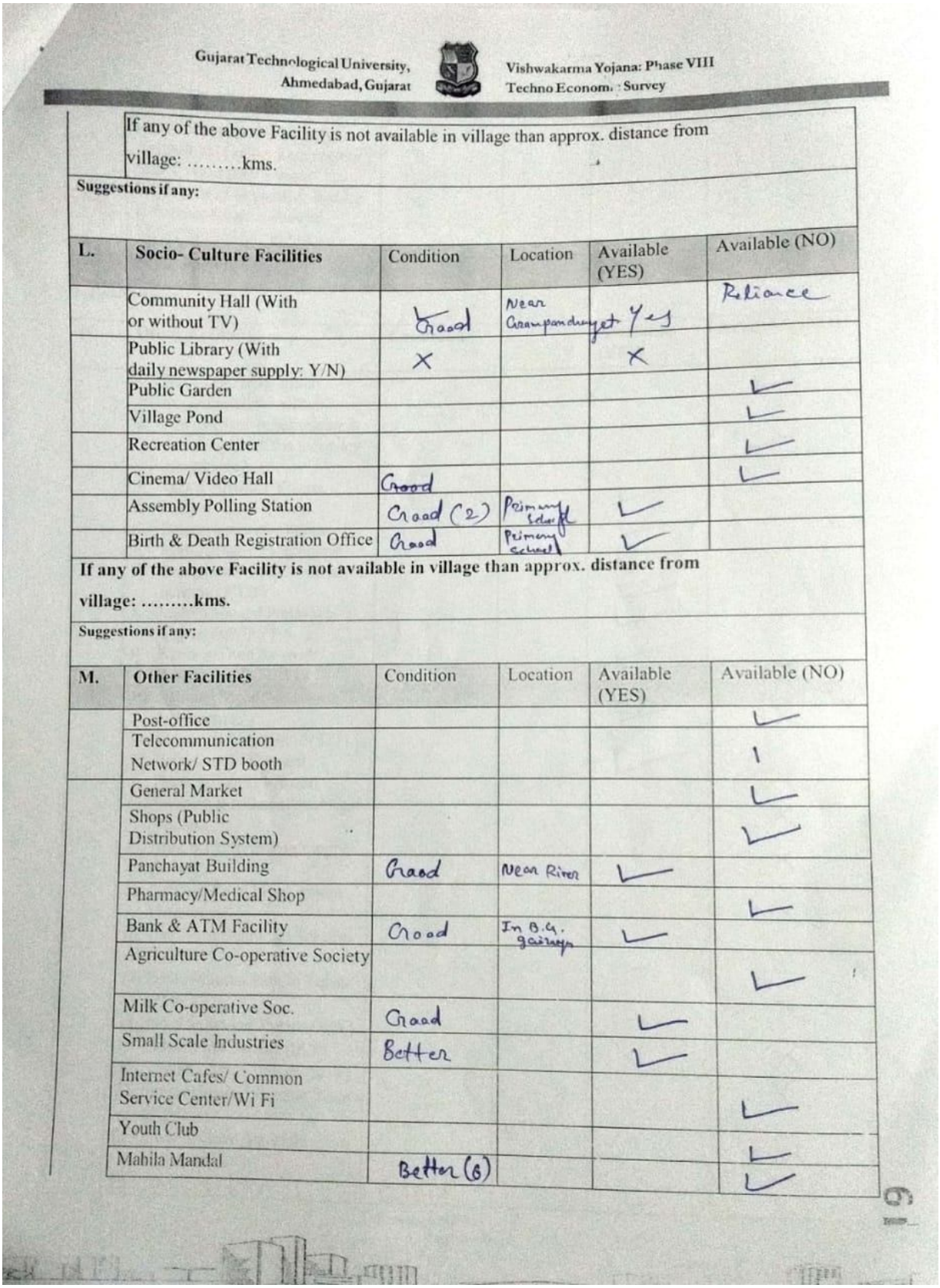
H.	**Main Source of Irrigation Facility:**				
	TANK/POND	Pond			
	STREAM/RIVER	Yes			
	CANAL	No			
	WELL	Yes			
	TUBE WELL	Yes			
	OTHER (SPECIFY)	-			

Suggestions if any:

I.	**Housing Condition:**				
	Kutchha/Pucca (Approx. ratio)	27/73			

V. SOCIAL INFRASTRUCTURAL FACILITIES:

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



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

Suggestions if any:

L.	Socio- Culture Facilities	Condition	Location	Available (YES)	Available (NO)
	Community Hall (With or without TV)	Good	Near Grampanchayat	Yes	Reliance
	Public Library (With daily newspaper supply: Y/N)	X		X	
	Public Garden				✓
	Village Pond				✓
	Recreation Center				✓
	Cinema/ Video Hall	Good			✓
	Assembly Polling Station	Good (2)	Primary School	✓	
	Birth & Death Registration Office	Good	Primary school	✓	

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

Suggestions if any:

M.	Other Facilities	Condition	Location	Available (YES)	Available (NO)
	Post-office				✓
	Telecommunication Network/ STD booth				1
	General Market				✓
	Shops (Public Distribution System)				✓
	Panchayat Building	Good	Near River	✓	
	Pharmacy/Medical Shop				✓
	Bank & ATM Facility	Good	In B.G. gairaya	✓	
	Agriculture Co-operative Society				✓
	Milk Co-operative Soc.	Good		✓	
	Small Scale Industries	Better		✓	
	Internet Cafes/ Common Service Center/Wi Fi				✓
	Youth Club				✓
	Mahila Mandal	Better (6)			✓

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	Credit Cooperative Society				
	Agricultural Cooperative Society	X			
	Milk Cooperative Society	✓			
	Fishermen's Cooperative Society	X			
	Computer Kiosk/ e-chaupal /	X			
	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)			✓	X
	10. National Social Assistance Programme			✓	X
	11. Sanitation Programme (SP)				X
	12. Rajiv Gandhi National Drinking Water Mission			✓	X
	13. Swarnjayanti Gram Swarozgar Yojana				X
	14. Minimum Needs Programme (MNP)				X
	15. National Rural Employment Programme				X
	16. Employee Guarantee Scheme (EGS)				X
	17. Prime Minister Rojgar Yojana (PMRY)				X
	18. Jawahar Rozgar Yojana (JRY)				X
	19. Indira Awas Yaojna (IAY)				X
	20. Samagra Awas Yojana (SAY)				X
	21. Sanjay Gandhi Niradhar Yojana (SGNY)				X
	22. Jawahar Gram Samridhi Yojana (JGSY)				X
	23. Other (SPECIFY)	Well (Ambedakar Yojana)		✓	

VI. SUSTAINABLE /GREEN INFRASTRUCTURE FACILITIES:

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

VII. DATA COLLECTION FROM VILLAGE

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

Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Techno Economic Survey

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 ..Weekly..... FOGGING..... Drive was undertaken in the village?		

IX. Smart Village / Heritage Details

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

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

તલાટી-કમ-મંત્રી,
શ્રી કાળીપાટ ગ્રામ પંચાયત

સરપંચ,
કાળીપાટ ગ્રામ પંચાયત

12.4 Gap Analysis of the Allocated Village

12.1 Gap Analysis of Allocated Village

VILLAGE GAP Analysis					
Village Facilities	**Planning Commission/UD PFI Norms**	**Village Name:**	KALIPAT		
		Population:			
		Existing	**Required as per Norms**	**Smart Vilage / Cities / Heritage Future Projection Design**	Gap
Social Infrastructure Facilities					
Education					
Anganwadi	Each or Per 2500 population	1	1	0	**0**
Primary School	Each Per 2500 population	1	1	0	**0**
Secondary School	Per 7,500 population	0	0	0	**0**
Higher Secondary School	Per 15,000 Population	0	0	0	**0**
College	Per 125,000 Population	0	0	0	**0**
Tech. Training Institute	Per 100000 Population	0	0	0	**0**
Agriculture Research Centre	Per 100000 Population	0	0	0	**0**
Skill Development Center	Per 100000 Population	0	0	0	**0**
Health Facility					
Govt/Panchyat Dispensary or Sub PHC or Health Centre	Each Village	1	1	0	**0**
Primary Health & Child Health Center	Per 20,000 population	0	0	0	**0**
Child Welfare and Maternity Home	Per 10,000 population	0	0	0	**0**
Multispeciality Hospital	Per 100000 Population	0	0	0	**0**
Public Latrines	1 for 50 families (if toilet is not there in home, specially for slum pockets &kutcha house)	0	0	0	**0**
Physical Infrastructure Facilities					
Transportation		**Adequate/ Inadequate**			
Pucca Village Approach Road	Each village	1	1	0	**0**
Bus/Auto Stand provision	All Villages connected by PT (ST Bus or Auto)	0	1	0	**1**
Drinking Water (Minimum 70 lpcd)		**Adequate/ Inadequate**			
Over Head Tank	1/3 of Total Demand				
U/G Sump	2/3 of Total Demand				

Drainage Network - Open		**Inadequate**			
Drainage Network - Cover		0	1	0	**1**
Waste Management System		**Inadequate**	1	0	**1**
Socio- Cultural Infrastructure Facilities					
Community Hall	Per 10000 Population	0	0	0	**0**
community hall and Public Library	Per 15000 Population	0	0	0	**0**
Cremation Ground	Per 20,000 population	0	0	0	**0**
Post Office	Per 10,000 population	0	0	0	**0**
Gram Panchayat Building	Each individual/group panchayat	0	0	0	**0**
APMC	Per 100000 Population	0	0	0	**0**
Fire Station	Per 100000 Population	0	0	0	**0**
Public Garden	Per village	0	0	0	**0**
Police post	Per 40,000Population	0	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 Details of All the Villages Designs in Table form as Part-I and Part-II

Sr. No.	Village Name	Discipline	Part-I	Part-2
1	Nakarwadi	Civil	Post Office	Solid Waste Collection
			Road	Roof Rain water harvesting
			Community Hall	Library
			Cyber Cafe	PHC
			Public Toilet	Pump House
			Chabutro	Milk-Dairy
		Electrical	On-Grid Solar Plant (100kW)	
			Solar Street Light	
			Energy Audit	
2	Haripar	Civil	Community Hall	Bus Stop
			E-Corner Center	Post Office
			PHC Center	Dairy
			Water Tank	Library
			Bore With Ground Water Recharging	Garden and Children Play Ground
			Bio-gas Plant	Smart Dust Bin
		Electrical	Solar Power Plant	Home Automation with Blynk using Node MCU (ESP8266)
			Solar Street Light	Solar Rooftop Plant 3kW)
			Energy Audit	Solar photovoltaic water pumping Systems
3	Khirsara	Civil	Public Library	Foot Path
			Rainwater Harvesting	Animal health Care Centre
			Bust Stop	Dairy
			ATM	Community Hall
			Public toilet	Septic Tank
			Children Play Ground	Gram Panchayat Office
		Electrical	Economical Energy Conservation & Primary Energy audit of Government School	Home Automation with Blynk using NodeMCU
			Solar Street Light	Solar photovoltaic water pumping Systems
			Solar Power Plant	Solar Roof Top 4.02 kW
4	Kalipat	Civil	PHC	Community Hall
			Bus Station	Entance Gate
			Pavement Design	Library
			Garden	Medical Store
			Drainage System	Post Office
			Water Tank	Public Toilet
		Electrical	Energy Audit of Gram Panchayat Building	CCTV Camera Installation with DVR

			Integrated Solar Street Light	Home Automation System Using A Wi-Fi Module
			Off-Grid Solar System (50 kW)	Multi-Utility Protection System for Agricultural Equipment
5	Naranpar	Civil	Bus-Stand	Waste Water Management
			PHC	Secondary High School
			Vocational Training Center	Coaching Centre
			Meditation Hall	Public Garden
			Chabutaro	Post Office
			Soak Pit	Bank
		Electrical	Energy Audit	Solar Cleaning System
			Solar Plant	Design of CCTV Camera
			Solar Street Light	Home Automation with Blynk using Node
6	MotaRampar	Civil	Pharmacy Store	Bus Stand
			Community Hall	Post Office
			Super Market	Dairy
			ATM	Library
			Cyber Cafe	Garden and Children Play Area
			Entrance Gate	Dust Bin
		Electrical	Energy Audit	
			Solar Street Light	
			Solar Power Plant	

12.2 Summary of All Village Design

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

All design are already available in A3 sheets.

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

<table>
<tr><td colspan="2">Ideal Village-Sardhar</td></tr>
<tr><td> 
Fig:12.1 Swaminarayan temple-Sardhar</td><td> 
Fig: 12.2 Grampanchayat-Sardhar</td></tr>
<tr><td> 
Fig: 12.3 Ayushman Bharat</td><td> 
Fig:12.4 Sardhar village Top view</td></tr>
</table>

Smart Village-Rajsamadhiyala

Fig:12.5 Rules and Regulation

Fig:12.6 Angadwadi

Fig:12.7 Solar Light

Fig:12.8 Network Tower

Allocated Village-Kalipat

Fig:12.9 Rules and Regulation

Fig:12.2.1Angadwadi

Fig:12.2.2 Aji River

Fig: 12.2.3 Gamtal Map

12.8 Village Interaction with sarpanch Report with the photograph

Fig: 12.2.4 At Grampanchyat-Kalipat

Fig:12.2.5 Interaction with Talati Mantri

12.9 Sarpanch Letter giving information about the village development

राष्ट्राय स्वाहा इदं न मम ।

V.V.P. Engineering College

राष्ट्राय स्वाहा इदं न मम् ।

Opp.motel the village, kalawad road, virda-vajdi Rajkot-5
Civil engineering department

To,

Sarpanch shree/ Talati cam mantri,

Village: Kalipat,

District: Rajkot

Subject: approval of design for Kalipat village, Rajkot district to the students of Gujarat technological university-Ahmadabad in vishwakarma yojana phase-VIII

Respected sir,

As per "vishwakarma yojana phase-VIII" guidelines following students are allocated Kalipat village as part of project. From the visit of village and valuable information provided by you. As the outcome of our project they proposed design with a details design plan, estimation and costing.

Kindly accept our design proposal, do assuming that this is allocated by government of Gujarat with consent from Gujarat technological university-Ahmadabad. For the same we students of vvp engineering collage Rajkot are proposing the design for study purpose only.

STUDENT NAME	BRANCH NAME	ENROLLMENT NO
Mori Ravi B.	Civil Engineering	180473106013
Jani Dharmang	Civil Engineering	180473106007
Bathawar Sanjay	Electrical Engineering	170470109004

Details of proposal design:

1. Primary health centre
2. Public Garden
3. Bus stand
4. Drainage Design
5. Pavement Design
6. Water tank

I am talati mantra/sarpanch of Kalipat village and accepting your proposal design for development of village given by under vishwakarma yojana phase-VIII.

Talati mantri/ Sarpanch

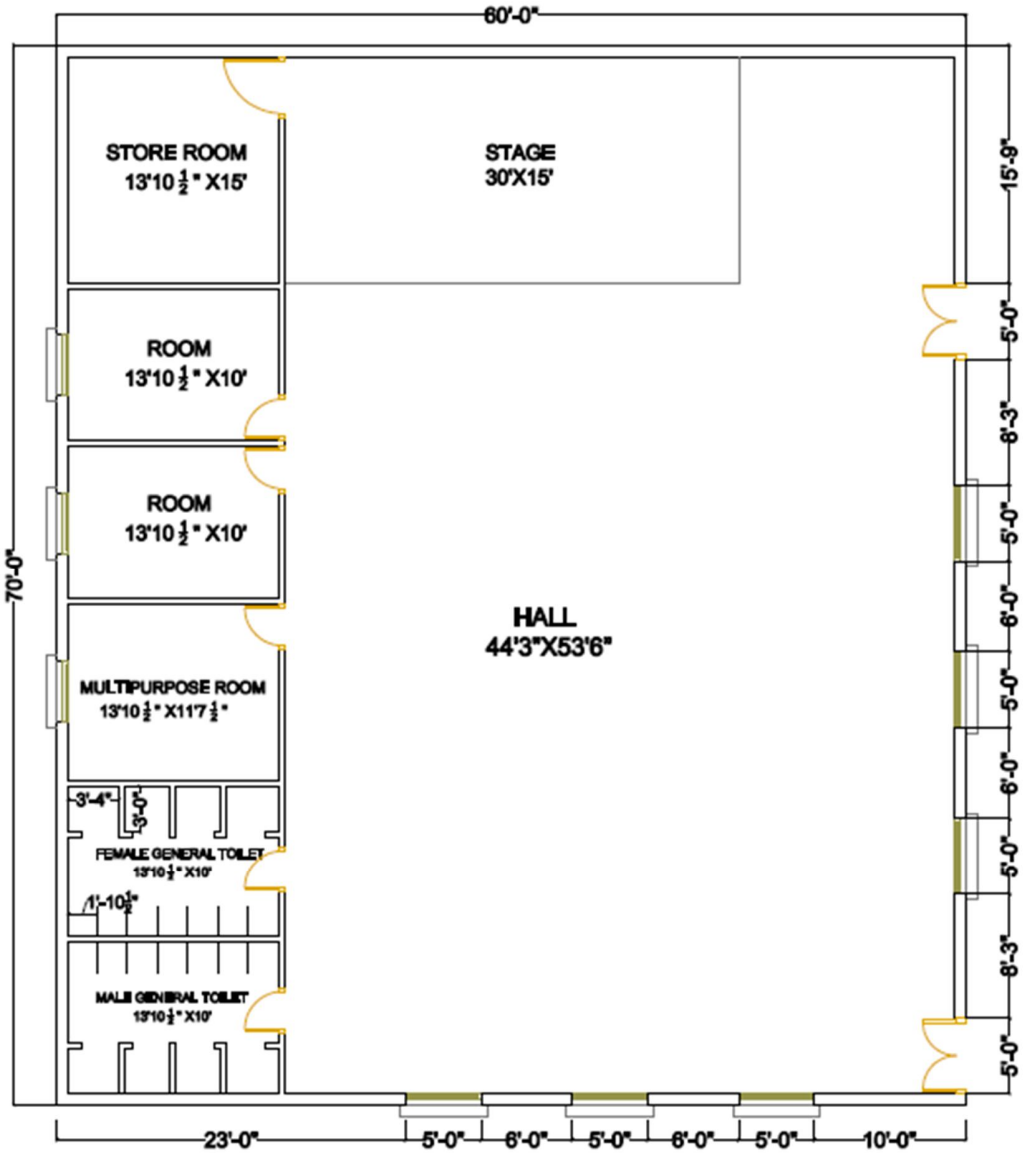
Kalipat, Rajkot

Chapter: 13

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

13.1 Design Proposals

13.1.1 Civil Design 1 : Community Hall



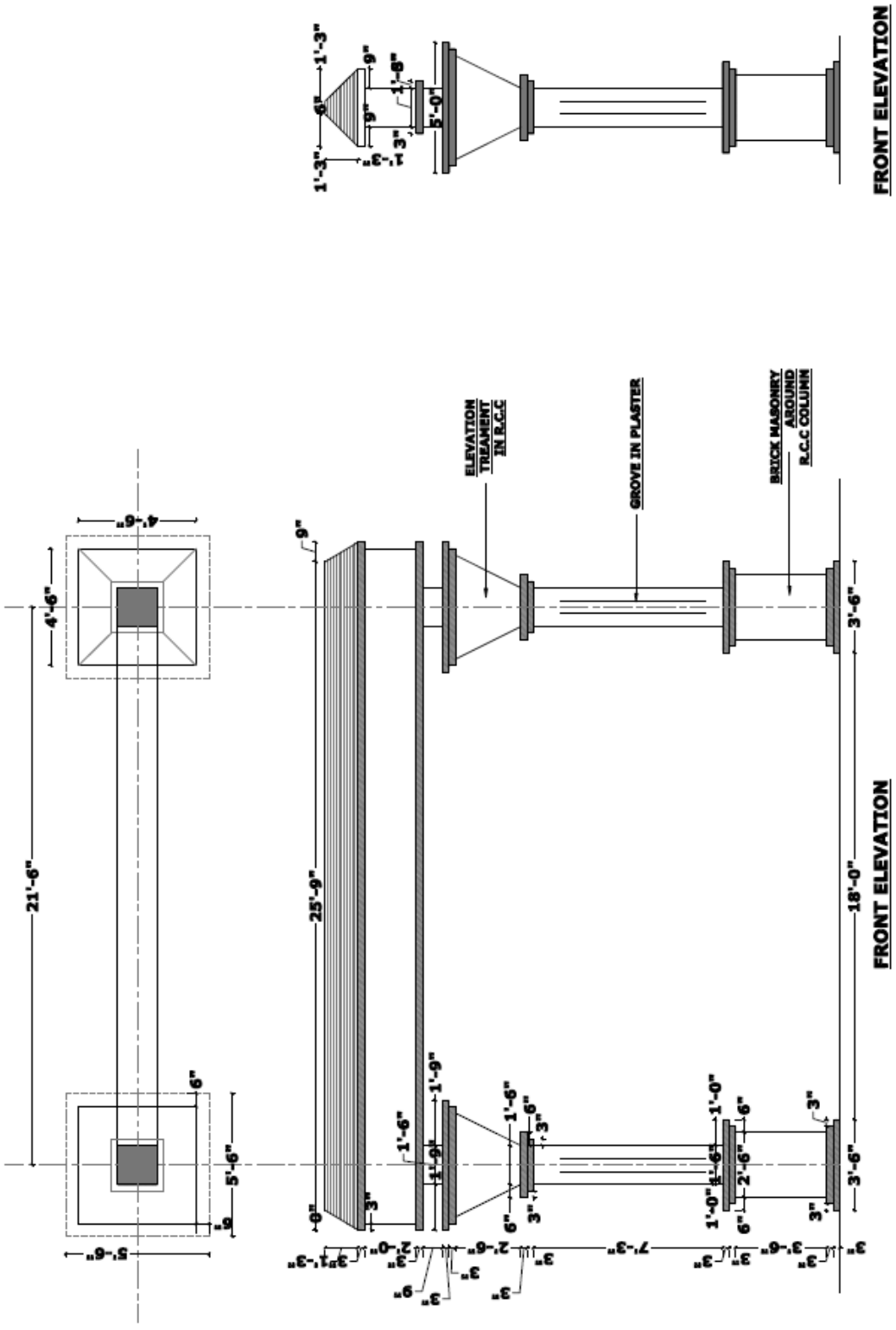
Community Hall

Name of Work : Community Hall		
Sr.No.	**Particular**	**Amount in Rs.**
1	Civil work	18,58,172.48
	Total - A	18,58,172.48
2	Add 3% Contingency charges (B)	55,745.18
	Total A + B	19,13,917.65
3	Add 2% Work charge est. charge on A + B	19,139.65
4	Add 1% quality control charge on - A+ B	19,139.65
	Total Rs.	19,52,196.95
	Say Total Rs.	19,53,200

Abstract sheet				
QTY	**Item Work & Rate**		**Unit**	**Total AMT**
118.89	Earth excavation upto 1.5m for foundation	131.20	Cu.m.	15,598.37
21.4	C.C work in foundation with 1:2:4	3228	Cu.m.	69,080
19.5	P.C.C work for plinth area with 1:3:6	3617	Cu.m	70,531.5
305.26	Brick masonry work with 1:3 mortar and first class brick	3870	Cu.m.	1,181,356.2
58.55	R.C.C work in slab with 1:2:4	6742	Cu.m.	3,94,744.1
21.55	Plastering work with 1:4	1617	Sq.m.	34,846.35
10.22	(Optional) Plumbing work in required area	3618	`Sq.m.	36,975.96
5.1	(Optional) Electrical work in required area	5400	Sq.m.	27,540
22	(Optional) Furniture work in required zone	1250	Sq.ft.	27,500
				18,58,172.48

Table: 13.1 Abstract sheet-Community hall

13.1.2 Civil Design 2: Entrance Gate

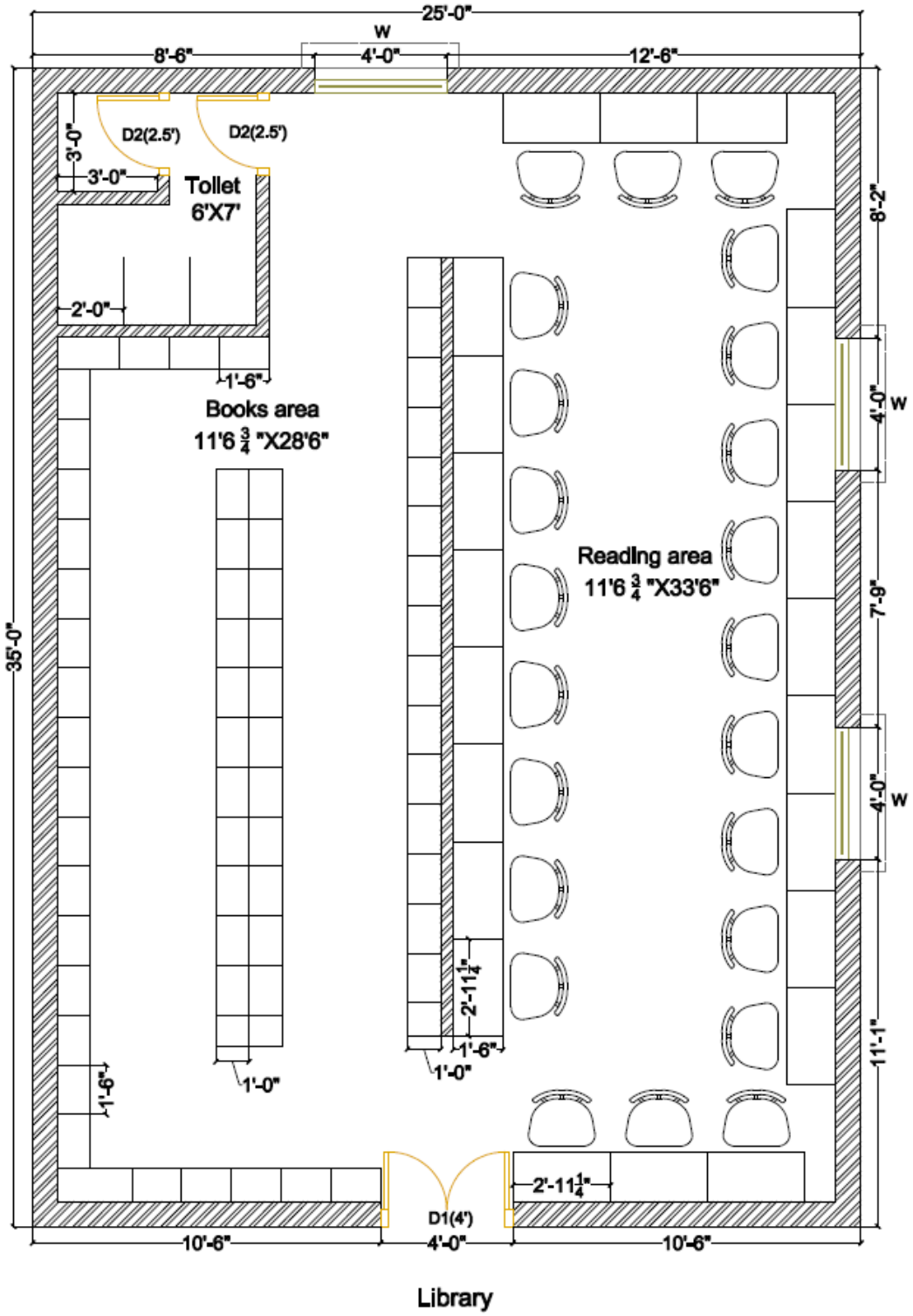


Name of Work : Entrance Gate		
Sr.No.	**Particular**	**Amount in Rs.**
1	Civil Work	98559.1
	Total – A	98559.1
2	Add 3% contingency charges(B)	2956.77
	Total A+B	101515.88
3	Add 1% work charges est. charge on A+B	1015.16
4	Add 1% quality control charge on A+B	1015.16
	Total Rs.	103546.2
	Say total Rs.	104000

Abstract sheet				
QTY	**Item Work & Rate**		**Unit**	**Total AMT**
3.4	Earth excavation up to 1.5m for foundation	131.20	Cu.M	446.08
1.7	C.C work in foundation with 1:2:4	3228	Cu.M	5487.6
13.4	Brick masonry work with 1:3 mortar and first class brick	3870	Cu.M	51858
0.5	R.C.C work in slab with 1:2:4	6742	Cu.M	3371
23.17	Plastering work with 1:4	1617	Sq.M.	37396.4
				98559.1

Table: 13.2 Abstract sheet-Entrance Gate

13.1.3 Civil Design 3: Library



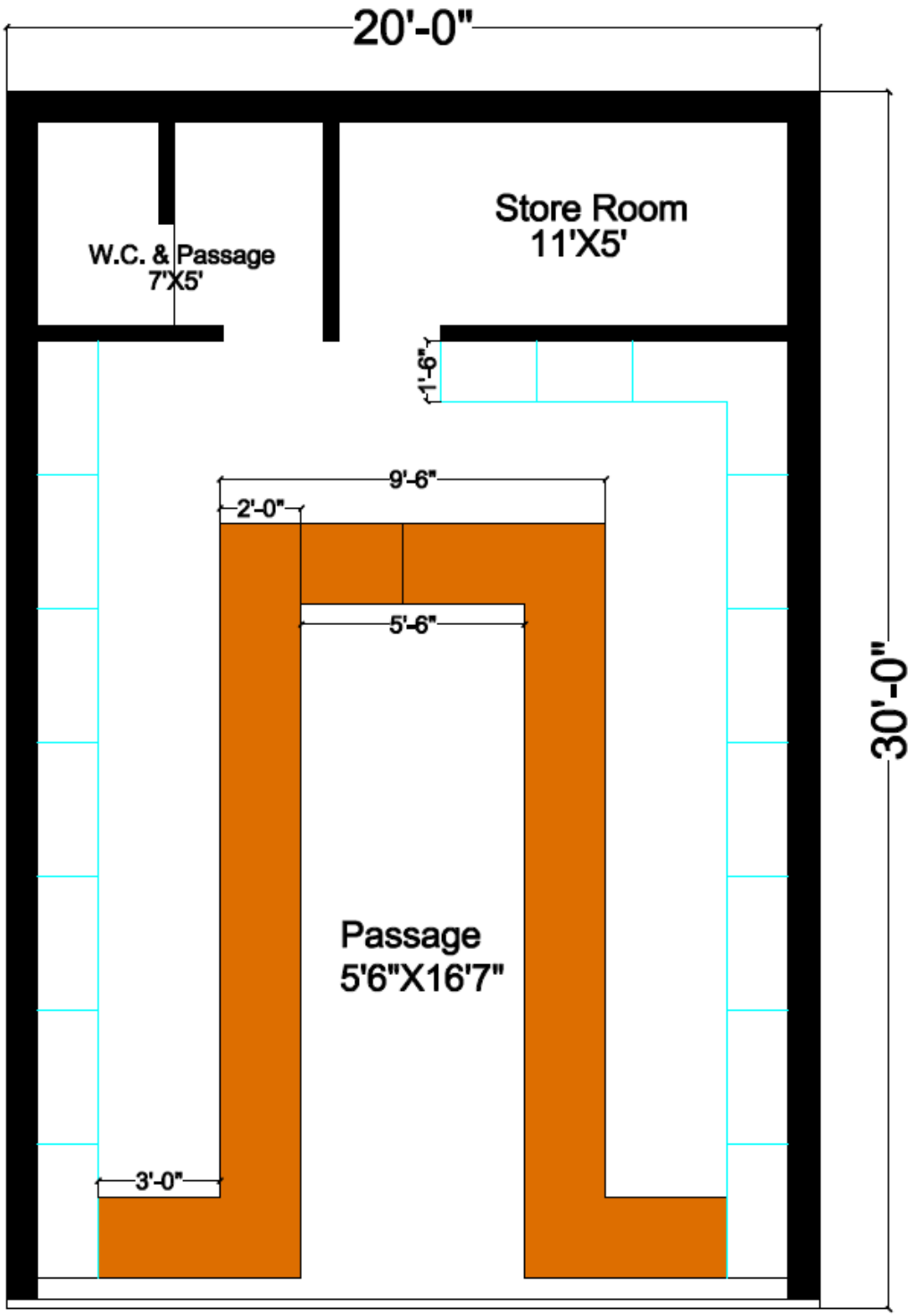
Library

Name of Work : Library		
Sr.No.	**Particular**	**Amount in Rs.**
1	Civil Work	1067256.8
	Total – A	1067256.8
2	Add 3% contingency charges(B)	32014.7
	Total A+B	1099273.15
3	Add 1% work charges est. charge on A+B	10992.15
4	Add 1% quality control charge on A+B	10992.15
	Total Rs.	1121257.45
	Say total Rs.	1122000

Abstract sheet				
QTY	**Item Work & Rate**		**Unit**	**Total AMT**
54.87	Earth excavation upto 1.5m for foundation	131.20	Cu.M	7198.95
9.87	C.C work in foundation with 1:2:4	3228	Cu.M	31860.36
4.07	P.C.C work for plinth area with 1:3:6	3617	Cu.M	14721.19
115.58	Brick masonry work with 1:3 mortar and first class brick	3870	Cu.M	447294.6
12.2	R.C.C work in slab with 1:2:4	6742	Cu.M	82252.4
173.2	Plastering work with 1:4	1617	Sq.M.	280064.4
9.84	(Optional) Plumbing work in required area	3618	Sq.M	35620
6.8	(Optional) Electrical work in required area	5400	Sq.M	36720
105.22	(Optional) Furniture work in required zone	1250	Sq.ft	131525
				1067256.8
				1067300

Table: 13.3 Abstract sheet-Library

13.1.4 Civil Design 4 : Medical Store



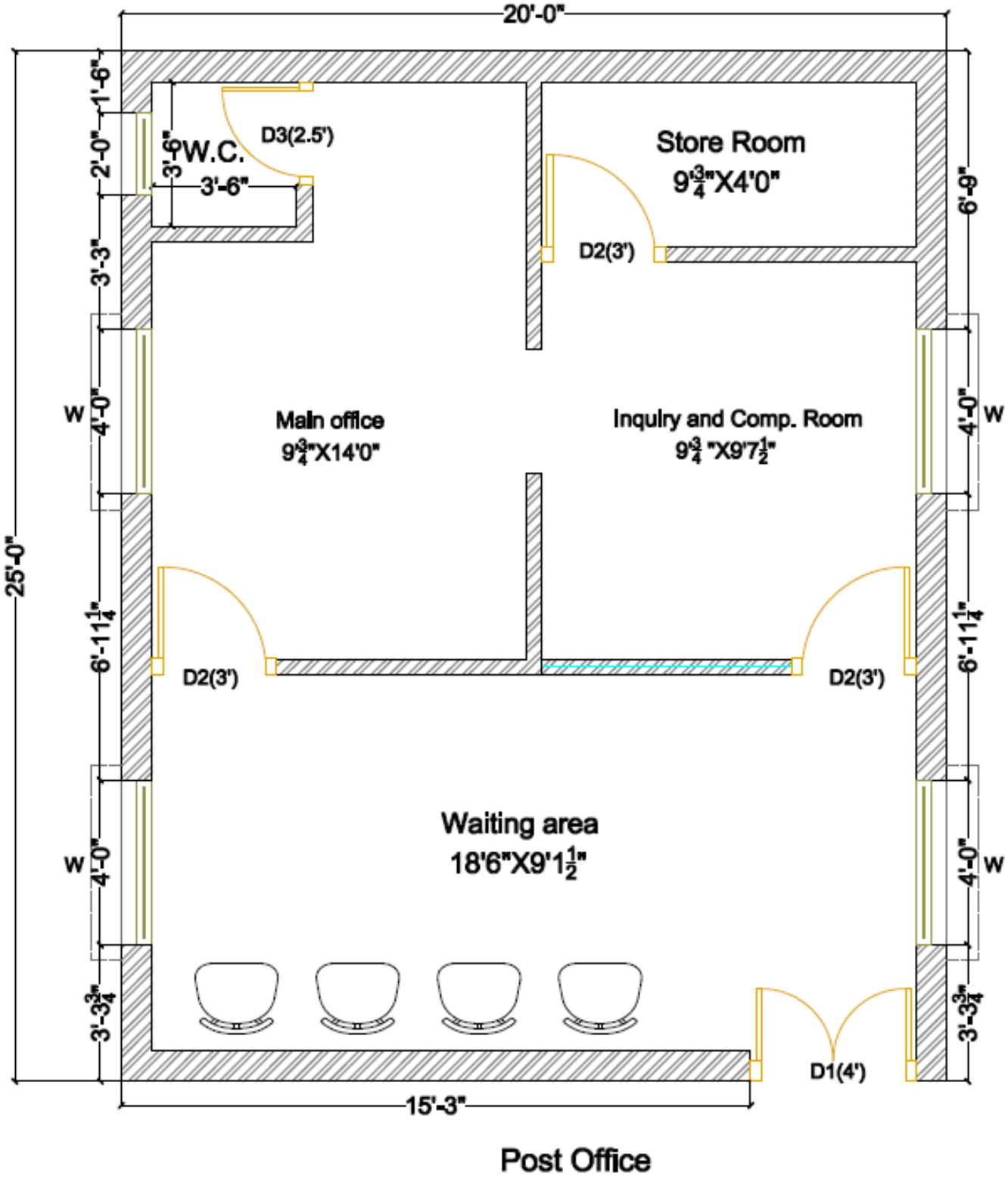
Medical Store Plan

Name of Work : Medical Store		
Sr.No.	**Particular**	**Amount in Rs.**
1	Civil Work	5,94,094.66
	Total – A	5,94,096.66
2	Add 3% contingency charges(B)	17,822.84
	Total A+B	6,11,918.85
3	Add 1% work charges est. charge on A+B	6,119.19
4	Add 1% quality control charge on A+B	6,119.19
	Total Rs.	6,24,156.4
	Say total Rs.	6,25,000

Abstract sheet				
QTY	**Item Work & Rate**		**Unit**	**Total AMT**
45.72	Earth excavation upto 1.5m for foundation	131.20	Cu.M	5998.5
8.23	C.C work in foundation with 1:2:4	3228	Cu.M	26,566.44
2.79	P.C.C work for plinth area with 1:3:6	3617	Cu.M	10,091.43
82.3	Brick masonry work with 1:3 mortar and first class brick	3870	Cu.M	3,18,501
8.36	R.C.C work in slab with 1:2:4	6742	Cu.M	56,363.12
9.57	Plastering work with 1:4	1617	Sq.M.	15,474.69
8.64	(Optional) Plumbing work in required area	3618	Sq.M	31,259.52
4.6	(Optional) Electrical work in required area	5400	Sq.M	24,840
84	(Optional) Furniture work in required zone	1250	Sq.ft	1,05,000
				5,94,094.66
				5,95,000

Table: 13.4 Abstract sheet-Medical Store

13.1.5 Civil Design 5 : Post Office



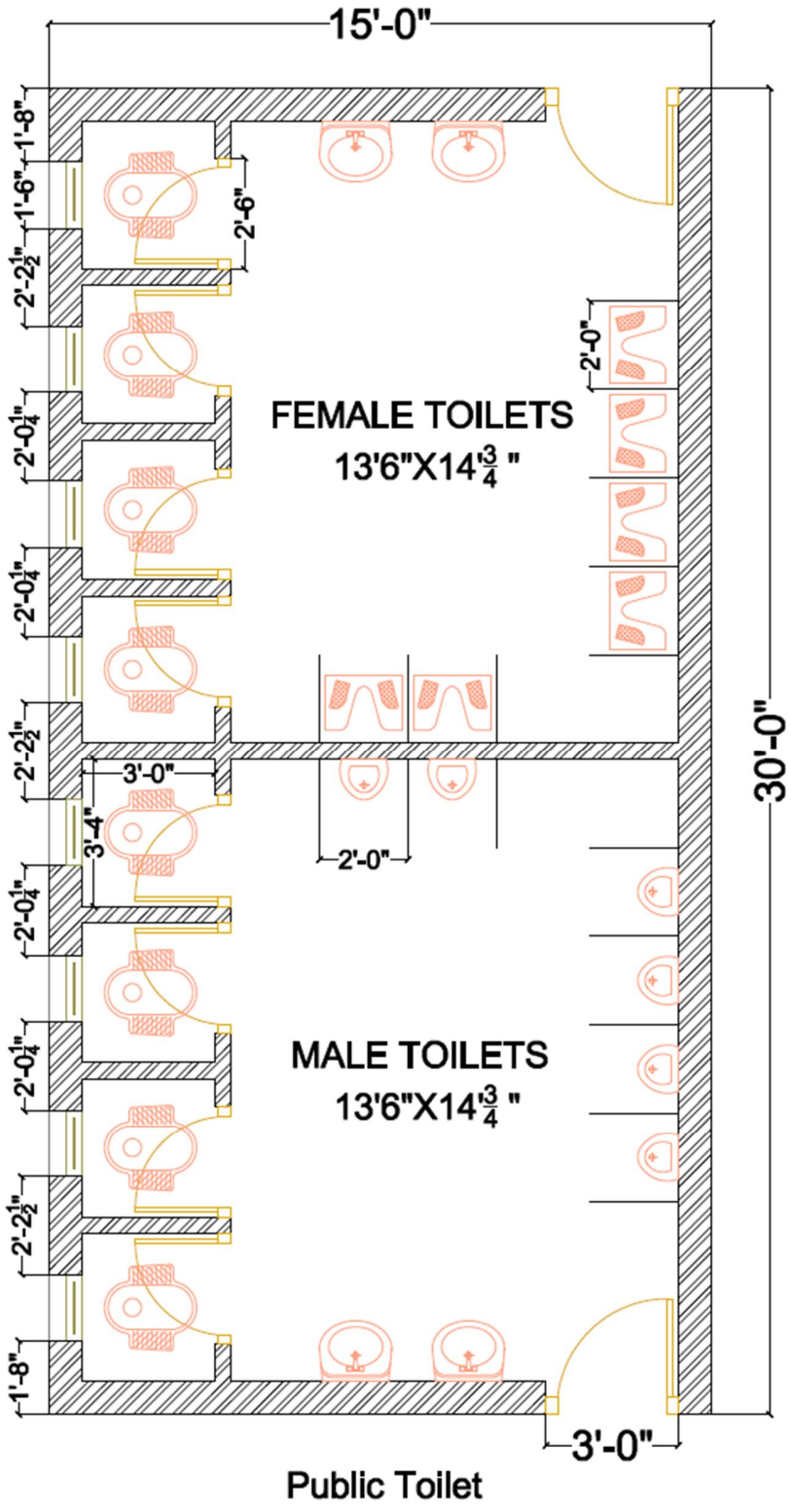
Post Office

Name of Work : Post office		
Sr.No.	**Particular**	**Amount in Rs.**
1	Civil Work	326381.05
	Total – A	326381.05
2	Add 3% contingency charges(B)	9797.43
	Total A+B	336172.48
3	Add 1% work charges est. charge on A+B	3361.72
4	Add 1% quality control charge on A+B	3361.72
	Total Rs.	342895.93
	Say total Rs.	343000

Abstract sheet				
QTY	**Item Work & Rate**		**Unit**	**Total AMT**
41.16	Earth excavation up to 1.5m for foundation	131.20	Cu.M	5400.2
7.40	C.C work in foundation with 1:2:4	3228	Cu.M	23887.2
2.32	P.C.C work for plinth area with 1:3:6	3617	Cu.M	8391.44
58.42	Brick masonry work with 1:3 mortar and first class brick	3870	Cu.M	226085.4
6.97	R.C.C work in slab with 1:2:4	6742	Cu.M	46991.74
9.66	Plastering work with 1:4	1617	Sq.M.	15625.07
				326381.05

Table: 13.5 Abstract sheet-Post Office

13.1.6 Civil Design 6 : Public Toilet



Public Toilet

Name of Work : Public Toilet		
Sr.No.	**Particular**	**Amount in Rs.**
1	Civil Work	143697.28
	Total – A	143697.28
2	Add 3% contingency charges(B)	4310.93
	Total A+B	148008.21
3	Add 1% work charges est. charge on A+B	1480.01
4	Add 1% quality control charge on A+B	1480.01
	Total Rs.	150968.41
	Say total rs.	151000

Abstract sheet				
QTY	**Item Work & Rate**		**Unit**	**Total AMT**
40.92	Earth excavation upto 1.5m for foundation	131.20	Cu.M	5368.70
7.4	C.C work in foundation with 1:2:4	3228	Cu.M	23887.2
2.08	P.C.C work for plinth area with 1:3:6	3617	Cu.M	7523.36
9.10	Brick masonry work with 1:3 mortar and first class brick	3870	Cu.M	35217
6.26	R.C.C work in slab with 1:2:4	6742	Cu.M	42204.92
10.82	Plastering work with 1:4	1617	Sq.M.	17496.10
24	Sanitary items	24	Piece	12000
				143697.28

Table: 13.6 Abstract sheet-Public Toilet

13.1.7 Electrical Design 1 : CCTV Camera Installation with DVR

➢ **CCTV Camera Installation with DVR**

- Steps for how to install a **CCTV** (**Closed Circuit Television**) security camera in home, office and other sensitive places where it needed to monitor and control the security and manage proper system for better protection.

➢ **Main components of CCTV System**

- DVR / NVR
- CCTV Camera (Bullet, Dome or PTZ Cameras)
- Monitor / LCD (PC, Laptop etc)
- Power supply, adopter, power splitter and other related cables and connectors

➢ **Optional component**

- PTZ Camera
- USB / Mouse
- Speaker / Microphone
- Router (To view and control the camera by smartphones through Wi-Fi)

➢ **What is the difference between DVR and NVR**

- DVR also known as “Digital Video Recorder” is an electronic device which processes the video signals in the recorder and stores in the mass storage i.e. Hard driver or USB flash drive. It is slimier to the VCR and also known as PVR “Personal Video Recorder”.

- The chip inside DVR is used to convert the analog video signals from camera to digital signals and stores in the hard-drive which can be seen and playback the camera recording latter.

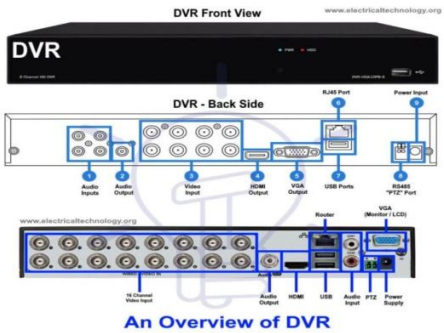


Fig :13.7 The different slots for connection on the both side of a typical DVR.

➢ **Difference Between DVR and NVR**

- DVR stands for “Digital Video Recorder” and NVR stands for “Network Video Recorder”. The main purpose of both DVR and NVR is to record the video. The main difference between the DVR and NVR is that DVR processes the video signal date at the recorder while the NVR encodes the video signal data and process in the camera where the remote viewing and data storage functions performed by NVR recorder.

- Another difference between DVR and NVR is that analog cameras are needed in DVRs with coax cables while IP cameras (Internet Protocol) are required in NVRs as they process the video data signals differently through Ethernet cables. Keep in mind that NVR can be wired or wireless system whereas DVR can be wired security system.

- If image quality is the consideration factor, NVR security system is better than DVR system as NVR process the data via digital System as compared to DVR analog system. In addition, the video and image quality of NVR system is better than DVR but NVR security system is little bit expensive than DVR. In recent technologies era, both systems are reliable and the suitable option depends on the user needs.

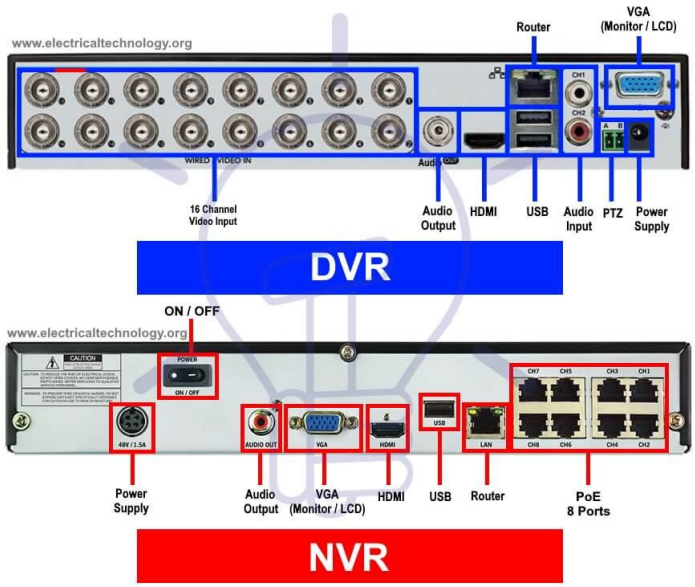


Fig :13.8 Different slots on the back side of a DVR and NVR.

➢ CCTV Camera Installation Wiring Diagram with DVR System

The instruction below as shown in fig below for **surveillance camera installation**.

- First of all, check all the cameras before installation to make sure they all are working properly.
- Connect the video and power BNC and cables connectors to the "CAMERA ONLY" labeled and power respectively. For tight connection, twist and lock the Camera BNC connectors. In fig, the yellow connector from dome cameras and bullet cameras are connected to the yellow to the DVR and red cable as power connection from camera to the 12V DC power adopter connected to the 120V or 220V AC power supply.
- Connect the video connector labeled as "DVR ONLY" to the rear / back side of DVR in the Camera input slot(s). In fig below, the yellow camera connector by extension wire labeled as "Video to DVR" is shown which can be connected to one of the 16 video input slots in the DVR. In the audio enabled cameras, the white RCA cable should be connected to the audio input slot in DVR to audio signal transmission.
- Now, connect all the red female power supply connector from the camera to the male connectors of power supply.
- Connect the all the power splitter from the camera to the 12V DC power supply adopter.
- Connect the Monitor / LCD or PC and laptops through VGA cables. For HD, use the HDMI cables and connect to the PC and DVR HDMI slot in DVR.
- Now, connect the power adopter to the 120V AC (220V in EU) by connecting the three pin plug of power adopter into three pin socket. For 24/7/365 security system, it is recommended to connect the camera and DVR to the UPS (Uninterruptible Power Supply System).
- Finally, connect the DVR power adopter to the 120V/220V AC supply as shown in fig below. You have done. Check the system if it works properly by viewing the LCD screen which shows the live camera recording.

Fig: 13.9 Typical CCTV cameras security system with DVR

Optional Wiring Connection of DVR Security & CCTV Camera

- In case of external speaker, microphones and pickups or camera audio recording, the RCA connector should be connected to the audio input as shown in fig.
- In case of alarm and PTZ Camera (Pan, Tilt and Zoom) to monitor and detect the motion at different angles, connect the wires from the camera (RS485) to the RS485 / RS232 slot of DVR. Connect the power cables, audio and video connectors to the power, audio and video slots on the back side of DVR.
- Connect the USB or mouse through USB port as shown in fig.
- If you need to manage and control the security recording remotely through smartphones and laptops far away from the camera position, you will have to connect the Ethernet router through RJ45 cables as shown in figure below. This way, you will be able to monitor the camera recording on smartphone through Wi-Fi.
- Keep in mind that for the basic CCTV camera process, you don't need an internet connection and monitor. Monitor is needed in the initial stage while installing the camera and checking the camera live recording on the monitor screen for proper operation. You can disconnect the monitor and check the video later which has been stored in the hard disk in the DVR. If you need to control the security remotely, you will have to install the router and an active internet connection.
- Note: Please see the user manual for CCTV camera installation as there are multiple types of surveillance camera available in the market. Contact the manufacturer if you are unable to follow the user manual or contact a licensed electrician as they know how to properly install and connect a CCTV camera to the DVR system.

Technical Details of product offer

Brand	HIKVISION
Manufacturer	Hikvision
Model	DS-7B08HGHI-F1,DS-2CE1AD0T-IRP/ECO
Product dimension	19 x 19 x 19 cm; 1.8 Kilograms
Item Model number	DS-7B08HGHI-F1, DS-2CE1AD0T-IRP/ECO
Resolution	1080p
Special features	Hard Disk & Installation is not included., Hikvision Upgraded DS-7B08HGHI-F1 8CH Turbo HD Metal DVR 1Pcs, Hikvision Upgraded DS-2CE1AD0T-IRP/ECO 2MP (1080P) Plastic Body Night Vision Bullet Cameras 8Pcs, Can Be Watched Online APP. HIK-CONNECT, High Quality Branded Products, Free Mobile View (Android and Windows Phone)
Mounting hardware	Hikvision Upgraded DS-7B08HGHI-F1 8CH Turbo HD Metal DVR

	1Pcs, Hikvision Upgraded DS-2CE1AD0T-IRP/ECO 2MP (1080P) Plastic Body Night Vision Bullet Cameras 8Pcs.
Number of items	9
Video capture resolution	1080p, 3 MP
Batteries Included	No
Batteries Required	No
Connector Type	Wired
Material	Plastic
Country of Origin	India
Item Weight	1 kg 800 g

Table: 13.7 Technical detail

Price 18,500/- Inclusive of all taxes
1 Year Seller Warranty of Camera & DVR. (Adapter, Mouse, Physical Damage & Burning are not covering in Warranty).

Installation and labour charges extra.

- Location for place of CCTV
  1. Gram panchayat
  2. Aanganvadi
  3. Ram mandir
  4. Mahakali mandir
  5. Main gate

13.1.8 Electrical Design 2

Home Automation System Using A Wi-Fi Module

This home automation system can measure temperature, relative humidity, light intensity and control two electrical equipment on Cayenne IoT (Internet of Things) platform. The two electrical equipment can be a light bulb and a ceiling fan, or any other electrical devices.The prototype is shown in Fig. 1.

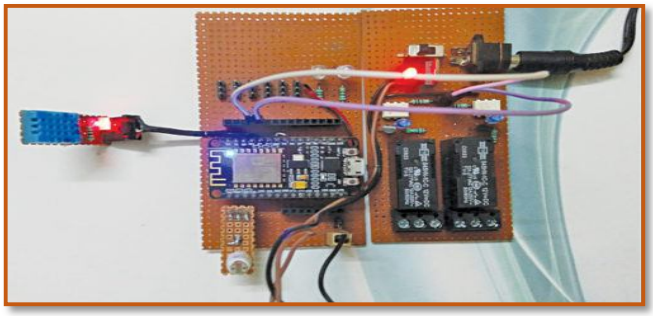


Fig.13.10: Prototype

Basic IoT components

An IoT system has some basic components, as shown in Fig. 2, such as sensors, actuators, embedded system, network link, user interface and Big Data storage.

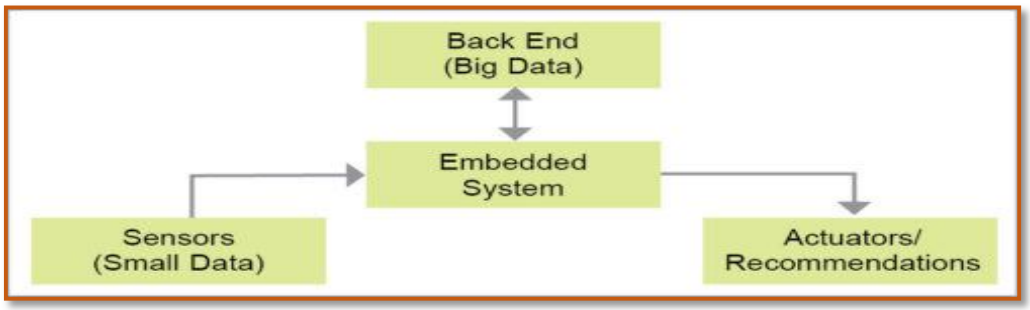


Fig.13.11: Basic components of an IoT system

Sensors

In this project, two sensors are used. One is a light-dependent resistor (LDR) to sense ambient light intensity, and the other is DHT11 temperature and relative humidity sensor.

Actuators

Relays connected to output pins are used as actuators here. Electrical loads like lights and fans are connected to contacts of the relays, which are controlled remotely through a Web interface or mobile app.

Embedded system

Wi-Fi module ESP8266 (NodeMCU) used here is an embedded controller that is programmed through Arduino, to handle analogue or digital data received from sensors and to transmit over

the Internet. At the same time, it accepts commands from the Web and accordingly actuates connected devices or actuators.

Network link
The Internet works as a network link to connect the embedded system to the outer world.

User interface
Cayenne platform supports Message Queue Telemetry Transport (MQTT) protocol for Communication. MQTT protocol is a lightweight messaging protocol for use over TCP/IP protocol.

It is designed for low-power devices that work on low bandwidth.

Cayenne platform has a simple drag-and-drop feature to create a dashboard in a few minutes. This saves time and effort for programming the user interface.

Big Data
This is also managed by Cayenne platform. Big Data is basically huge data that is collected from all connected devices, where type of data varies from device to device and data flow is at a very high speed. For example, Facebook gets more than 600TB of data daily from different posts (image or video), text messages, likes and so on.

Circuit and working
The circuit diagram of ESP8266-based home automation system is shown in Fig. 3. It is built around NodeMCU (ESP8266), an LDR, DHT11 sensor, op to-coupler 4N33 (IC2 to IC3), two relays (RL1 and RL2) and a few other components.

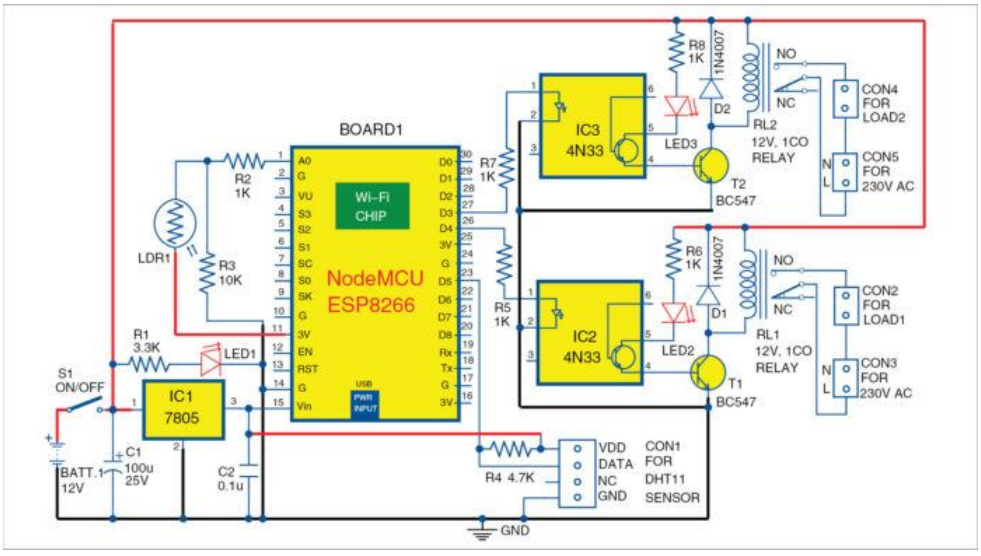


Fig.13.12: Circuit diagram of ESP8266-based home automation system

The circuit has two input channels—analogue input to measure light intensity through LDR1 and digital input to read values of temperature and relative humidity through DHT11. For measuring a wider range of temperature and humidity, replace DHT11 with DHT22 and then replace DHT11 with DHT22 in the source code.

The table shows the basic comparison between DHT11 and DHT22. The remaining specs, including pin configuration, are the same.

The circuit is powered by 12V DC supply, as it needs to drive 12V relays. 5V output is derived from 7805 regulator from the 12V input to power ESP8266 NodeMCU module.

NodeMCU V1.0 (ESP8266 ESP-12) has 11 GPIO pins and one ADC input pin with 10-bit resolution. Fig. 4 shows the pin details of NodeMCU module. It has 3.3V inbuilt voltage regulator and CP2102- based USB-to-serial converter that gives an easy interface with the PC for loading Arduino code to NodeMCU.

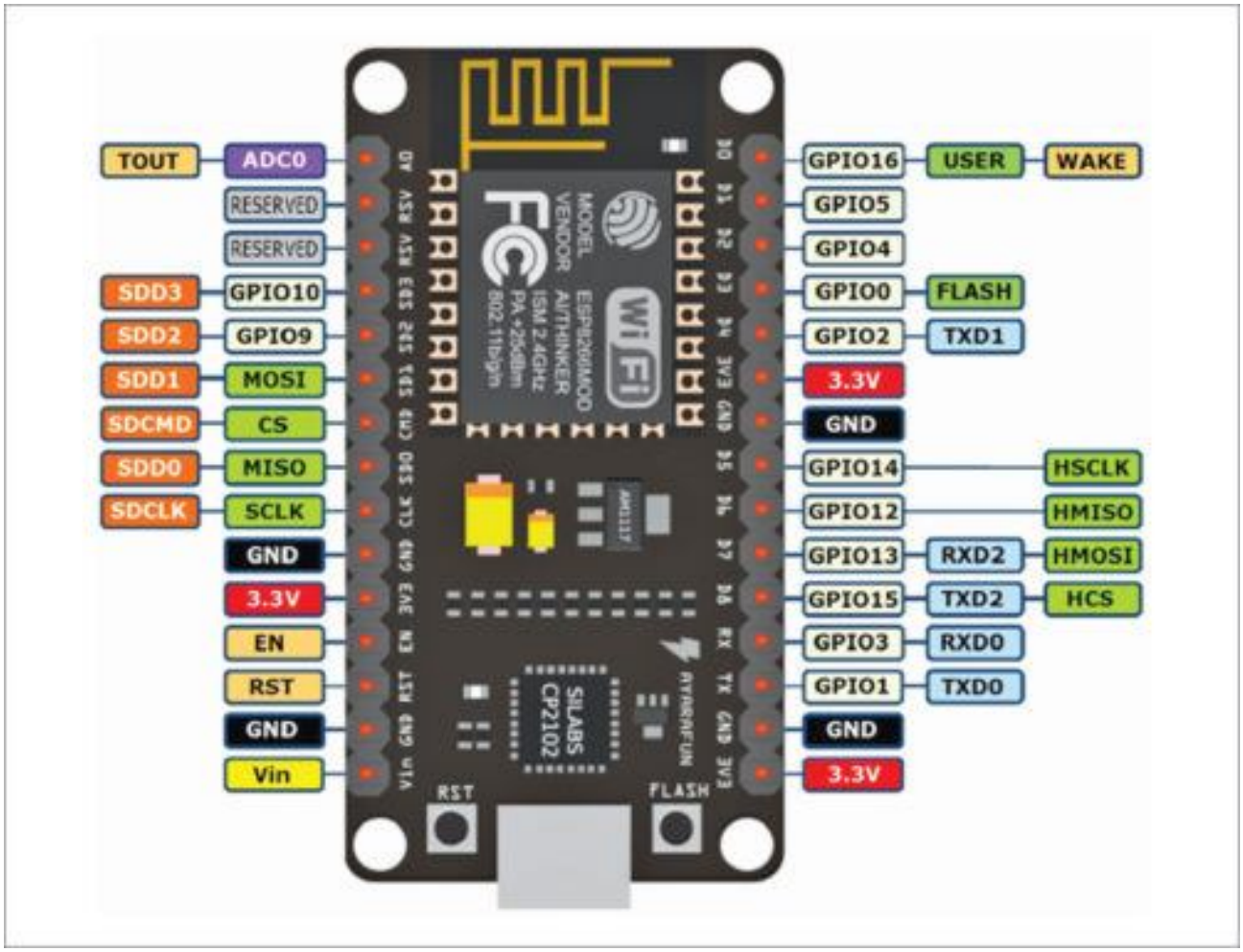


Fig.13.13: NodeMCU module pin details

TABLE II
SINK AND SOURCE CURRENTS OF AUDIO BUFFER FOR SINGLE AND TWO PARALLELLED LM358

Single op-amp				Two parallelled LM358 op-amps			
Sink		Source		Sink		Source	
Min	Typ	Min	Typ	Min	Typ	Min	Typ
10mA	20mA	20mA	40mA	20mA	40mA	40mA	80mA

Table: 13.8 Sink and source currents of audio buffer

NodeMCU has a 30-pin (2×15) male header. Components around it are wired on a general-purpose PCB or on the designed PCB layout.

The LDR (LDR1) is used to sense the intensity of light around it, which is displayed as percentage on Cayenne dashboard. This is connected to A0 pin of NodeMCU module to read analogue voltage generated based on ambient light.

DHT11 sensor is used to read ambient temperature and relative humidity through digital I/O pin D5 (GPIO14). This sensor can split the data for temperature and relative humidity, and send it one at a time through the same output pin.

Two 12V relays are driven by two BC547 transistors through MCT2E/4N33 op-to-isolators. Each relay can drive AC/DC load through the terminal headers connected to it.

Software

The software (ESP8266_HA.ino) is written in Arduino programming language, which allows writing the code within a few lines. The program makes the device communicate with Cayenne platform when connected to the Internet through an access point or Wi-Fi router.

To add board for ESP8266 in Arduino IDE, go to File Preferences and paste the link in Additional Board Manager URLs.

Open Boards Manager from Tools ®Board menu and install esp8266 platform. (Do not forget to select your ESP8266 board from Tools®Board menu after installation.)

For programming NodeMCU module, three unique identities are required from Cayenne website, namely, MQTT user name, MQTT password and Client ID. When the device is connected to the network, these IDs help Cayenne website to find the device and start communicating with it.

Other IDs required are your Wi-Fi SSID and password, if any, to connect with the local Wi-Fi network.

Before compiling and loading the code to NodeMCU module, install the following libraries in Arduino IDE as described below.

Cayenne-MQTT-ESP8266 library

This allows NodeMCU to communicate with devices on Cayenne platform.

DHT library

This allows DHT11 sensor to communicate with NodeMCU. Search Unified under Library Manager and install Adafruit Unified Sensor.

To add the above two libraries to Arduino IDE, go to Sketch®Include Library®Add .ZIP Library… Locate and install the files.

Alternatively, you can directly download and copy these libraries to Arduino/library folder of Arduino IDE.

Construction and testing

An PCB layout for ESP8266-based home automation system is shown in Fig. 5 and its components layout in Fig. 6. Assemble the components on the PCB as per circuit diagram. CON2-CON5 are not shown in the PCB (can be connected externally).

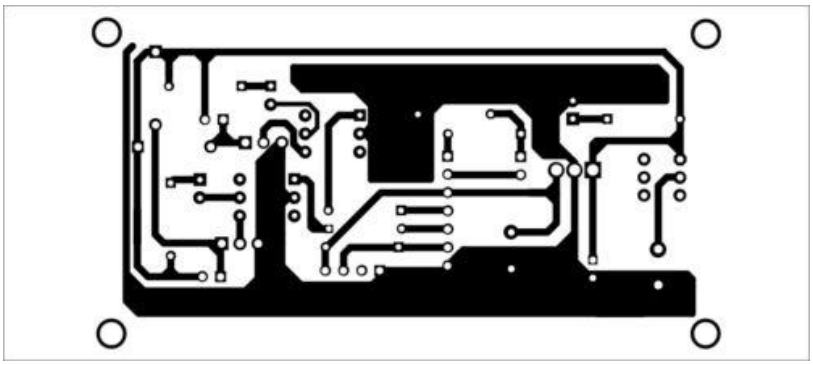


Fig.13.14: PCB layout of ESP8266-based home automation system

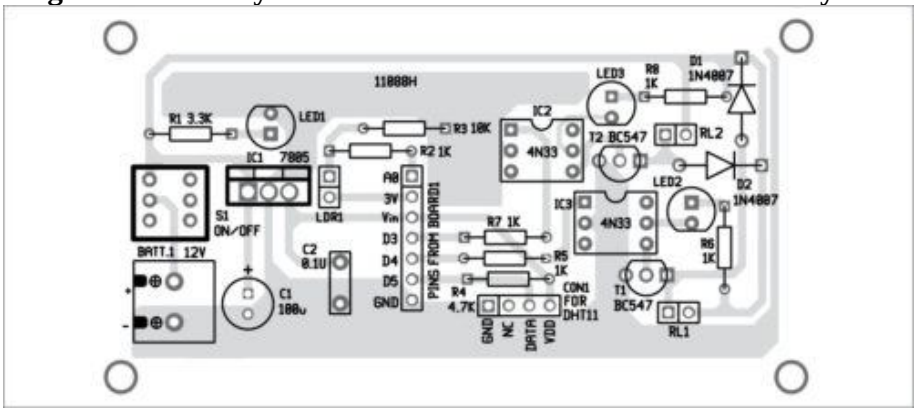


Fig.13.15: Components layout for the PCB

Building dashboard on Cayenne IoT platform

Open website and create an account through Sign Up Free button on the top-right. Click on Bring Your Own Thing. The next page will give three unique strings: MQTT Username, MQTT Password and Client ID.

Copy these strings and paste in appropriate fields in Arduino code (ESP8266_HA.ino). Then, load the code in NodeMCU module through a USB cable. Wait for some time on this page to connect with the device on the network.

Once the module is connected to Wi-Fi, the Web page will move to the next screen. Here, your device will be given a unique name, which can be changed through Settings on the top-right. You will get a screen as shown in Fig. 7.

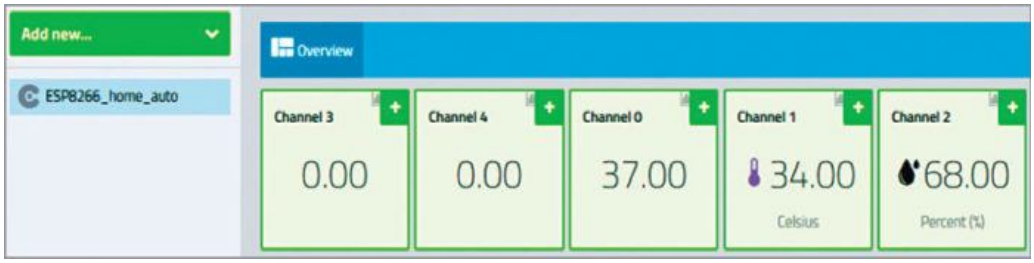


Fig.13.16: Overview of channels

Click on plus (+) sign on each channel icon to add the channel to your dashboard. You will get the names of added channels on the left under Add New page as shown in Fig. 8.

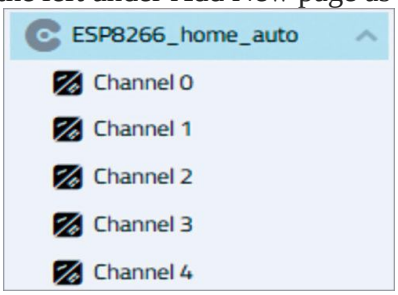


Fig.13.17: Channels on Add New page

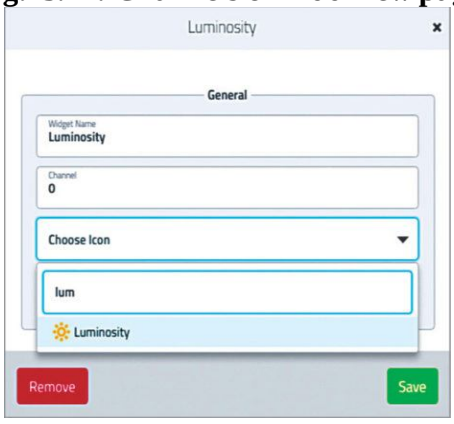


Fig.13.18: Channel 0 settings

Click on Settings of Channel 0 and change its Widget name to, say, Luminosity. Click on Choose Icon, select Luminosity and click on Save. The icon will change as shown in Fig. 10. This will show the light around LDR in percentage.

Fig.13.19: Channel 0 dashboard

Similarly, change the name of Channel 1 as Temperature and Channel 2 as Humidity. Make the required settings as mentioned in Channel 0. Now, proceed to channels 3 and 4 for configuring the buttons for controlling the two relays. Go to Settings of channels 3 and 4 and delete these using Remove button.

Now, click on Add New Device Widget. Select Custom Widgets® Button. Fill the required data for load 1 as shown in Fig. 11. Click on Add Widget. Similarly, repeat the load settings for Channel 4.

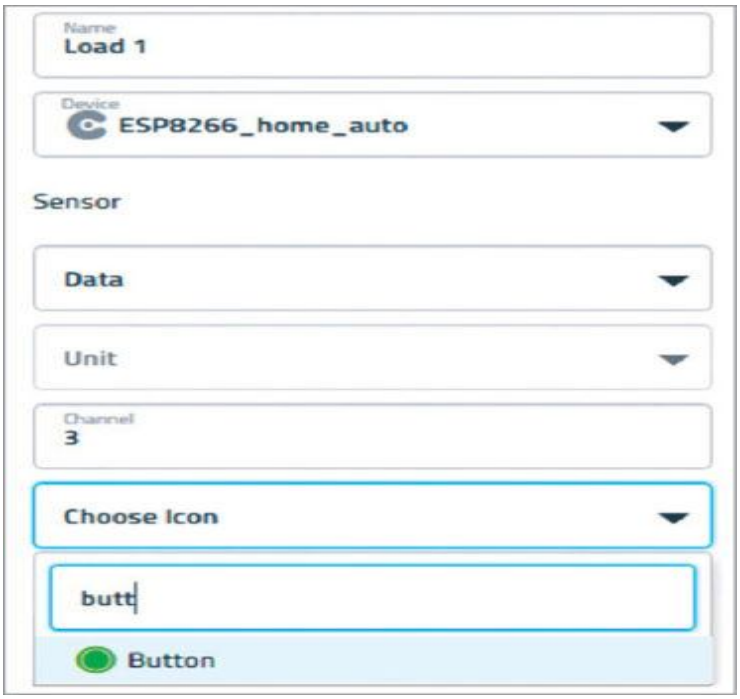


Fig. 13.20: Channel 3 settings for load 1 to turn on/off through RL1

PARTS LIST

Semiconductors:

Board1	- ESP8266 NodeMCU (ESP-12)
IC1	- 7805, 5V voltage regulator
IC2-IC3	- 4N33 opto-coupler
D1-D2	- 1N4007, rectifier diode
LED1-LED3	- 5mm LED
T1-T2	- BC547, npn transistor

Resistors (all 1/4-watt, ±5% carbon):

R1	- 3.3-kilo-ohm
R2, R5-R8	- 1-kilo-ohm
R3	- 10-kilo-ohm
R4	- 4.7-kilo-ohm

Capacitors:

C1	- 100µF, 25V electrolytic
C2	- 0.1µF ceramic disc

Miscellaneous:

DHT11	- Temp. and humidity sensor
S1	- On/off switch
CON1	- 4-pin connector
BATT.1	- 12V battery
RL1-RL2	- 12V, single-changeover relay
LDR1	- 5mm LDR
	- 7-pin Berg connector (female)
	- 2-pin terminal connector for battery

Fig:13.21 Parts list

The final dashboard is shown in Fig. 12. Now, you are ready to control the two relays attached to channels 3 and 4. You can also monitor luminosity, temperature and humidity level of a place where your devices are located.

Fig. 13.22: Final dashboard of the project on the Cayenne IoT platform

Download Cayenne app from Google Play Store, and login using the same credentials to start controlling the above-mentioned parameters from anywhere over the Internet.

Component name	Price in Rupees
NodeMCU (ESP8266)	449/-
7805 ,5V voltage Regulator	190/-
4N33 op-to-coupler	70/-
1N4007, Rectifier diode	35/-
5mm LED	2/piece
BC547 npn Transistor	40/-
Resistors all 1/4 watt	35/-
Capacitor (Electrolytic)(Ceramic disc)	500/-
DHT11 Temp. & humidity sensor	340/-
S1 On-Off switch	30/-
4 Pin connector	300/-
12V battery	60/-
Single changeover relay	200/-
LDR 5mm	30/-
7-pin berg connector(female) & 2 -pin terminal connector	400/-
Total price	Rs. 2681/ - (T & C apply)
(All mentioned price are taken from e-commerce website it will vary time to time)	

Table: 13.9 Component and price

13.1.8 Electrical Design 3

Multi-Utility Protection System for Agricultural Equipment

- This design is used for fire detection and then sending an SMS alert to a cellphone. The design is based on Arduino Uno. The project also includes an LCD and an LED for visual indications, and a buzzer for audio indication. It has sensory systems including flame and temperature sensors along with a relay switching device.
- Agricultural equipment include farm robots, pest controls, and crops and seeds monitoring systems. This circuit generates an alarm if a fire breaks out near motors, transformers or other equipment installed in the field. At the same time, electrical load is automatically switched o". This circuit should be installed near the equipment to be monitored.

Circuit and working

- The circuit diagram of the multi-utility protection system for agricultural equipment is shown in Fig. It comprises LCD (JHD162A), Arduino Uno, piezo buzzer, SIM900A GSM module, preset (10- kilo-ohm), LED, 9V battery, flame sensor, temperature sensor, 5V relay module and a few other components.

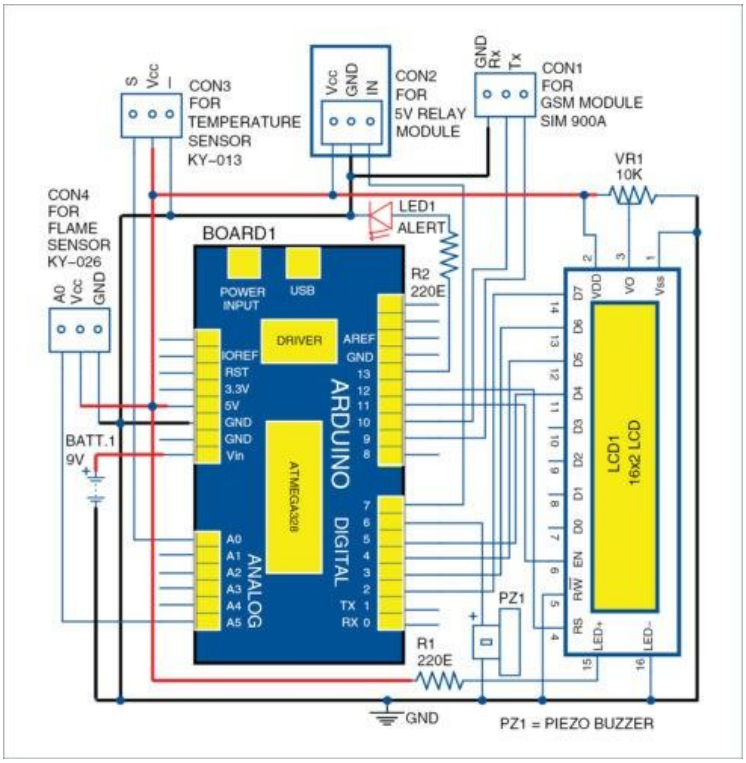


Fig.13.23 : Circuit diagram of multi-utility protection system

- If a fire breaks out, or excessive heat or burning flame is detected near the equipment, the system generates an alert with visual LED indication and a sound alarm. Status of the environment in real time, including temperature and flame level, is displayed on the LCD.
- The LCD is used to track the temperature sensor level. If the level goes beyond safe limit, immediate action can be taken. Most of the time, workers are in the field, so they can check various sensor levels through the LCD.
- GSM-based SMS alert facility is also included. It allows getting the SMS alert on a cellphone at home, even at night in case of fire. The owner can then alert the worker or incharge present in the field to take appropriate action.

➢ **Flame sensor**

KY-026 flame sensor module is used here. This flame detection sensor module is quite sensitive to flame or light. Detection angle can be around 30 to 60 degrees. The module operates on 5V DC. Its analogue output pin A0 is connected to pin A5 of Arduino board.

➢ **LCD module**

The 16-pin JHD162A LCD module used here can display 16 characters in two lines. It is used to display the temperature level on the first line and flame level on the second.

➢ **Arduino Uno**

Arduino Uno is based on ATmega328 series micro-controller (MCU). It contains 14 digital input/output pins (of which six can be used as PWM outputs), six analogue inputs, 16MHz crystal oscillator, USB connection, power jack, ICSP header and reset button.

➢ **GSM module**

GSM SIM900A module works on frequencies from 900MHz to 1800MHz. It includes RS232 interface, which allows connecting the PC and MCU with RS232 chip. Baud rate can be set in the range of 9600 to 115200. It contains internal TCP/IP stack to enable connection with the Internet via GPRS. It is suitable for SMSs, calls and Internet connectivity applications.

➢ **Temperature sensor**

NTC thermistor-based KY-013 sensor module is used here. It is an analogue temperature sensor module compatible with Arduino. A thermistor is a low-cost, small device. It is sensitive to ambient temperature variation. It is used to detect the temperature of the surrounding environment. KY-013 can be directly connected to analogue pin A0 of Arduino to detect temperature changes in the environment. The temperature measuring range is between 20°C and 80°C.

➢ **Preset**

A preset is a three-terminal resistor with a rotating contact that makes an adjustable voltage divider. If only two terminals are utilised—one end and the wiper—it behaves like a variable resistor or rheostat. A 10-kilo-ohm preset (VR1) is used here.

- **Software**

Programming of the project is done on Arduino IDE version 1.8.6. Pin A5 of Arduino for the flame sensor and pin A0 of Arduino for the temperature sensor are defined in Arduino program code/sketch (agriculture.ino). The program displays flame and temperature levels on the serial monitor in the PC and on the LCD in digital form.

- **Construction and testing**

The PCB layout of the multi-utility protection system is shown in Fig. and its components layout in Fig.

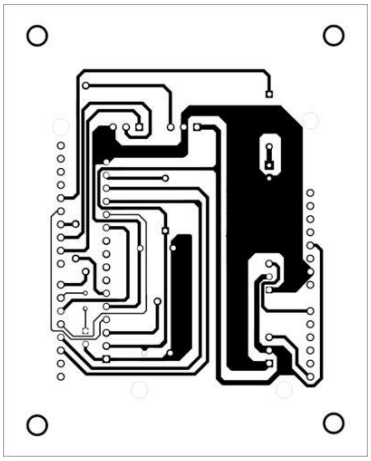


Fig :13.24 PCB layout of the multi-utility protection system

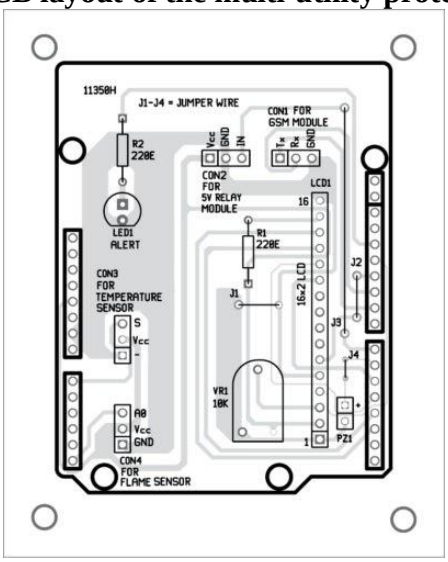


Fig 13.25: Components layout for the PCB

Assemble the components on the PCB. Make connections as per the circuit diagram. Note that 32-pin male Berg connectors should be connected on the PCB from solder side and should be soldered on the components side. Then, insert this board into the 32-pin female Berg connectors on top of the Arduino board.

Switch on the power supply by connecting 9V battery to the circuit. Check flame level on the LCD and the serial monitor. If there is a burning flame or sparks in motors, transformers or other devices, the circuit will send a buzzer alert, update the status of flame and temperature levels on the LCD, cut o" the load by de-energing the relay, and the system will send an SMS to the registered cellphone.

For initial testing, light a candle and bring its flame near the flame sensor. Monitor the flame detection distance against the flame values shown on the serial monitor. Sensitivity can be adjusted using inbuilt potentiometer in KY-026 module.

On pressing S on the serial monitor, the system starts recording the flame intensity level. If the value goes beyond the threshold level, the buzzer sounds an alarm and LED1 starts blinking. At the same time, it sends an SMS alert to the cell number included in the software code. The flame level can also be viewed on the serial monitor and the LCD.

Component name	Price in Rupees
Arduino Uno Board	1690/-
16*2 LCD(JHD162A)	249/-
SIM900A GSM module	1200/-
5mm LED	2 /piece
3-pin temperature sensor module	280/-
3-pin flame sensor module	70/-
Resistors 220-ohm	70/-
9V battery	25/-
Piezo buzzer	30/-
3-pin female Berg connector	275/-
5V relay module	250/-
Jumper wires	70/-
Berg strips	90/-
32-pin male Berg connector	200/-
16-pin female Berg connector	170/-
Total price	4670/- (T & C apply)
(All mentioned price are taken from e-commerce website it will vary time to time)	

Table: 13.10 Component and price

Chapter: 14

Technical Options with Case Studies

14.1 Civil Engineering

14.1.1 Advanced Earthquake Resistant

Earthquake-resistant construction, the fabrication of a building or structure that is able to withstand the sudden ground shaking that is characteristic of earthquakes, thereby minimizing structural damage and human deaths and injuries. Suitable construction methods are required to ensure that proper design objectives for earthquake-resistance are met. Construction methods can vary dramatically throughout the world, so one must be aware of local construction methods and resource availability before concluding whether a particular earthquake-resistant design will be practical and realistic for the region.

There is a fundamental distinction between the design of a building and the construction methods used to fabricate that building. Advanced designs intended to withstand earthquakes are effective only if proper construction methods are used in the site selection, foundation, structural members, and connection joints. Earthquake-resistant designs typically incorporate ductility (the ability of a building to bend, sway, and deform without collapsing) within the structure and its structural members. A ductile building is able to bend and flex when exposed to the horizontal or vertical shear forces of an earthquake. Concrete buildings, which are normally brittle (relatively easy to break), can be made ductile by adding steel reinforcement. In buildings constructed with steel-reinforced concrete, both the steel and the concrete must be precisely manufactured to achieve the desired ductile behaviour.

Building failures during earthquakes often are due to poor construction methods or inadequate materials. In less-developed countries, concrete often is not properly mixed, consolidated, or cured to achieve its intended compressive strength, so buildings are thus extremely susceptible to failure under seismic loading. This problem is often made worse by a lack of local building codes or an absence of inspection and quality control.

Experience in past earthquakes has demonstrated that many common buildings and typical methods of construction lack basic resistance to earthquake forces. In most cases this resistance can be achieved by following simple, inexpensive principles of good building construction practice. Adherence to these simple rules will not prevent all damage in moderate or large earthquakes, but life threatening collapses should be prevented, and damage limited to repairable proportions. These principles fall into several broad categories:

(i) Planning and layout of the building involving consideration of the location of rooms and walls, openings such as doors and windows, the number of storeys, etc. At this stage, site and foundation aspects should also be considered.

(ii) (ii) Lay out and general design of the structural framing system with special attention to furnishing lateral resistance, and

(iii) (iii) Consideration of highly loaded and critical sections with provision of reinforcement as required.

14.1.2 Seismic Retrofitting of Buildings

Seismic retrofitting is the modification of existing structures to make them more resistant to seismic activity, ground motion, or soil failure due to earthquakes. With better understanding of seismic demand on structures and with our recent experiences with large earthquakes near urban centres, the need of seismic retrofitting is well acknowledged. Prior to the introduction of modern seismic codes in the late 1960s for developed countries (US, Japan etc.) and late 1970s for many other parts of the world (Turkey, China etc.) many structures were designed without adequate detailing and reinforcement for seismic protection.

In view of the imminent problem, various research work has been carried out. State-of-the-art technical guidelines for seismic assessment, retrofit and rehabilitation have been published around the world – such as the ASCE-SEI 4 and the New Zealand Society for Earthquake Engineering (NZSEE)'s guidelines. These codes must be regularly updated; the 1994 Northridge earthquake brought to light the brittleness of welded steel frames, for example.

The retrofit techniques outlined here are also applicable for other natural hazards such as tropical cyclones, tornadoes, and severe winds from thunderstorms. Whilst current practice of seismic retrofitting is predominantly concerned with structural improvements to reduce the seismic hazard of using the structures, it is similarly essential to reduce the hazards and losses from non-structural elements.

It is also important to keep in mind that there is no such thing as an earthquake-proof structure, although seismic performance can be greatly enhanced through proper initial design or subsequent modifications.

Case Study: Seismic Retrofitting of RC Building with Jacketing and Shear Walls

- **Source**
  - The Mexico Earthquake of September 19, 1985 – Typical Cases of Repair and Strengthening of Concrete Buildings
  - M. Jara, C. Hernandez, R. Garcia, and F. Robles
  - Earthquake Spectra, Vol. 5, No. 1, 1989

- **Typical Features of the Building**
  - Number of Stories - Eight stories with basement
  - Year of Construction - 1966
  - Lateral load Resisting System - Reinforced concrete frames
  - Floor system - two-way slab with beam
  - Foundation - Grid foundation with retaining walls around the perimeter
  - Typical floor plan and elevation shown in Figure 1

- **Features of Damages in Mexico earthquake, 1979**
  - Minor cracks in beams and columns

- **Retrofitting Techniques Employed**
  - Addition of concrete shear wall in axes 2 and A
  - Addition of masonry wall in axes 5
- **Behaviour of Retrofitted Building in Mexico Earthquake, 1985**
  - Severe damage such as spelling of the concrete cover and buckled bar at the interface of the walls and beam-column joints
  - Main reinforcement in the columns located at the ground floor buckled and crushing of the concrete core
  - Most damaged columns were the columns adjacent to the added walls
  - Damage attributed to the inadequate connection between the added walls and original frame connection and the poor quality of the concrete

- **Retrofitting Techniques Employed after Mexico earthquake, 1985**
  - Minor cracks - Repaired by injecting epoxy resins
  - Buckled longitudinal reinforcement, broken ties, and crushed concrete – Replacement of new reinforcement welded with the existing bars and new additionally closed ties were placed, concrete with low shrinkage properties were placed
  - Severely damaged columns adjacent to added walls – Retrofitted with encasing in concrete with appropriate longitudinal and transverse reinforcement, existing surface should be chipped and cleaned of all loose materials. The surface was moistened before the new concrete was placed.
  - Other columns – Retrofitted with wire mesh and a cover of 50mm of shotcrete
  - Damaged concrete wall added after 1979 earthquake – Demolished and replaced with new concrete walls with 200mm in thickness
  - Wall with slight damage – repaired by injecting epoxy resins and by increasing their thickness to 200mm.
  - Added new walls along the axes 2, 5, 6, E and A.
  - Foundation – The foundation grid was encased to permit the anchorage to the new longitudinal reinforcement. Additionally, the grid was connected to the retaining walls located around the perimeter to ensure monolithic behaviour.

- **Expected Performance**
  - Static and dynamic analysis was performed on the original undamaged building, match to the distribution of the damage observed accordingly.
  - Retrofitted building has been analysed with the assumption of monolithic behaviour between old and new material.
  - Results indicate no additional piles to the foundation

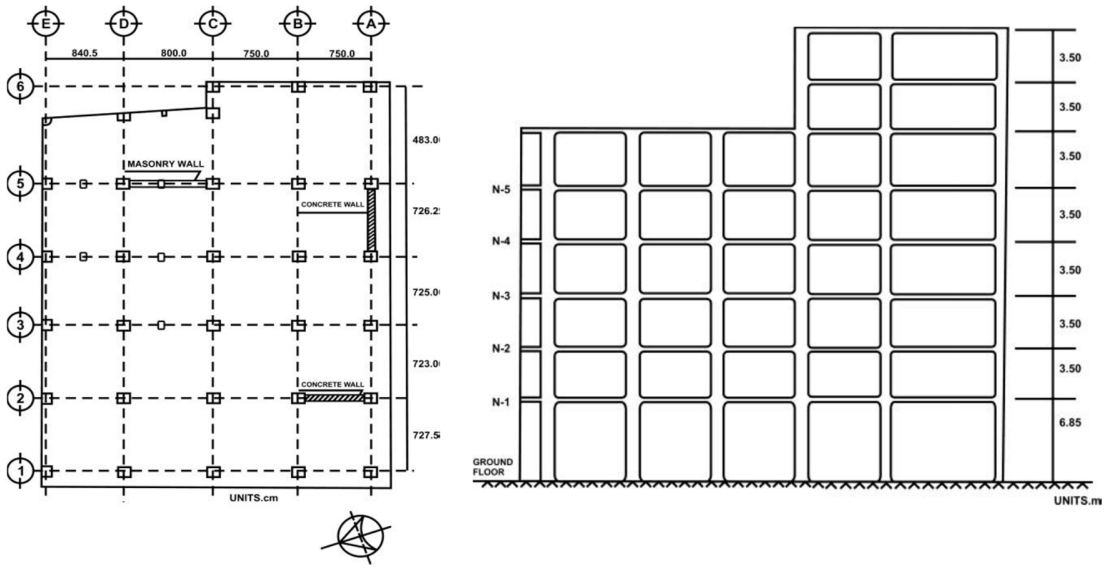


Fig14.1: Plan and elevation of the building

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

Material:

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

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

As research and development in materials science advance, new ways of constructing buildings are emerging. Some will inevitably find their places in small niches, others might turn out to have broad applicability, but what is certain is that the buildings of the next decade will be stronger, more environmentally friendly, and more cost-efficient than the buildings of the last one.
Here are 6 new materials that could change commercial construction for the better:

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

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

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

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

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

2. Self-Healing Materials

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

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

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

3. Air Cleaning Bricks

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

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

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

4. Strand Rods

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

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

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

5. Passive Cooling Ceramics

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

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

The students responsible for the project found that it could produce up to a 6.4 degrees centigrade reduction in temperature over the course of 20 minutes. In ideal conditions, this could lead to a reduction in air conditioning use of 28 percent, which would result in significant savings and reduction in carbon emissions.

6. Trash
Plastic bottles can be repurposed for a variety of uses.

Fig: 14.2 Plastic bottles

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

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

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

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

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

Techniques:
Building construction methods have experienced significant facelift in recent times with innovative technologies being harnessed optimally for improving the qualitative index of buildings. This has spelled considerable advantages for end users like us who can remain

immune from recurrent expenses on repairs and other incidental building-related jobs. Construction lead time has also been reduced and building costs have been rationalized. This post takes you through 8 techniques that have given the much-needed fillip to the most primitive human pursuit that still exists i.e. construction.

1) 3D Volumetric Construction

Using this modular construction technology, 3D units are produced in controlled factory settings using needful construction and building materials. Finished units are transported to site in various modules, basic structural blocks or final touched up units with all amenities installed, for assembly. Blocks can be erected rapidly at site and properties of concrete like fire retardant, sound resistivity, thermal mass etc. are retained.

Fig: 14.3 3D volumetric Constructions

2) Precast Flat Panel Modules

These are primarily wall and floor modules which are manufactured away from the actual site and then transported to site for erection. Load bearing components like decorative cladding and insulation panels can also be produced. Also called cross-wall construction, the technology has gained momentum due to seamless adherence to specifications and ease as well as swiftness of construction.

Fig: 14.4 Precast Flat Panel Modules

3) Tunnel Formwork System

With this tunnel technique, construction is paced up for cellular structures of repetitive patterns through the building of monolithic walls or units in a single operation per day.

Expeditious work is achieved by deploying formwork and readily mixed concrete with the convenience and agility of factory conditions. Formworks in tunnel form are stacked and used at the site with cranes.

Fig: 14.5 Tunnel Formwork System

4) Flat Slabbing Technology

This technique utilizes the simplicity of contemporary formwork for quickly building flat slabs to facilitate easy and swift placing of horizontal amenities and for partitioning.

Maximization of pre-fabricated services occurs as services can be carried out in an uninterrupted manner in zones underneath the floor slabs.

Every top-notch building Construction Company is using the same as internal layouts can be conveniently modified for accommodating alterations at a later date. Further, reinforcement needed is lesser which cuts down labour costs significantly.

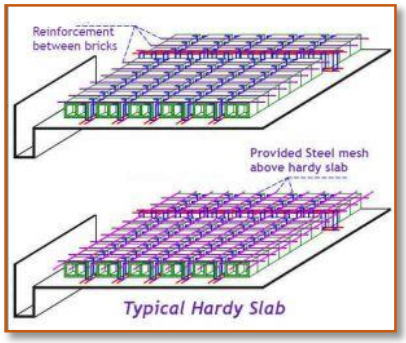


Fig: 14.6 Tunnel Formwork System

5) Pre-cast Foundation Technique

Foundations can be built swiftly with precast concrete units which are produced in a factory and are high on quality quotient. Strength is imparted to foundation related building construction materials through interconnected concrete piles.This technique allows construction work to progress even in inclement weather and minimizes excavation activity.

Fig: 14.7 Pre-cast Foundation Technique

6) Hybrid Concrete Building Technique

This technique expedites construction turnaround time by blending the advantages of concrete pre-casting with the in-situ building. Quality improves, whereas the cost of construction plummets.Hybrid concrete structures are easy to build, competitive in nature and perform consistently.

Fig: 14.8 Hybrid Concrete Building Technique

7) Thin Joint Masonry Technique

Utilization of this technique leads to the reduction of the quantum of mortar applied by slashing it depth from 10mm to lesser than 3mm. Consequently, mortar can be laid swiftly with enhanced productivity on the longer wall panels.

With large sized concrete blocks, higher construction efficiency along with significant cost reduction can be achieved. Within a single day, the number of mortar courses laid is higher as curing of mortar takes place quickly without compromising on bonding strength resulting in the elimination of floating problem.

Fig: 14.9 Thin Joint Masonry Technique

8) Insulating Concrete Formwork (ICF) Technique

ICF technique employs polystyrene blocks that feature twin walls and can be rapidly put together for creating building wall formwork. The formwork is then pumped in with high quality, ready mixed, factory-made concrete.

Fig: 14.10 Insulating Concrete Formwork (ICF) Technique

The building construction process becomes fool-proof and the resultant structure has a high level of sound and thermal insulation.Building construction methods have matured significantly with advancement in technologies underlying them. Resourceful builders are taking recourse to these methods to help you optimize your investment.Structures developed with these methods offer unparalleled cost competitiveness, quality assurance and superiority of final outcome. You can learn more about ongoing projects which use these technologies over here.

Equipment:

Advanced Construction Equipment

1. **Earthmoving & Mining**: Construction equipment that is capable of lifting huge quantities of earth in one scoop falls in this category. While bulldozers and articulated trucks are part of this kind, they are quite versatile and are widely used in highway construction projects. Some of the other specialized equipment is:

- Surface Mining equipment, which includes electric shovels for mineral extraction, drills, mass excavators and giant draglines, which are extensively used in civil engineering.
- Underground mining equipment, while similar, needs to function under different space parameters. Advanced pieces of such machinery include scalers, scissor lifts, and continuous miners.

2. **Excavation**: Any kind of operation that requires digging, excavation, making trenches, etc. falls under this category. Many of the examples of machinery that are grouped under this require a great degree of flexibility and manoeuvrability, because of the limited area they might be operating under. The most popular and versatile of the lot is the backhoe loader. Apart from this, the other kinds that find widespread use are dredges (which are used in waterways to access sediments under water), excavators (in forestry, pipelines, and even mining) and trenchers for laying underground cable networks or to facilitate sewer systems.

3. **Lifting**: Since the construction industry involves a great deal of hoisting material, people and other equipment, there are numerous specialized types of machines for this purpose, although some lifting can be done using excavators etc. They are developed taking into account various factors like machine capacity at specific heights, the speed of wind, manoeuvre radius, etc. The most popular equipment in this category includes boom trucks, forklifts, man lifts (specially designed for greater height reach without any impediments), cranes of many specialized varieties and pipe layers.

4. **Roads**: Building a road is a project that necessitates the use of a rather wide variety of heavy machinery. Earthmoving, clearing areas, lifting work (especially when building a structure like a bridge) and paving are all activities that need different equipment. Cold planers (for milling asphalt), compactors (for ensuring a smooth, eve surface), curb machines, and crushing machines are just a few examples.

5. **Railroads**: The use of several types of highly specialized machinery is needed when constructing railroads. Many factors like high cargo levels, passenger transit, energy consumption and safety have to be taken into consideration; so the equipment needed to serve these purposes has to be just right. Some of the commonly used machinery includes ballast tampers and ballast regulators. While the former help to render the railway tracks more durable and to facilitate perfect track alignment, the latter is aimed at distributing the gravel underneath the tracks more evenly.

14.1.4 Engineering Aspects of Soil mechanics - Environmental Impact Assessment

The term "**soil**" can have different meanings, depending upon the field in which it is considered.
To a geologist, it is the material in the relative thin zone of the Earth's surface within which roots occur, and which are formed as the products of past surface processes. The rest of the crust is grouped under the term "rock".

To a penologist, it is the substance existing on the surface, which supports plant life.
To an engineer, it is a material that can be:

- **built on:** foundations of buildings, bridges
- **built in:** basements, culverts, tunnels
- **built with:** embankments, roads, dams
- **supported:** retaining walls

Soil Mechanics is a discipline of Civil Engineering involving the study of soil, its behaviour and application as an engineering material.
Soil Mechanics is the application of laws of mechanics and hydraulics to engineering problems dealing with sediments and other unconsolidated accumulations of solid particles, which are produced by the mechanical and chemical disintegration of rocks, regardless of whether or not they contain an admixture of organic constituents.
Soil consists of a multiphase aggregation of solid particles, water, and air. This fundamental composition gives rise to unique engineering properties, and the description of its mechanical behaviour requires some of the most classic principles of engineering mechanics.
Engineers are concerned with soil's mechanical properties: permeability, stiffness, and strength. These depend primarily on the nature of the soil grains, the current stress, the water content and unit weight.

Soil mechanics is a branch of soil physics and applied mechanics that describes the behaviour of soils. It differs from fluid mechanics and solid mechanics in the sense that soils consist of a heterogeneous mixture of fluids (usually air and water) and particles (usually clay, silt, sand, and gravel) but soil may also contain organic solids and other matter. Along with rock

mechanics, soil mechanics provides the theoretical basis for analysis in geotechnical engineering,[5] a sub discipline of civil engineering, and engineering geology, a sub discipline of geology. Soil mechanics is used to analyse the deformations of and flow of fluids within natural and man-made structures that are supported on or made of soil, or structures that are buried in soils.[6] Example applications are building and bridge foundations, retaining walls, dams, and buried pipeline systems. Principles of soil mechanics are also used in related disciplines such as geophysical engineering, coastal engineering, agricultural engineering, hydrology and soil physics.

This article describes the genesis and composition of soil, the distinction between pore water pressure and inter-granular effective stress, capillary action of fluids in the soil pore spaces, soil classification, seepage and permeability, time dependent change of volume due to squeezing water out of tiny pore spaces, also known as consolidation, shear strength and stiffness of soils. The shear strength of soils is primarily derived from friction between the particles and interlocking, which are very sensitive to the effective stress. The article concludes with some examples of applications of the principles of soil mechanics such as slope stability, lateral earth pressure on retaining walls, and bearing capacity of foundations.

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-Sewerage system-Waste Water- Sustainable development techniques

Water supply system, infrastructure for the collection, transmission, treatment, storage, and distribution of water for homes, commercial establishments, industry, and irrigation, as well as for such public needs as firefighting and street flushing. Of all municipal services, provision of potable water is perhaps the most vital. People depend on water for drinking, cooking, washing, carrying away wastes, and other domestic needs. Water supply systems must also meet requirements for public, commercial, and industrial activities. In all cases, the water must fulfill both quality and quantity requirements.

Historical background:

Developments in supply systems

Water was an important factor in the location of the earliest settled communities, and the evolution of public water supply systems is tied directly to the growth of cities. In the development of water resources beyond their natural condition in rivers, lakes, and springs, the digging of shallow wells was probably the earliest innovation. As the need for water increased and tools were developed, wells were made deeper. Brick-lined wells were built by city dwellers in the Indus River basin as early as 2500 BCE, and wells almost 500 metres (more than 1,600 feet) deep are known to have been used in ancient China.

The need to channel water supplies from distant sources was an outcome of the growth of urban communities. Among the most notable of ancient water-conveyance systems are the aqueducts built between 312 BCE and 455 CE throughout the Roman Empire. Some of these impressive works are still in existence. The writings of Sextus Julius Frontinus (who was appointed superintendent of Roman aqueducts in 97 CE) provide information about the design and construction of the 11 major aqueducts that supplied Rome itself. Extending from a distant spring-fed area, a lake, or a river, a typical Roman aqueduct included a series of underground and aboveground channels. The longest was the Aqua Marcia, built in 144 BCE. Its source was

about 37 km (23 miles) from Rome. The aqueduct itself was 92 km (57 miles) long, however, because it had to meander along land contours in order to maintain a steady flow of water. For about 80 km (50 miles) the aqueduct was underground in a covered trench, and only for the last 11 km (7 miles) was it carried aboveground on an arcade. In fact, most of the combined length of the aqueducts supplying Rome (about 420 km [260 miles]) was built as covered trenches or tunnels. When crossing a valley, aqueducts were supported by arcades comprising one or more levels of massive granite piers and impressive arches.
The aqueducts ended in Rome at distribution reservoirs, from which the water was conveyed to public baths or fountains. A few very wealthy or privileged citizens had water piped directly into their homes, but most of the people carried water in containers from a public fountain. Water was running constantly, the excess being used to clean the streets and flush the sewers.

Ancient aqueducts and pipelines were not capable of withstanding much pressure. Channels were constructed of cut stone, brick, rubble, or rough concrete. Pipes were typically made of drilled stone or of hollowed wooden logs, although clay and lead pipes were also used. During the Middle Ages there was no notable progress in the methods or materials used to convey and distribute water.

Cast iron pipes with joints capable of withstanding high pressures were not used very much until the early 19th century. The steam engine was first applied to water-pumping operations at about that time, making it possible for all but the smallest communities to have drinking water supplied directly to individual homes. Asbestos cement, ductile iron, reinforced concrete, and steel came into use as materials for water supply pipelines in the 20th century.

Developments in water treatment
In addition to quantity of supply, water quality is also of concern. Even the ancients had an appreciation for the importance of water purity. Sanskrit writings from as early as 2000 BCE tell how to purify foul water by boiling and filtering. But it was not until the middle of the 19th century that a direct link between polluted water and disease (cholera) was proved, and it was not until the end of that same century that the German bacteriologist Robert Koch proved the germ theory of disease, establishing a scientific basis for the treatment and sanitation of drinking water.

Water treatment is the alteration of a water source in order to achieve a quality that meets specified goals. At the end of the 19th century and the beginning of the 20th, the main goal was elimination of deadly waterborne diseases. The treatment of public drinking water to remove pathogenic, or disease-causing, microorganisms began about that time. Treatment methods included sand filtration as well as the use of chlorine for disinfection. The virtual elimination of diseases such as cholera and typhoid in developed countries proved the success of this water-treatment technology. In developing countries, waterborne disease is still the principal water quality concern.

In industrialized countries, concern has shifted to the chronic health effects related to chemical contamination. For example, trace amounts of certain synthetic organic substances in drinking water are suspected of causing cancer in humans. Lead in drinking water, usually leached from

corroded lead pipes, can result in gradual lead poisoning and may cause developmental delays in children. The added goal of reducing such health risks is seen in the continually increasing number of factors included in drinking-water standards.

Water sources

Global distribution

Water is present in abundant quantities on and under Earth's surface, but less than 1 percent of it is liquid fresh water. Most of Earth's estimated 1.4 billion cubic km (326 million cubic miles) of water is in the oceans or frozen in polar ice caps and glaciers. Ocean water contains about 35 grams per litre (4.5 ounces per gallon) of dissolved minerals or salts, making it unfit for drinking and for most industrial or agricultural uses.

There is ample fresh water—water containing less than 3 grams of salts per litre, or less than one-eighth ounce of salts per gallon—to satisfy all human needs. It is not always available, though, at the times and places it is needed, and it is not uniformly distributed over the globe, sometimes resulting in water scarcity for susceptible communities. In many locations the availability of good-quality water is further reduced because of urban development, industrial growth, and environmental pollution.

Surface water and groundwater

Surface water and groundwater are both important sources for community water supply needs. Groundwater is a common source for single homes and small towns, and rivers and lakes are the usual sources for large cities. Although approximately 98 percent of liquid fresh water exists as groundwater, much of it occurs very deep. This makes pumping very expensive, preventing the full development and use of all groundwater resources.

The hydrologic cycle

Water is in constant circulation, powered by the energy from sunlight and gravity in a natural process called the hydrologic cycle. Water evaporates from the ocean and land surfaces, is held temporarily as vapour in the atmosphere, and falls back to Earth's surface as precipitation. Surface water is the residue of precipitation and melted snow, called runoff. Where the average rate of precipitation exceeds the rate at which runoff seeps into the soil, evaporates, or is absorbed by vegetation, bodies of surface water such as streams, rivers, and lakes are formed. Water that infiltrates Earth's surface becomes groundwater, slowly seeping downward into extensive layers of porous soil and rock called aquifers. Under the pull of gravity, groundwater flows slowly and steadily through the aquifer. In low areas it emerges in springs and streams. Both surface water and groundwater eventually return to the ocean, where evaporation replenishes the supply of atmospheric water vapour. Winds carry the moist air over land, precipitation occurs, and the hydrologic cycle continues.

Surface water sources

The total land area that contributes surface runoff to a river or lake is called a watershed, drainage basin, or catchment area. The volume of water available for municipal supply depends mostly on the amount of rainfall. It also depends on the size of the watershed, the slope of the ground, the type of soil and vegetation, and the type of land use.

The flow rate or discharge of a river varies with time. Higher flow rates typically occur in the spring, and lower flow rates occur in the winter, though this is often not the case in areas with monsoon systems. When the average discharge of a river is not enough for a dependable supply of water, a conservation reservoir may be built. The flow of water is blocked by a dam, allowing an artificial lake to be formed. Conservation reservoirs store water from wet weather periods for use during times of drought and low streamflow. A water intake structure is built within the reservoir, with inlet ports and valves at several depths. Since the quality of water in a reservoir varies seasonally with depth, a multilevel intake allows water of best quality to be withdrawn. Sometimes it is advisable, for economic reasons, to provide a multipurpose reservoir. A multipurpose reservoir is designed to satisfy a combination of community water needs. In addition to drinking water, the reservoir may also provide flood control, hydroelectric power, and recreation.

Groundwater sources

The value of an aquifer as a source of groundwater is a function of the porosity of the geologic stratum, or layer, of which it is formed. Water is withdrawn from an aquifer by pumping it out of a well or infiltration gallery. An infiltration gallery typically includes several horizontal perforated pipes radiating outward from the bottom of a large-diameter vertical shaft. Wells are constructed in several ways, depending on the depth and nature of the aquifer. Wells used for public water supplies, usually more than 30 metres (100 feet) deep and from 10 to 30 cm (4 to 12 inches) in diameter, must penetrate large aquifers that can provide dependable yields of good-quality water. They are drilled using impact or rotary techniques and are usually lined with a metal pipe or casing to prevent contamination. The annular space around the outside of the upper portion of the casing is filled with cement grout, and a special sanitary seal is installed at the top to provide further protection. At the bottom of the casing, a slotted screen is attached to strain silt and sand out of the groundwater. A submersible pump driven by an electric motor can be used to raise the water to the surface. Sometimes a deep well may penetrate a confined artesian aquifer, in which case natural hydrostatic pressure can raise the water to the surface.

Water requirements

Municipal water supply systems include facilities for storage, transmission, treatment, and distribution. The design of these facilities depends on the quality of the water, on the particular needs of the user or consumer, and on the quantities of water that must be processed.

Drinking-water quality

Water has such a strong tendency to dissolve other substances that it is rarely found in nature in a pure condition. When it falls as rain, small amounts of gases such as oxygen and carbon dioxide become dissolved in it; raindrops also carry tiny dust particles and other substances. As it flows over the ground, water picks up fine soil particles, microbes, organic material, and soluble minerals. In lakes, bogs, and swamps, water may gain colour, taste, and odour from decaying vegetation and other natural organic matter. Groundwater usually acquires more dissolved minerals than does surface runoff because of its longer direct contact with soil and rock. It may also absorb gases such as hydrogen sulfide and methane. In populated areas the quality of surface water as well as groundwater is directly influenced by land use and by human activities. For example, storm water runoff contaminated with agricultural or lawn pesticides and fertilizers, as well as with road deicing chemicals or motor oil, can flow into streams and lakes. In addition,

effluent from malfunctioning septic tanks and subsurface leaching fields can seep into groundwater.

Municipal water consumption

Water consumption in a community is characterized by several types of demand, including domestic, public, commercial, and industrial uses. Domestic demand includes water for drinking, cooking, washing, laundering, and other household functions. Public demand includes water for fire protection, street cleaning, and use in schools and other public buildings. Commercial and industrial demands include water for stores, offices, hotels, laundries, restaurants, and most manufacturing plants. There is usually a wide variation in total water demand among different communities. This variation depends on population, geographic location, climate, the extent of local commercial and industrial activity, and the cost of water.

Water use or demand is expressed numerically by average daily consumption per capita (per person). In the United States the average is approximately 380 litres (100 gallons) per capita per day for domestic and public needs. Overall, the average total demand is about 680 litres (180 gallons) per capita per day, when commercial and industrial water uses are included. (These figures do not include withdrawals from freshwater sources for such purposes as crop irrigation or cooling operations at electric power-generating facilities.) Water consumption in some developing countries may average as little as 15 litres (4 gallons) per capita per day. The world average is estimated to be approximately 60 litres (16 gallons) per person per day.

In any community, water demand varies on a seasonal, daily, and hourly basis. On a hot summer day, for example, it is not unusual for total water consumption to be as much as 200 percent of the average demand. The peak demands in residential areas usually occur in the morning and early evening hours (just before and after the normal workday). Water demands in commercial and industrial districts, though, are usually uniform during the work day. Minimum water demands typically occur in the very early or predawn morning hours. Civil and environmental engineers must carefully study each community's water use patterns in order to design efficient pumping and distribution systems.

Water treatment

Water in rivers or lakes is rarely clean enough for human consumption if it is not first treated or purified. Groundwater, too, often needs some level of treatment to render it potable. The primary objective of water treatment is to protect the health of the community. Potable water must, of course, be free of harmful microorganisms and chemicals, but public supplies should also be aesthetically desirable so that consumers will not be tempted to use water from another, more attractive but unprotected source. The water should be crystal clear, with almost no turbidity, and it should be free of objectionable colour, odour, and taste. For domestic supplies, water should not be corrosive, nor should it deposit troublesome amounts of scale and stains on plumbing fixtures. Industrial requirements may be even more stringent; many industries provide special treatment on their own premises.

The type and extent of treatment required to obtain potable water depends on the quality of the source. The better the quality, the less treatment is needed. Surface water usually needs more extensive treatment than does groundwater, because most streams, rivers, and lakes are polluted to some extent. Even in areas remote from human populations, surface water contains

suspended silt, organic material, decaying vegetation, and microbes from animal wastes. Groundwater, on the other hand, is usually free of microbes and suspended solids because of natural filtration as the water moves through soil, though it often contains relatively high concentrations of dissolved minerals from its direct contact with soil and rock.

Water is treated in a variety of physical and chemical methods. Treatment of surface water begins with intake screens to prevent fish and debris from entering the plant and damaging pumps and other components. Conventional treatment of water primarily involves clarification and disinfection. Clarification removes most of the turbidity, making the water crystal clear. Disinfection, usually the final step in the treatment of drinking water, destroys pathogenic microbes. Groundwater does not often need clarification, but it should be disinfected as a precaution to protect public health. In addition to clarification and disinfection, the processes of softening, aeration, carbon adsorption, and fluoridation may be used for certain public water sources. Desalination processes are used in areas where freshwater supplies are not readily available.

Clarification:

Sedimentation

Impurities in water are either dissolved or suspended. The suspended material reduces clarity, and the easiest way to remove it is to rely on gravity. Under quiescent (still) conditions, suspended particles that are denser than water gradually settle to the bottom of a basin or tank. This is called plain sedimentation. Long-term water storage (for more than one month) in reservoirs reduces the amount of suspended sediment and bacteria. Nevertheless, additional clarification is usually needed. In a treatment plant, sedimentation (settling) tanks are built to provide a few hours of storage or detention time as the water slowly flows from tank inlet to outlet. It is impractical to keep water in the tanks for longer periods, because of the large volumes that must be treated.

Sedimentation tanks may be rectangular or circular in shape and are typically about 3 metres (10 feet) deep. Several tanks are usually provided and arranged for parallel (side-by-side) operation. Influent (water flowing in) is uniformly distributed as it enters a tank. Clarified effluent (water flowing out) is skimmed from the surface as it flows over special baffles called weirs. The layer of concentrated solids that collects at the bottom of the tank is called sludge. Modern sedimentation tanks are equipped with mechanical scrapers that continuously push the sludge toward a collection hopper, where it is pumped out.

The efficiency of a sedimentation tank for removing suspended solids depends more on its surface area than on its depth or volume. A relatively shallow tank with a large surface area will be more effective than a very deep tank that holds the same volume but has a smaller surface area. Most sedimentation tanks, though, are not less than 3 metres (about 10 feet) deep, in order to provide enough room for a sludge layer and a scraper mechanism.

A technique called shallow-depth sedimentation is often applied in modern treatment plants. In this method, several prefabricated units or modules of “tube settlers” are installed near the tops of tanks in order to increase their effective surface area.

Insulating Concrete Formwork (ICF) Technique

Suspended particles cannot be removed completely by plain settling. Large, heavy particles settle out readily, but smaller and lighter particles settle very slowly or in some cases do not settle at all. Because of this, the sedimentation step is usually preceded by a chemical process known as coagulation. Chemicals (coagulants) are added to the water to bring the nonsettling particles together into larger, heavier masses of solids called floc. Aluminum sulfate (alum) is the most common coagulant used for water purification. Other chemicals, such as ferric sulfate or sodium aluminate, may also be used.

Coagulation is usually accomplished in two stages: rapid mixing and slow mixing. Rapid mixing serves to disperse the coagulants evenly throughout the water and to ensure a complete chemical reaction. Sometimes this is accomplished by adding the chemicals just before the pumps, allowing the pump impellers to do the mixing. Usually, though, a small flash-mix tank provides about one minute of detention time. After the flash mix, a longer period of gentle agitation is needed to promote particle collisions and enhance the growth of floc. This gentle agitation, or slow mixing, is called flocculation; it is accomplished in a tank that provides at least a half hour of detention time. The flocculation tank has wooden paddle-type mixers that slowly rotate on a horizontal motor-driven shaft. After flocculation the water flows into the sedimentation tanks. Some small water-treatment plants combine coagulation and sedimentation in a single prefabricated steel unit called a solids-contact tank.

Filtration

Even after coagulation and flocculation, sedimentation does not remove enough suspended impurities from water to make it crystal clear. The remaining nonsettling floc causes noticeable turbidity in the water and can shield microbes from disinfection. Filtration is a physical process that removes these impurities from water by percolating it downward through a layer or bed of porous, granular material such as sand. Suspended particles become trapped within the pore spaces of the filter media, which also remove harmful protozoa and natural colour. Most surface water supplies require filtration after the coagulation and sedimentation steps. For surface waters with low turbidity and colour, however, a process of direct filtration, which is not preceded by sedimentation, may be used.

Two types of sand filters are in use: slow and rapid. Slow filters require much more surface area than rapid filters and are difficult to clean. Most modern water-treatment plants now use rapid dual-media filters following coagulation and sedimentation. A dual-media filter consists of a layer of anthracite coal above a layer of fine sand. The upper layer of coal traps most of the large floc, and the finer sand grains in the lower layer trap smaller impurities. This process is called in-depth filtration, as the impurities are not simply screened out or removed at the surface of the filter bed, as is the case in slow sand filters. In order to enhance in-depth filtration, so-called mixed-media filters are used in some treatment plants. These have a third layer, consisting of a fine-grained dense mineral called garnet, at the bottom of the bed.

Rapid filters are housed in boxlike concrete structures, with multiple boxes arranged on both sides of a piping gallery. A large tank called a clear well is usually built under the filters to hold the clarified water temporarily. A layer of coarse gravel usually supports the filter media. When clogged by particles removed from the water, the filter bed must be cleaned by backwashing. In the backwash process, the direction of flow through the filter is reversed. Clean water is forced

upward through the media, expanding the filter bed slightly and carrying away the impurities in wash troughs. The backwash water is distributed uniformly across the filter bottom by an underdrain system of perforated pipes or porous tile blocks.

Because of its reliability, the rapid filter is the most common type of filter used to treat public water supplies. However, other types of filters may be used, including pressure filters, diatomaceous earth filters, and micro strainers. A pressure filter has a granular media bed, but, instead of being open at the top like a gravity-flow rapid filter, it is enclosed in a cylindrical steel tank. Water is pumped through the filter under pressure. In diatomaceous earth filters, a natural powder like material composed of the shells of microscopic organisms called diatoms is used as a filter media. The powder is supported in a thin layer on a metal screen or fabric, and water is pumped through the layer. Pressure filters and diatomaceous earth filters are used most often for industrial applications or for public swimming pools.

Micro strainers consist of a finely woven stainless-steel wire cloth mounted on a revolving drum that is partially submerged in the water. Water enters through an open end of the drum and flows out through the screen, leaving suspended solids behind. Captured solids are washed into a hopper when they are carried up out of the water by the rotating drum. Micro strainers are used mainly to remove algae from surface water supplies before conventional gravity-flow filtration. (They can also be employed in advanced wastewater treatment.)

Disinfection

Disinfection destroys pathogenic bacteria and is essential to prevent the spread of waterborne disease. Typically the final process in drinking-water treatment, it is accomplished by applying chlorine or chlorine compounds, ozone, or ultraviolet radiation to clarified water.

Chlorination

The addition of chlorine or chlorine compounds to drinking water is called chlorination. Chlorine compounds may be applied in liquid and solid forms—for instance, liquid sodium hypochlorite or calcium hypochlorite in tablet or granular form. However, the direct application of gaseous chlorine from pressurized steel containers is usually the most economical method for disinfecting large volumes of water.

Taste or odour problems are minimized with proper dosages of chlorine at the treatment plant, and a residual concentration can be maintained throughout the distribution system to ensure a safe level at the points of use. Chlorine can combine with certain naturally occurring organic compounds in water to produce chloroform and other potentially harmful by-products (trihalomethanes). The risk of this is small, however, when chlorine is applied after coagulation, sedimentation, and filtration.

The use of chlorine compounds called chloramines (chlorine combined with ammonia) for disinfecting public water supplies has been increasing since the beginning of the 21st century. This disinfection method is often called chloramination. The disinfecting effect of chloramines lasts longer than that of chlorine alone, further protecting water quality throughout the distribution system. Also, chloramines further reduce taste and odour problems and produce lower levels of harmful by-products, compared with the use of chlorine alone.

Ozone

Ozone gas may be used for disinfection of drinking water. However, since ozone is unstable, it cannot be stored and must be produced on-site, making the process more expensive than chlorination. Ozone has the advantage of not causing taste or odour problems; it leaves no residual in the disinfected water. The lack of ozone residual, however, makes it difficult to monitor its continued effectiveness as water flows through the distribution system.

Ultraviolet radiation

Ultraviolet radiation destroys pathogens and its use as a disinfecting agent eliminates the need to handle chemicals. It leaves no residual, and it does not cause taste or odour problems. But the high cost of its application makes it a poor competitor with either chlorine or ozone as a disinfectant.

Additional treatment

Clarification and disinfection are the conventional processes for purifying surface water supplies. Other techniques may be used in addition, or separately, to remove certain impurities, depending on the quality of the raw water.

Membrane filtration

Several types of synthetic semipermeable membranes can be used to block the flow of particles and molecules while allowing smaller water molecules to pass through under the effect of hydrostatic pressure. Pressure-driven membrane filtration systems include microfiltration (MF), ultrafiltration (UF), and reverse osmosis (RO); they differ basically in the pressures used and pore sizes of the membranes. RO systems operate at relatively high pressures and can be used to remove dissolved inorganic compounds from water. (RO is also used for desalination, described below.) Both MF and UF systems operate under lower pressures and are typically used for the removal of particles and microbes. They can provide increased assurances of safe drinking water because the microbial contaminants (viruses, bacteria, and protozoa) can be completely removed by a physical barrier. Low-pressure membrane filtration of public water supplies has increased significantly since the late 1990s because of improvements in membrane manufacturing technology and decreases in cost.

Water softening

Softening is the process of removing the dissolved calcium and magnesium salts that cause hardness in water. It is achieved either by adding chemicals that form insoluble precipitates or by ion exchange. Chemicals used for softening include calcium hydroxide (slaked lime) and sodium carbonate (soda ash). The lime-soda method of water softening must be followed by sedimentation and filtration in order to remove the precipitates. Ion exchange is accomplished by passing the water through columns of a natural or synthetic resin that trades sodium ions for calcium and magnesium ions. Ion-exchange columns must eventually be regenerated by washing with a sodium chloride solution.

Aeration

Aeration is a physical treatment process used for taste and odour control and for removal of dissolved iron and manganese. It consists of spraying water into the air or cascading it downward through stacks of perforated trays. Dissolved gases that cause tastes and odours are transferred

from the water to the air. Oxygen from the air, meanwhile, reacts with any iron and manganese in the water, forming a precipitate that is removed by sedimentation and filtration.

Carbon adsorption

An effective method for removing dissolved organic substances that cause tastes, odours, or colours is adsorption by activated carbon. Adsorption is the capacity of a solid particle to attract molecules to its surface. Powdered carbon mixed with water can adsorb and hold many different organic impurities. When the carbon is saturated with impurities, it is cleaned or reactivated by heating to a high temperature in a special furnace.

Fluoridation

Many communities reduce the incidence of tooth decay in young children by adding sodium fluoride or other fluorine compounds to filtered water. The dosage of fluoride must be carefully controlled. Low concentrations are beneficial and cause no harmful side effects, but very high concentrations of fluoride may cause discoloration of tooth enamel.

Desalination

Desalination, or desalting, is the separation of fresh water from salt water or brackish water. Major advances in desalination technology have taken place since the 1950s, as the need for supplies of fresh water has grown in arid and densely populated areas of the world. Desalted water is the main source of municipal supply in areas of the Caribbean, the Middle East, and North Africa, and its use is increasing in the southeastern United States. Although it is relatively expensive to produce, desalted water can be more economical than the alternative of transporting large quantities of fresh water over long distances.

There are two basic types of desalting techniques: thermal processes and membrane processes. Both types consume considerable amounts of energy. Thermal methods involve heat transfer and a phase change of the water from liquid into vapour or ice. Membrane methods use very thin sheets of special plastic that act as selective barriers, allowing pure water to be separated from the salt.

Thermal processes

Distillation, a thermal process that includes heating, evaporation, and condensation, is the oldest and most widely used of desalination technologies. Modern methods for the distillation of large quantities of salt water rely on the fact that the boiling temperature of water is lowered as air pressure drops, significantly reducing the amount of energy needed to vaporize the water. Systems that utilize this principle include multistage flash distillation, multiple-effect distillation, and vapour-compression distillation.

Multistage flash distillation plants account for more than half of the world production of desalted water. The process is carried out in a series of closed vessels (stages) set at progressively lower internal pressures. Heat is added to the system from a boiler. When preheated salt water enters a low-pressure chamber, some of it rapidly boils, or flashes, into water vapour. The vapour is condensed into fresh water on heat-exchange tubes that run through each stage. These tubes carry incoming seawater, thereby reducing the heat required from the boiler. Fresh water collects in trays under the tubes. The remaining brine flows into the next stage at even lower pressure, where some of it again flashes into vapour. A multistage flash plant may have as many as 40 stages, permitting salt water to boil repeatedly without supplying additional heat.

Multiple-effect distillation also takes place in a series of low-pressure vessels (effects), but it differs from multistage distillation in that preheated salt water is sprayed onto evaporator tubes in order to promote rapid evaporation in each vessel. This process requires pumping the salt water from one effect to the next.

In the vapour-compression system, heat is provided by the compression of vapour rather than by direct heat input from a boiler. When the vapour is rapidly compressed, its temperature rises. Some of the compressed and heated vapour is then recycled through a series of tubes passing through a reduced-pressure chamber, where evaporation of salt water occurs. Electricity is the main source of energy for this process. It is used for small-scale desalting applications—for example, at coastal resorts.

Two other thermal processes are solar humidification and freezing. In solar humidification, salt water is collected in shallow basins in a "still," a structure similar to a greenhouse. The water is warmed as sunlight enters through inclined glass or plastic covers. Water vapour rises, condenses on the cooler covers, and trickles down to a collecting trough. Thermal energy from the sun is free, but a solar still is expensive to build, requires a large land area, and needs additional energy for pumping water to and from the facility. Solar humidification units are suitable for providing desalted water to individual families or for very small villages where sunlight is abundant.

The freezing process, also called crystallization, involves cooling salt water to form crystals of pure ice. The ice crystals are separated from the unfrozen brine, rinsed to remove residual salt, and then melted to produce fresh water. Freezing is theoretically more efficient than distillation, and scaling as well as corrosion problems are lessened at the lower operating temperatures, but the mechanical difficulties of handling mixtures of ice and water prevent the construction of large-scale commercial plants. In hot climates, heat leakage into the facility is also a significant problem.

Membrane processes

Two commercially important membrane processes used for desalination are electrodialysis and reverse osmosis. They are used mainly to desalt brackish or highly mineralized water supplies rather than much saltier seawater. In both methods, thin plastic sheets act as selective barriers, allowing fresh water but not salt to flow through.

Most salts dissolved in water exist in the form of electrically charged particles called ions. Half are positively charged (e.g., sodium), and half are negatively charged (e.g., chloride). In electro dialysis an electric voltage is applied across the saline solution. This causes ions to migrate toward the electrode that has a charge opposite to that of their own. In a typical electro dialysis unit, several hundred plastic membranes that are selectively permeable to either positive ions or negative ions, but not both, are closely spaced in alternation and bound together with electrodes on the outside. Incoming salt water flows between the membrane sheets. Under the applied voltage the ions move in opposite directions through the membranes, but they are trapped by the next membrane in the stack. This forms alternate cells of dilute salt water and brine. The more-dilute solution is recycled back through the stack until it reaches freshwater quality.

When a semipermeable membrane separates two solutions of different concentrations, there is a natural tendency for the concentrations to become equalized. Water flows from the dilute side to the concentrated side. This process is called osmosis. However, a high pressure applied to the concentrated side can reverse the direction of this flow. In reverse osmosis, salty water is pumped into a vessel and pressurized against the membrane. Fresh water diffuses through the membrane, leaving a more concentrated salt solution behind.

Next to multistage flash distillation, reverse osmosis is the second-ranking desalting process. It will play a greater role in the desalting of seawater and brackish water as more-durable membranes are developed. It can also be applied to the advanced treatment of municipal sewage and industrial wastewater.

Cogeneration and hybrid processes

Desalting costs are reduced by using cogeneration and hybrid processes. Cogeneration (or dual-purpose) desalination plants are large-scale facilities that produce both electric power and desalted seawater. Distillation methods in particular are suitable for cogeneration. The high-pressure steam that runs electric generators can be recycled in the distillation unit's brine heater. This significantly reduces fuel consumption compared with what is required if separate facilities are built. Cogeneration is very common in the Middle East and North Africa.

Hybrid systems are units that operate with two or more different desalting processes (e.g., distillation and reverse osmosis). They offer further economic benefits when employed in cogeneration plants, productively combining the operation of each process.

Effluent disposal

Desalination produces fresh water but also a significant volume of waste effluent, called brine. Since the primary pollutant in the brine is salt, disposal in the ocean is generally not a problem for facilities located near a coastline. At inland desalination facilities, care must be taken to prevent pollution of groundwater or surface waters. Methods of brine disposal include dilution, evaporation, injection into a saline aquifer, and pipeline transport to a suitable disposal point.

Water distribution

A water distribution system is a network of pumps, pipelines, storage tanks, and other appurtenances. It must deliver adequate quantities of water at pressures sufficient for operating plumbing fixtures and fire fighting equipment, yet it must not deliver water at pressures high enough to increase the occurrence of leaks and pipeline breaks. Pressure-regulating valves may be installed to reduce pressure levels in low-lying service areas. More than half the cost of a municipal water supply system is for the distribution network.

Pipelines

The pipeline system of a municipal water distribution network consists of arterial water mains or primary feeders, which convey water from the treatment plant to areas of major water use in the community, and smaller-diameter pipelines called secondary feeders, which tie in to the mains. Usually not less than 150 mm (6 inches) in diameter, these pipelines are placed within the public right-of-way so that service connections can be made for all potential water users. The pipelines are usually arranged in a gridiron pattern that allows water to circulate in interconnected loops; this permits any broken sections of pipe to be isolated for repair without disrupting service to large areas of the community. "Dead-end" patterns may also be used, but they do not permit circulation, and the water they provide is more susceptible to taste and odour problems because of stagnation.

A water distribution pipeline must be able to resist internal and external forces, as well as corrosion. Pipes are placed under stress by internal water pressure, by the weight of the overlying soil, and by vehicles passing above. They may have to withstand water-hammer forces; these occur when valves are closed too rapidly, causing pressure waves to surge through

the system. In addition, metal pipes may rust internally if the water supply is corrosive or externally because of corrosive soil conditions.

Materials

Distribution pipes are made of asbestos cement, cast iron, ductile iron, plastic, reinforced concrete, or steel. Although not as strong as iron, asbestos cement, because of its corrosion resistance and ease of installation, is a desirable material for secondary feeders up to 41 cm (16 inches) in diameter. Pipe sections are easily joined with a coupling sleeve and rubber-ring gasket. Cast iron has an excellent record of service, with many installations still functioning after 100 years. Ductile iron, a stronger and more elastic type of cast iron, is used in newer installations. Iron pipes are provided in diameters up to 122 cm (48 inches) and are usually coated to prevent corrosion. Underground sections are connected with bell-and-spigot joints, the spigot end of one pipe section being pushed into the bell end of an adjacent section. A rubber-ring gasket in the bell end is compressed when the two sections are joined, creating a watertight, flexible connection. Flanged and bolted joints are used for aboveground installations.

Plastic pipes are available in diameters up to 61 cm (24 inches). They are lightweight, easily installed, and corrosion-resistant, and their smoothness provides good hydraulic characteristics. Plastic pipes are connected either by a bell-and-spigot compression-type joint or by threaded screw couplings.

Precast reinforced concrete pipe sections up to 366 cm (12 feet) in diameter are used for arterial mains. Reinforced concrete pipes are strong and durable. They are joined using a bell-and-spigot-type connection that is sealed with cement mortar. Steel pipe is sometimes used for arterial mains in aboveground installations. It is very strong and lighter than concrete pipe, but it must be protected against corrosion with lining of the interior and with painting and wrapping of the exterior. Sections of steel pipe are joined by welding or with mechanical coupling devices.

Fittings

In order to function properly, a water distribution system requires several types of fittings, including hydrants, shutoff valves, and other appurtenances. The main purpose of hydrants is to provide water for fire fighting. They also are used for flushing water mains, pressure testing, water sampling, and washing debris off public streets.

Many types of valves are used to control the quantity and direction of water flow. Gate valves are usually installed throughout the pipe network. They allow sections to be shut off and isolated during the repair of broken mains, pumps, or hydrants. A type of valve commonly used for throttling and controlling the rate of flow is the butterfly valve. Other valves used in water distribution systems include pressure-reducing valves, check valves, and air-release valves.

Installation

Water mains must be placed roughly 1 to 2 metres (3 to 6 feet) below the ground surface in order to protect against traffic loads and to prevent freezing. Since the water in a distribution system is under pressure, pipelines can follow the shape of the land, uphill as well as downhill. They must be installed with proper bedding and backfill. Compaction of soil layers under the pipe (bedding) as well as above the pipe (backfill) is necessary to provide proper support. A water main should never be installed in the same trench with a sewer line. Where the two must cross, the water main should be placed above the sewer line.

Pumps

Many kinds of pumps are used in distribution systems. Pumps that lift surface water and move it to a nearby treatment plant are called low-lift pumps. These move large volumes of water at relatively low discharge pressures. Pumps that discharge treated water into arterial mains are called high-lift pumps. These operate under higher pressures. Pumps that increase the pressure within the distribution system or raise water into an elevated storage tank are called booster pumps. Well pumps lift water from underground and discharge it directly into a distribution system.

Most water distribution pumps are of the centrifugal type, in which a rapidly rotating impeller adds energy to the water and raises the pressure inside the pump casing. The flow rate through a centrifugal pump depends on the pressure against which it operates. The higher the pressure, the lower the flow or discharge. Another kind of pump is the positive-displacement type. This pump delivers a fixed quantity of water with each cycle of a piston or rotor. The water is literally pushed or displaced from the pump casing. The flow capacity of a positive-displacement pump is unaffected by the pressure of the system in which it operates.

Storage tanks

Distribution storage tanks, familiar sights in many communities, serve two basic purposes: equalizing storage and emergency storage. Equalizing storage is the volume of water needed to satisfy peak hourly demands in the community. During the late night and very early morning hours, when water demand is lower, high-lift pumps fill the tank. During the day, when water demand is higher, water flows out of the tank to help satisfy the peak hourly water needs. This allows for a uniform flow rate at the treatment plant and pumping station. Water in a distribution storage tank may also be needed for fighting fires, cleaning up accidental spills of hazardous materials, or other community emergencies. The capacity of a distribution storage tank is designed to be about equal to the average daily water demand of the community.

Distribution storage tanks are built at ground level on hilltops higher than the service area. In areas with flat topography, the tanks may be elevated aboveground on towers in order to provide adequate water pressures, or ground-level storage tanks with booster pumping may be provided.

14.2 Electrical Engineering

14.2.1 Design of Power Electronics converter

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.

The design of power electronics converter circuits requires design the power and control circuits. The voltage and current harmonics that are generated by the power converters can be reduced or minimized with a proper choice of the control strategy.

- Diode rectifier
- AC to DC Converter (Controlled Rectifier)
- DC to DC Converter (DC Chopper)
- AC to AC Converter (AC voltage regulator)
- DC to AC Converter (Inverter)
- Static switch

- Diode Rectifiers. A diode rectifier circuit converts AC voltage into a fixed DC voltage. The input voltage to rectifier could be either single phase or three phase.
- AC to DC Converters. An AC to DC converter circuit can convert AC voltage into a DC voltage. The DC output voltage can be controlled by varying the firing angle of the thy-resisters.

The AC input voltage could be a single phase or three phase.

- AC to AC Converters. These converters can convert from a fixed ac input voltage into variable AC output voltage. The output voltage is controlled by varying firing angle of TRIAC. These type converters are known as AC voltage regulator.
- DC to DC Converters. These converters can converter a fixed DC input voltage into variable DC voltage or vice versa. The DC output voltage is controlled by varying of duty cycle.
- Static Switch. Because the power devices can be operated as static switches or contactors, the supply to these switches could be either AC or DC and the switches are called as AC static switches or DC static switches.
- 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.
- The block diagram of a power electronic converter is shown in figure above. It consist of an electrical energy source, power electronic circuit, a control circuit and an electric load. This converter changes one form of electrical energy to other form of electrical energy.
- The power electronic circuit consists of both power part and control part. Power part transfers the energy from source to load and it consists of power electronic switches (SCR or TRIAC), transformers, electric choke, capacitors, fuses and sometimes resistors.
- The control circuit or block regulates the elements in the power part of the converter. This block is built with a complex low power electronic circuit that consists of either analog or digital circuit assembly.
- Power electronic converters perform various basic power conversion functions.This converter is a single power conversion stage that can perform any of the functions in AC and DC power conversion systems.
- Depending on the type of function performed, power electronic converters are categorized into following types.

a. AC to DC = Rectifier: It converts AC to unipolar (DC) current
b. DC to AC = Inverter: It converts DC to AC of desired frequency and voltage
c. DC to DC = Chopper: It converts constant to variable DC or variable DC to constant DC

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

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

Introduction

The direct-on-line starting of induction motors produces troublesome torque and current transients. Soft-starting techniques, which are commonly used with three-phase induction motors, lead to more reliable operation and allow the reduction of the motor sizing: they limit the phase currents during the starting transient in order to obtain a smooth connection to the power supply. Unfortunately, little investigation has been made so far on the application of these techniques to single-phase motors, even if they are widely used e.g. in households purpose and of course suffer of the same troubles as in the three-phase motors.

Now a days, the present work can deals with various soft-starting techniques, implemented on a simulation tool. Out of these some are almost based on the so-called point-on-wave technique of switching, which is actually a delayed insertion, either simultaneous or independent, of both the main and auxiliary phases to the main supply. In order to limit the total transient current within the allowed maximum for household appliances, the gradual insertion of the motor's main phase, is also investigated and discussed.

Existing system

Soft starters of motors may offer a much variety of methods which are useful for controlling motor starting. Every soft starting method uses a different primary control parameter.

Soft Start Method	Parameter Controlled	Performance Parameter Influenced
Time Voltage Ramp	Voltage	Start current, Start torque, Acceleration
Constant Current	Current	Start current, Acceleration
Torque Control	Torque	Start current, Acceleration
Adaptive Acceleration Control	Acceleration	Start current, Acceleration

Best results are obtained by selecting the soft start method that directly controls the parameter of most importance for the application. Typically soft starters are mainly used to limit motor starting current or to control load acceleration and/or deceleration.

Timed Voltage Ramp (TVR) Starting

Timed voltage ramp (TVR) was the earliest form of soft starting. TVR slows the application of voltage, which reduces the start current. This reduces start torque and slows the motor’s rate of acceleration.

Current limit starting

With limiting of current of starting, the soft starter can delivers voltage to the motor so that it reaches a specified current level, then pauses the voltage ramp. When the current drops, the voltage ramp continues. This keeps start current within the required limit, although the motor's actual current level varies throughout the start. This can be useful for generator set applications where the supply is limited.

Constant current

With constant current starting, the current is raised from zero to a specified level and keeps the current stable at that level until the motor has accelerated. Constant current starting is very ideal for all applications where the starting current must have to kept below a particular level.

Torque Control

Torque control is promoted as a method of providing a more linear speed ramp in soft starters. By providing a constant acceleration torque, controlling of torque will allows the motor to speed to be up or slow down in a linear fashion.

Adaptive Control for Starting

Adaptive Acceleration Control is a new intelligent motor control technique. In an adaptive nature of control with soft start method, the soft starter are able adjusts the current value to start the motor within a specified time and using a selected acceleration profile. Every application has a particular starting profile, based on characteristics of the load and the motor. Adaptive Acceleration Control offers three different starting profiles schemes, to be suit the requirements of various applications.

Selecting a profile that matches the inherent profile of the application can help smooth out acceleration across the full start time. Selection of the dramatically different Adaptive Control profile can somewhat able neutralize the inherent profile. The soft starter monitors the motor's performance during each start, to improve control for future soft starts.

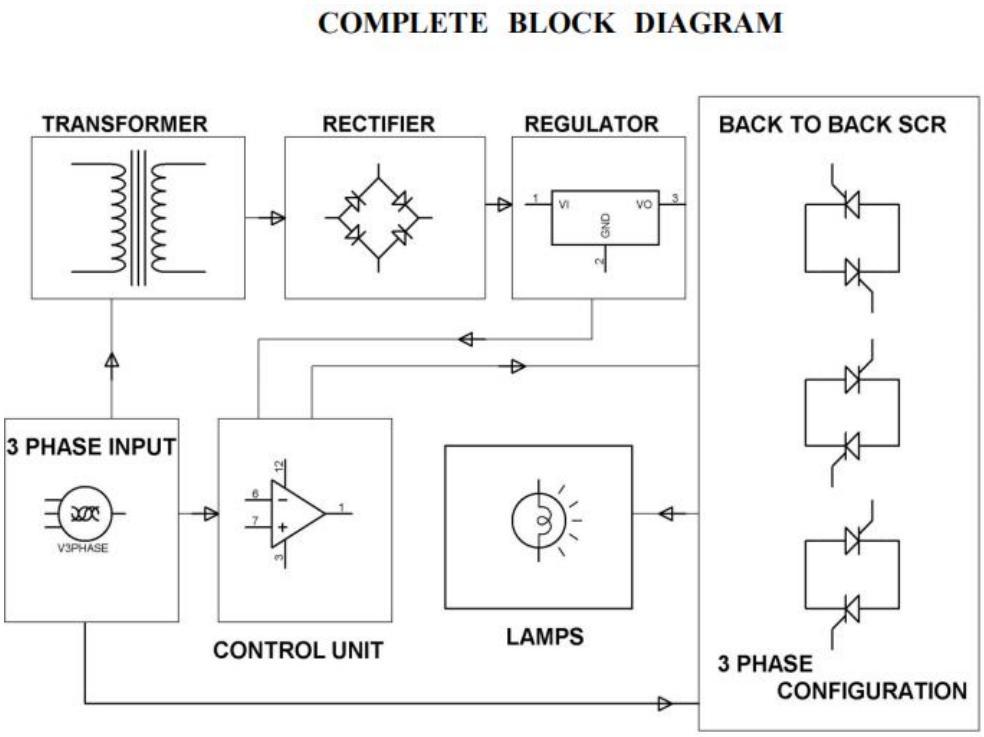


Fig: 14.11 Soft Start for 3-Phase-Induction Motor

The block diagram shown in the fig in this voltage is controlled by SCRs.

14.2.3 Advanced Wireless Power Transfer System

Wireless Power Transmission through Solar Power System & Working

- Traditional wired power transmission systems usually require lying of transmission wires between the distributed units and the consumer units. This produces a lot of constraints as the cost of the system- the cost of the cables, the losses incurred in the transmission as well as in distribution. Just imagine, only the resistance of the transmission line results in loss of about 20-30% of the generated energy.

- If you talk about the DC power transmission system, even that is not feasible as it requires a connector between the DC power supply and the device.

- Imagine a system completely devoid of wires, where you can get AC power to your homes without any wires. Where you can recharge your mobile without having to physically plug into the socket. Where the battery of the pacemaker (placed inside a human heart) can be recharged without having to replace the battery. Of course, such a system is possible and that‘s where the role of Wireless Power Transmission comes.

- This concept is actually not a new concept. This whole idea was developed by Nicolas Tesla in 1893, where he developed a system of illuminating vacuum bulbs using wireless transmission techniques.

We cannot imagine a world without Wireless Power Transfer is feasible: mobile phones, domestic robots, MP3 players, computers, laptops, and other conveyable gadgets fit for charging themselves while never being connected to, liberating us from that final and ubiquitous power wire. Some of these units may not even require many numbers of electric cells/batteries to operate.

3 Types of Wireless Power Transfer Methods:

Inductive Coupling:

- One of the most prominent methods of transferring energy is through inductive coupling. It is basically used for near field power transmission.

- It is based on the fact that when current flows through one wire, a voltage is induced across the ends of the other wire. The power transmission takes place through mutual inductance between the two conductive materials. A general example is a transformer.

Microwave Power Transmission:

- This idea was developed by William C Brown. The whole idea involves converting the AC power to RF power and transmitting it through space and again reconverting it to AC power at the receiver.
- In this system, power is generated using microwave power sources like klystron, and this generated power is given to the transmitting antenna via the waveguide (which protects the microwave power from reflected power) and the tuner (which matches the impedance of the microwave source with that of the antenna).
- The receiving section consists of the receiving antenna which receives the microwave power and the Impedance matching and filter circuit which matches the output impedance of the signal with that of the rectifying unit. This receiving antenna along with the rectifying unit is known as the Rectenna. The antenna used can be a dipole or a Yagi-Uda Antenna.
- The receiver unit also consists of the rectifier section consisting of Schottky diodes which is used to convert the microwave signal to DC signal. This transmission system uses frequencies in the range of 2GHz to 6GHz.

14.2.4 Industrial Temperature Controller

Industrial temperature controller

- As the name implies, a temperature controller is an instrument used to control temperatures, mainly without extensive operator involvement. A controller in a temperature control system will accept a temperature sensor such as a thermocouple or RTD as input and compare the actual temperature to the desired control temperature, or set point. It will then provide an output to a control element.
- A good example would be an application where the controller takes an input from a temperature sensor and has an output that is connected to a control element such as a heater or fan. The controller is usually just one part of a temperature control system, and the whole system should be analyzed and considered in selecting the proper controller.

What Are the Different Types of Process or Temperature Controllers, and How Do They Work?

- There are three basic types of process controllers: on-off, proportional and PID. Depending upon the system to be controlled, the operator will be able to use one type or another to control the process.

On/Off temperature Controller

- An on-off temperature controller is the simplest form of control device. The output from the device is either on or off, with no middle state. An on-off controller will switch the output only when the temperature crosses the setpoint. For heating control, the output is on when the temperature is below the setpoint, and off above setpoint.
- Since the temperature crosses the setpoint to change the output state, the process temperature will be cycling continually, going from below setpoint to above, and back below. In cases where this cycling occurs rapidly, and to prevent damage to contactors and valves, an on-off differential, or "hysteresis," is added to the controller operations.

This differential requires that the temperature exceed setpoint by a certain amount before the output will turn off or on again. On-off differential prevents the output from "chattering" or making fast, continual switches if the cycling above and below the setpoint occurs very rapidly. On-off control is usually used where a precise control is not necessary, in systems which cannot handle having the energy turned on and off frequently, where the mass of the system is so great that temperatures change extremely slowly, or for a temperature alarm. One special type of on-off control used for alarm is a limit controller. This controller uses a latching relay, which must be manually reset, and is used to shut down a process when a certain temperature is reached.

Proportional Control

- Proportional controls are designed to eliminate the cycling associated with on-off control. A proportional controller decreases the average power supplied to the heater as the temperature approaches setpoint.

- This has the effect of slowing down the heater so that it will not overshoot the setpoint, but will approach the set point and maintain a stable temperature. This proportioning action can be accomplished by turning the output on and off for short time intervals. This "time proportioning" varies the ratio of "on" time to "off" time to control the temperature.The proportioning action occurs within a "proportional band" around the setpoint temperature.
- Outside this band, the temperature controller functions as an on-off unit, with the output either fully on (below the band) or fully off (above the band). However, within the band, the output is turned on and off in the ratio of the measurement difference from the setpoint. At the setpoint (the midpoint of the proportional band), the output on:off ratio is 1:1; that is, the ontime and off-time are equal. If the temperature is further from the setpoint, the on- and offtimes vary in proportion to the temperature difference. If the temperature is below setpoint, the output will be on longer; if the temperature is too high, the output will be off longer

PID Control

- The third controller type provides proportional with integral and derivative control, or PID. This controller combines proportional control with two additional adjustments, which helps the unit automatically compensate for changes in the system.
- These adjustments, integral and derivative, are expressed in time-based units; they are also referred to by their reciprocals, RESET and RATE, respectively. The proportional, integral and derivative terms must be individually adjusted or "tuned" to a particular system using trial and error. It provides the most accurate and stable control of the threecontroller types, and is best used in systems which have a relatively small mass, those which react quickly to changes in the energy added to the process.
- In this other article, how to tune a PID controller is covered in more detail.
- It is recommended in systems where the load changes often and the controller is expected to compensate automatically due to frequent changes in setpoint, the amount of energy available, or the mass to be controlled. OMEGA offers a number of controllers that automatically tune themselves. These are known as autotune controllers.

Standard Sizes

- Since temperature controllers are generally mounted inside an instrument panel, the panel must be cut to accommodate the temperature controller. In order to provide interchangeability between temperature controllers, most temperature controllers are designed to standard DIN sizes. The most common DIN sizes are shown below.

Choose a temperature controller for your application

On-Off Controllers

- On-Off process controllers are the simplest type of controllers featuring on-off control action designed to provide the functionality of general purpose PID controllers but at a price suited to On/Off applications.

Autotune PID Controllers

- PID controllers provide very tight control but the PID algorithm requires tuning. Autotune controllers provide that function.

Multiloop Controllers

- Each control loop normally consists of one input and at least one output. OMEGA offers numerous multiloop controllers which can handle more than a single control loop. OMEGA's CS8DPT can handle up to 6 control loops.

Safety Limit Controllers

- A safety limit controller is an off-off controller with a latching output.changes state it requires a manual reset to change it back. Safety limit controllers are typically used as redundant controllers, to shut down a process when undesirable limits are reached.

Chapter: 15

Smart and / or Sustainable features of **Chapter 8 & 13 designs**, Impact on society. (For Allocated village development, villagers happiness, comfortable and for enhancement of the village) (**With the Smart village development Concept as per Your Idea and Village Visit, modern technology with innovation**).
with doing small changes, Period, Amount Expenditure and Benefit –
a) Immediately b) Within 1 year c) Long term (3-5 years) along with cost estimation.
b) If possible, List the sources of the funding available with the Village gram panchayat

Total existing scenario of the implementation

Education system:

Village has an anganvadi with good education system. Village also has an private school and collage of good education system and also in nearby villages. We can provide govt. school in village of better education in low cost.

Drainage system:

The drainage system of the village is very poor. The drainage lines are open and drainage covers are also missing.

Panchayat building:

The panchayat building of village is very old constructed and located at the end (backside gate) of the village.

Roads :

Roads of the village are more kuchha rather than pakka , although some roads were on construction , but as per our opinion paver blocks will be more suitable for the village.

Transportation facility:

There is only one bus stop outside the village nearby highway where people can wait for bus , which is in very bad condition. New bus stand should be built because there is no other option for transportation, oly bus is used by people of village.

Water tank facility:

There is only one water tank in the village with huge capacity of 6lac lit. , it is demanding some repair work.

Sanitation:

There is lack of cleanliness and hygine in the village , so we decided to provide public toilets in the village for hygienic life and cleanliness.

Table: 15.1 Design implementation with its amount of expenditure

Sr. no.	Design name	Period	Amount expenditure	Benefits
8.1.1	PHC building	Within 1 year	49040000	For helping people of village and welfare of village.
8.1.2	Bus station	Within 1 year	159128	For better relief in waiting of a bus and quick transportation.
8.1.3	Pavement design	Immediately	28337000	For better roads in village for safety and for good drainage.
8.1.4	Garden	Within 1 year	637000	For entertainment of kids and peace of old age person.
8.1.5	Drainage design	Immediately	30515000	For hygienic purpose. And for better roads.
8.1.6	Water tank	Immediately	3680000	For reducing wastage of water and maintaining cleanliness in water.
14.1.1	Community hall	Within 1 year	1953200	For welfare of village
14.1.2	Medical store	Immediately	625000	For easy availability of medicines and welfare of village
14.1.3	Library	Within 1 year	1122000	For educational purposes.
14.1.4	Entry gate	Within 1 year	104000	For easy recognization of village entry.
14.1.5	Public toilet	Immediately	151000	For hygienic life of people and cleanliness of village.
14.1.6	Post office	Within 1 year	343000	For easy and quick transportations of things.

List of the sources of funding available with the village authority :

1. Govt. various schemes funding.
2. Private organization helping for collecting donations.
3. By other donations.
4. Land charges.
5. Government schools
6. Collection of funds from village people.

Chapter: 16

Survey By Interviewing With Talati And/Or Sarpanch

SURVEY BY INTERVIEWING WITH TALATI AND/OR SARPANCH
ALLOCATED VILLAGE SURVEY
An approach towards "Rurbanisation for Village Development"

Sr.	Questions	Yes/ No	Remarks
1	What are the sources of income in village?	Yes	**Agriculture**
2	What are the chances of employment in village?	No	
3	What are the special technical facilities in village?	No	
4	Is any debt on village dwellers?	No	
5	Are village people getting agricultural help?	Yes	
6	Is women health awareness Program organized in village?	Yes	
7	Are women having opportunity to work and income?	No	
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	**Aji River**
13	Is village under any debt?	No	
14	Is any serious issue due to debt from bank or any person happened in village?	No	
15	Is any suicide like incident observed in village due to government policy, debt or threatening?	No	
16	Is any death of patient occurred due to unavailability of medical facility in village?	No	
17	How many disabled (physically challenged) is observed in village? Provide list with Male/female/girl/boy with age and type of disability and reason of disability.	No	
18	Is village improvement is observed in comparative scenario from past to present?	Yes	
19	Is any unavoidable difficulty village people are facing? Any natural calamity is there?	Yes	**Aji river**
20	Life Living standard of girls and women is appreciated and uplifted in village?	Yes	

Chapter: 17

Irrigation / Agriculture Activities and Agro Industry, Alternate Technics

Modern agriculture is driven by continuous improvements in digital tools and data as well as collaborations among farmers and researchers across the public and private sectors.
During the Green Revolution in the 1960s, India could achieve self-sufficiency in food grain production by using modern methods of agriculture like better quality of seeds, proper irrigation, chemical fertilisers and pesticides.

As time passed, more technological advances appeared in agriculture. The tractor was introduced, followed by new tillage and harvesting equipment, irrigation and air seeding technology, all leading to higher yields and improved quality of the food and fibre that was grown.

It is possible for farmers to utilise scientific data and technology to improve crop yields and keep themselves up-to-date with cutting edge methods of farming.
Here are some examples of how modern technology can be used to improve agriculture:

1. Monitoring and controlling crop irrigation systems via smartphone
Mobile technology is playing an important role in monitoring and controlling crop irrigation systems.
With this modern technology, a farmer can control his irrigation systems from a phone or computer instead of driving to each field.
Moisture sensors in the ground are able to communicate information about the level of moisture present at certain depths in the soil.

2. Ultrasounds for livestock
Ultrasound is not only for checking on baby animals in the womb. It also can be used to discover what quality of meat might be found in an animal before it goes to the market.The testing of DNA helps producers to identify animals with good pedigrees and other desirable qualities. This information can also be used to help the farmer to improve the quality of his herds.

3. Usage of mobile technology and cameras
Some farmers and ranchers use apps like ‘Foursquare’ to keep tabs on employees. They also put up cameras around the farm.

Livestock managers are wiring up their barn feedlots and pastures with cameras that send images back to the central location like an office or home computer. They can keep a closer eye on the animals when they are away or home for the night.

4. Crop Sensors
Crop sensors help apply fertilisers in a very effective manner, maximising uptake. They sense how your crop is feeling and reduce the potential leaching and runoff into ground water.

Instead of making a prescription fertiliser map for a field before you go out to apply it, crop sensors tell application equipment how much to apply in real time.
Optical sensors are able to see how much fertiliser a plant may need, based on the amount of light reflected back to the sensor.

Vision about modern agriculture

Nearly everyone working on the future of modern agriculture is focused on efficiency. A wide range of technologies will enable the transition of modern agriculture in the field.

Some technologies will need to be developed specifically for agriculture, while other technologies already developed for other areas could be adapted to the modern agricultural domain such as autonomous vehicles, artificial intelligence and machine vision.

If modern agriculture is applied widely in the near future, millions of farmers will be able to benefit from the acquisition of real-time farm information.

Farmers need not spend significant amount of time on acquiring farm data and will have access to disaster warnings and weather information when a disaster event occurs.It is difficult to predict the future of technology in agriculture but there are many promising trends and pilot projects.

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. Farming methods are increasingly becoming more refined, less manual, yields are increasing, and it's not uncommon to find beef poultry, beef cattle, and dairy cows on the same farm. But what is causing these changes? The answer is simple. Technology!

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 revolutionised agriculture.

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.

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 recognise their position within the farm and adapt their operation to maximise 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 analysed to generate a fertility map in a geographic information system (GIS). Using the map, farmers can accurately prescribe the quantity of fertiliser required for each sampled section of the farm field. After that, the farmer can use Variable-rate technology (VRT) fertiliser applicators to distribute the precise amount of fertilisers in the area.

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 colour 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, minimising on wastage, and lowering costs.

Mobile devices

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.

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.

Chapter: 18

Social Activities – Any Activates Planned By Students

“One day awareness program on road safety”

Road safety gained more importance due to the ever increasing numbers of road accidents and other damages. Many efforts are taken by the govt. to reduce road accidents and have therefore decided to observe road safety month for creating awareness among the road users.

As the village is located near highway , we have decided to do an one day awareness program in road safety , because many people are travelling in highway for their daily wages and risking their life by not following traffic rules and not keeping proper safety measures.

Fig: 18.1 Road Safety

There are some following precautions which should be kept in mind before and while you are on road.

- Use helmet while driving
- Wear seat belt while driving
- Be focused on driving and nowhere else
- Watch out on mirrors before turning
- Don’t break rules and regulations

- Control your speed as per the type of road
- One should know about all traffic signs and signals
- Should have an medical kit while on highway
- Should decrease speed on crossigs
- Should give a way to pedestrains
- Help others.

Knowledge of 4 E's of road safety:

1. Education
2. Enforcement
3. Engineering
4. Environment

Education:-

Awareness is generated through various Road Safety Campaigns utilizing audio-visual and other print media and through NGOs. With the view to raise road safety awareness among the general public, the Government have been undertaking various publicity measures through DAVP and professional agencies in the form of telecasting/broadcasting of TV spots/Radio spots, display of cinema slides, distribution of posters, books on road safety signage & signs, organizing Road Safety Week, Seminars, Exhibitions. All India Essay Competition on Road Safety, etc., containing road safety messages for various segments of road users viz. Pedestrians, cyclists, school children, heavy vehicle drivers, etc. painting on road railings on themes of road safety, road safety games, calendars depicting road safety messages, etc.

Enforcement:-

The Motor Vehicles Act 1988 and Central Motor Vehicles Rules 1989 contain a number of provisions, which if enforced correctly, would curb traffic violations by drivers. The enforcement of these provisions is primarily the responsibility of the concerned State Government. The States have been advised from time to time to enforce various provisions of the Motor Vehicles Act 1988 in the right earnest to improve road safety scenario in the country.

Engineering :-

Specification/designs are constantly under review by the Roads Wing of the Ministry. The States are constantly being advised on these issues. The Ministry had issued detailed guidelines regarding engineering measures to be taken by all concerned to ensure road safety vide a circular last year. As per this circular the following engineering measures are considered essential for

adoption so as to help in improving road safety leading to reduction of accidents:- Geometry of the road; Separation of local traffic; Pedestrian facility; Bus bays; Illuminations; Development of Junction; Signages; Traffic calming & Safety Management Measures; Bridges/CD Structures: and Road Safety Audit.

Environment and emergency care of road accident victims :-

The Scheme entails providing cranes and ambulances to States/UTs/NGOs for relief and rescue measures in the aftermath of accidents by way of evacuating road accident victims to nearest medical aid centre and for clearing the accident site. So far, 347 Ten ton cranes and 106 small/medium size cranes have been sanctioned under the scheme. 579 ambulances have been sanctioned to States/UTs/ NGOs under the scheme. During 2011-12, 30 cranes, 30 ambulances and 20 small/medium sized cranes are proposed to be provided.

Further Ministry of Road Transport & Highways would provide 140 advanced life support ambulances to 140 identified hospitals to be upgraded under the Ministry of Health & Family Welfare's scheme 'Establishment of an integrated network of Trauma Centers' along the Golden Quadrilateral, North-South and East-West Corridors of the National Highways by upgrading the trauma care facilities in 140 identified state Government hospitals. 70 ambulances have already been provided. Another 70 will be provided during the current year.

Chapter: 19

<<ALLOCATED VILLAGE>> SAGY Questionnaire Survey form with the Sarpanch Signature (Scanned copy attachment in the soft copy report and Original copy in hardbound report)

SAANSAD ADARSH GRAM YOJANA (SAGY) Baseline Household Survey Questionnaire

Village: Kalipat Gram Panchayat: Kalipat Ward No.

Block: Rajkot District: Rajkot

State: Gujarat L.S Constituency: Rajkot (Rural)

1. Family Identity and Size

Name of Head of Household	Rajshibhai Budhabhai Parmar							Male/ Female	M
SECC Survey ID:		Family Size	6	Over 18	3	6 to 18	3	Under 6	

2. Category & Entitlement Details (Tick as appropriate)

Social Category[1]	OBC	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	Other	Is any woman in the family member of an SHG? Yes / No ✓	
PDS (If NFSA is implemented)	Annapurna	Antyodaya ✓	Priority				

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]
Rajshibhai	41	M	N	2	04	Y	Y	0
Meenaben	50	F	N	3	01	Y	Y	0
Rujutaben	30	F	N	2	01	Y	Y	0

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
Divya	17	F	N	1	05	Y	11th	Y
Meet	15	M	N	1	04	Y	10th	Y
Bharti	12	F	N	1	05	Y	8th	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

[1] Scheduled Caste 1, Scheduled Tribe 2, Other Backward Castes 3, Other 4

[2] Enter the BPL Survey round being used in the Gram Panchayat for identification of BPL Families (e.g. 1997/2002/2011)

[3] Marital Status: Not Married – 1, Married – 2, Widowed – 3, Divorced/Separated – 4

[4] Level of Education: Not Literate – 01, Literate – 02, Completed Class 5 - 03, Class 8th – 04, Class 10th-05, Class 12th-06, ITI Diploma-07, Graduate-08, Post Graduate/Professional – 09 (write the highest level applicable)

[5] No Pension – 0, Old Age Pension – 1, Widow Pension – 2, Disability Pension – 3, Other Pension – 4 (mention)

SAANSAD ADARSH GRAM YOJANA (SAGY) Baseline Household Survey Questionnaire

5. Hand washing

	Always		Sometimes		Never
After use of Toilet	Soap ✓	Other	Soap	Other	
Before Eating	Soap ✓	Other	Soap	Other	

6. Use of Mosquito Net
Children: Yes / No Adults: Yes / No

7. Do members take Regular Physical Exercise

	Yoga	Games	Other Exercises
Adults	Yes / No	Yes / No	Yes / No
Children	Yes / No	Yes / No	Yes / No

8. Consumption of Tobacco

	Smoking	Chewing
Adults	No	No
Children	No	No

9. House & Homestead Data

Own House: Yes / No	No. of Rooms: 3
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): Private Borewell		

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		2. Cultivable Area	
3. Irrigated Area		4. Uncultivable Area	

13. Principal Occupations in the Household

Livelihood	Tick if applicable
Farming on own Land	✓
Sharecropping /Farming Leased Land	
Animal Husbandry	
Pisciculture	
Fishing	
Skilled Wage Worker	
Unskilled Wage Worker	
Salaried Employment in Government	
Salaried Employment - Private Sector	
Weaving	
Other Artisan (mention)	
Other Trade & Business (mention)	

14. Migration Status
Does any member of the household migrate for Work: Yes / No If Yes Entire Year / Seasonal
Does anyone below 18 years migrate for work: Y/N

15. Agriculture Inputs

Do you use Chemical Fertilisers	Yes/No ✓
Do you use Chemical Insecticides	Yes/No ✓
Do you use Chemical Weedicide	Yes/No ✓
Do you have Soil Health Card	Yes/No ✓
Irrigation: None/ Canal/ Tank/ Borewell/Other	
Drip or Sprinkler Irrigation: Drip /Sprinkler / None	

16. Agricultural Produce in a normal year (Top 3)

Name	Unit	Quantity
Cotton		
Penute		
Wheat Corn		

17. Livestock Numbers

Cows: –	Bullocks: –	Calves: –
Female Buffalo: –	Male Buffalo: –	Buffalo Calves: –
Goats/ Sheep: –	Poultry/ Ducks: –	Pigs: –
Any other: Type –		No.
Shelter for Livestock: Pucca / Kutcha / None		
Average Daily Production of Milk(Litres):		

18. What games do Children Play
Guli Cricket, Hide & Seek, Kho-Kho

19. Do children play musical instrument (mention)
No

Schedule Filled By: Sanjay Bathwar
Principal Respondent: Rajubhai
Date of Survey:

SAANSAD ADARSH GRAM YOJANA (SAGY) Village Details Survey Questionnaire

This questionnaire should be filled for each of the villages in the selected Gram Panchayat[1]

I. Basic Information

a. Village: Kalipat
b. Ward Number: -
c. Gram Panchayat: Kalipat
d. Block: -
e. District: Rajkot
f. State: Gujarat
g. Lok Sabha Constituency: Rajkot
h. Number of Habitations / Hamlets in the Gram Panchayat: 3
i. Names of Habitations / Hamlets:
Farmer, Labour

Demographic Information

Number of Households 473 Total Population 2692 Male 1386 Female 1306

SC HHs 415 ST HHs 0 OBC HHs 20 Other HHs 38

II. Access to Infrastructure/Amenities etc.

i.	Access to Infrastructure / Facilities / Services	Located in the Village Yes (Y)/No(N)	If located elsewhere (N), distance in kms from the village
a.	Nearest Primary School	Y	–
b.	Nearest Middle School	N	3km
c.	Nearest Secondary School	N	3km
d.	Kisan Seva Kendra	N	18km
e.	Milk Cooperative /Collection Centre	Y	–
g.	Health Sub Centre	N	3km
h.	Bank	Y	–
i.	ATM	Y	–
j.	Bus Stop	Y	–
k.	Railway Station	N	21 km.

[1] While filling this the surveyor must collect the information from the Ward Members and relevant government officials

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	Rajkot (18 km)
p	Nearest Agro Service Centre	N	Rajkot (18km)
p	MSP based Government Procurement Centre	N	Rajkot (18 km)
q	Milk Cooperative /Collection Centre	Y	Rajkot (18km)
r	Veterinary Care Centre	N	Rajkot (18km)
s	Ayurveda Centre	N	Rajkot (18 km)
t	E – Seva Kendra	N	Rajkot (18km)
u	Bus Stop	Y	—
v	Railway Station	N	Rajkot (18km)
w	Library	N	Rajkot (18km)
x	Common Service Centre	Y	—

IV. Sports Facilities in the Gram Panchayat

a. Number of Play Grounds in the GP: Total 0 Public — Private —

b. Mini Stadium : N Yes(Y) /No (N) *(Playground with equipment and sitting arrangement)*

V. Education, ICDS

a. Number of Angan Wadi Centres: 1

b. Number of villages without Angan Wadi Centres —

Names of such villages: —

c. Schools (Number)

Primary Private: 1 Primary Govt.: 1

Middle Private: — Middle Govt.: —

Secondary Private: 0 Secondary Govt.: —

Higher Secondary Private: — Higher Secondary Govt: —

VI. Public Distribution System

	Item	Private Contractor	Women's SHG	Gram Panchayat	Cooperative	Other (Mention)	Location in GP (mention Location)	If outside GP, Location & distance from GP HQrs)
a.	Cereal (Rice/ Wheat/ Millets)	—	—	—	—	Govt.		—
b.	Kerosene	—	—	—	—	Govt.		—
c.	Other (mention)	—	—	—	—	—		—

Saansad Adarsh Gram Yojana (SAGY) Panchayat Details Survey Questionnaire

(Note: Please aggregate information from village level questionnaires wherever relevant)

VII. Coverage of Villages under different Facilities & Services

	Parameter	Villages Status[1]	Names of Villages Covered	Names of Villages not Covered
a.	Piped Water Supply Coverage to Villages	Covered / Not Covered	Kalipat	—
b.	Hand Pump Coverage in Villages:	Covered / Not Covered	Kalipat (5 handpump)	—
c.	Coverage under Covered Drains:	Covered / Not Covered	Kalipat	—
d.	Coverage under Open Drains:	Covered / Not Covered	—	—
e.	Villages with Household Electricity Connection (Numbers)	Connected / Not Connected	Kalipat (99 % household connected with electricity)	—

VIII. Land and Irrigation

	Private Land	Area in Acres		Common Land	Area in Acres		Irrigation Structure	No.
a.	Cultivable Land		d.	Pasture / Grazing Land		g.	Check Dam	1
b.	Irrigated Land		e.	Forests/ Plantations		h.	Wells/Bore Wells	5
c.	Un-irrigated Land		f.	Other Common Land	—	i	Tanks /Ponds	2

[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)	12
b)	Number of Households receiving pension (old age, widow, disability)	12
c)	Number of eligible Households who are not receiving pension	-
d)	Number of Households eligible for Ration Card	473
e)	Number of eligible HHs having ration cards	473
f)	Number of households covered under RSBY (Rashtriya Swasthya Bima Yojana)	0
g)	Number of HHs covered under AABY (Aam Aadmi Bima Yojana)	0
h)	Number of active Job Card holders under MGNREGA	0
i)	Number of Job Card holders who completed 100 days of work during 2013-14	0
j)	Number of shops selling alcohol	0
k)	Number of BPL families	13
l)	Number of landless households	38
m)	Number of IAY beneficiaries	0
n)	Number of FRA[2] beneficiaries	0
o)	Number of Community Sanitary Complexes	0
p)	Number of Households headed by single women	0
q)	Number of Households headed by physically handicapped persons	0
r)	Total number of Persons with Disability in the village	3
s)	Number of SHGs	6
t)	Number of active SHGs	0
u)	Number of SHG Federations	0
v)	Number of Youth Clubs	0
w)	Number of Bharat Nirman Volunteers	0

Name and Signature of Surveyor and Respondent

Sanjay Ravi Dharmani	[signature]	[signature] તલાટી-કમ-મંત્રી, કાળીપાટ ગ્રામ પંચાયત	
Surveyor	PRI Respondent (Preferably Gram Panchayat Chairperson)	Official Respondent (Preferably seniormost Government official in the Gram Panchayat)	Date of Survey

[2] The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition [illegible] Act, 2006

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: Kalipat

b. Block: _____

c. District: Rajkot

d. State: Gujarat

e. Lok Sabha Constituency: Rajkot

f. Number of Wards in the Gram Panchayat: 2

g. Number of Villages in the Gram Panchayat: 1

h. Names of Villages:
Kalipat

Demographic Information

Number of Households 473 Total Population 2692 Male 1386 Female 1306

SC HHs 415 ST HHs 0 OBC HHs 20 Other HHs 38

I. Access to Infrastructure / Facilities / Services

	Infrastructure Facilities / Services	Located within the GP Yes (Y)/No (N)	If located elsewhere (N), distance from the GP office
a.	ANM/ Health Sub Centre	N	3km (Tramba)
b.	Nearest Primary Health Centre (PHC)	N	3 km (Tramba)
c.	Nearest Community Health Centre (CHC)	N	3km (Tramba)
d.	Nearest Post Office	Y	–
e.	Nearest Bank Branch (Any)	Y	–
f.	Nearest Bank with CBS Facility	Y	–
g.	Nearest ATM	Y	–
h.	Nearest Primary School	Y	–
i.	Nearest Middle School	N	3km (Tramba)
j.	Nearest Secondary School	N	3 km (Tramba)
k.	Nearest Higher Secondary School / +2 College	N	3 km (Tramba)
l.	Nearest Graduate College	N	2 km
m	Nearest ITI / Polytechnic Centre	N	Rajkot (18km)
n	Kisan Seva Kendra	N	Rajkot (18km)

SAANSAD ADARSH GRAM YOJANA (SAGY) Village Details Survey Questionnaire

i.	Access to Infrastructure / Facilities / Services	Located in the Village Yes (Y)/No(N)	If located elsewhere (N), distance in kms from the village
l	Library	N	Rajkot (13km)
m	Common Service Centre	N	Rajkot (13 km)
n	Veterinary Care Centre	N	Rajkot (13 km

ii. Road Connectivity

a. Habitations connected by All-weather Roads 1 *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations where not available: _____

iii. Drinking Water Facilities

a.Piped Water Supply Coverage to Habitations: 1 *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations not covered: _____

b.Hand Pump Coverage in Habitations: 1 *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations not covered: _____

iv. Coverage of Habitations under Waste Management System

a. Coverage under Covered Drains: 2 *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations not covered: _____

b. Coverage under Open Drains: 2 *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations not covered: _____

c. Coverage under Doorstep Waste Collection: *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations not covered: 2

v. Coverage of Habitations under Electrification ✓

a. Coverage under Household Connections: *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations not covered: _____

b.Coverage under Street Lighting: All *(1-All 2-None 3-Some)* ✓

If 3 mention the name of the habitations not covered: _____

vi. Sports Facilities in the Village

a.Number of Play Grounds in the Village (minimum size 200 square meters): –

b.Mini Stadium : N Yes(Y) /No (N)

vii. Education, ICDS

a. Number of Anganwadi Centres: 1

c. Schools (Number)

Primary Private: 1 Primary Govt.: 1

Middle Private: – Middle Govt.: –

Secondary Private: – Secondary Govt.: –

Higher Secondary Private: – Higher Secondary Govt: –

SAANSAD ADARSH GRAM YOJANA (SAGY) Village Details Survey Questionnaire

viii. Land Category		Area in Acres		Land Category	Area in Acres		Irrigation Structure	No.
a.	Cultivable Land		d.	Pasture / Grazing Land		g.	Check Dam	
b.	Irrigated Land		e.	Forests/ Plnatations		h.	Wells/Bore Wells	
c.	Un-irrigated Land		f.	Other Common Land		i.	Tanks /Ponds	

ix. Entitlement Related Parameters		
1	Number of active Job Card holders under MGNREGA	0
2	Number of active Job Card holders who have completed 100 days of work	0
3	Number of shops selling alcohol	0
4	Number of BPL families	13
5	Number of landless households	38
6	Number of IAY beneficiaries	0
7	Number of FRA beneficiaries	6
8	Number of common sanitation complexes	0
9	Number of SHGs	6
10	Number of active SHGs	0
11	Existence of SHG Federation in the Village (Yes / No)	N
12	Number of Youth Clubs	0
13	Number of Bharat Nirman Volunteers	0

Name and Signature of Surveyor and Respondent'

Sanjay Ravi Dharmang Surveyor	PRI Respondent (Preferably a ward member from a ward that is fully or partially covered under the Village)	તલાટી-કમ-મંત્રી, કાળીપાટ ગ્રામ પંચાયત Official Respondent (Preferably seniormost Government official in the Gram Panchayat)	Date of Survey

Chapter: 20

TDO-DDO-Collector email sending Soft copy attachment in the report

10/30/21, 1:45 AM Gmail - Development scenario of Kalipat Village, Taluka Rajkot, District Rajkot

Gmail

Dharmang Jani <18civil.dharmang.jani@gmail.com>

Development scenario of Kalipat Village, Taluka Rajkot, District Rajkot

1 message

Dharmang Jani <18civil.dharmang.jani@gmail.com> 30 October 2021 at 01:45
To: ddo-raj@gujarat.gov.in

Respected sir
Greetings from V.V.P. Engineering College Rajkot,

V.V.P. Engineering College Rajkot affiliated to Gujarat Technological University-GTU is an institution of higher learning dedication to providing quality, career-focused an undergraduate program that prepares student with the knowledge, skills and credentials needed to launch, enhance, or change careers.

The Gujarat Technological University-GTU has allotted an prestigious Vishwakarma Yojana by the Government of Gujarat. Vishwakarma Yojana is providing Design to delivery solution for the development work in villages that could be undertaking as per the need of the village includes physical infrastructure, Social infrastructure, Socio-Culture infrastructure and sustainable infrastructure for the effective development of the villages.

As a part of final year UG Civil & Electrical Engg. Students project work, student carried out the survey of Nakarawadi Village and design various amenities to deliver it to them making them ideal for living better life as per necessity & current village condition.

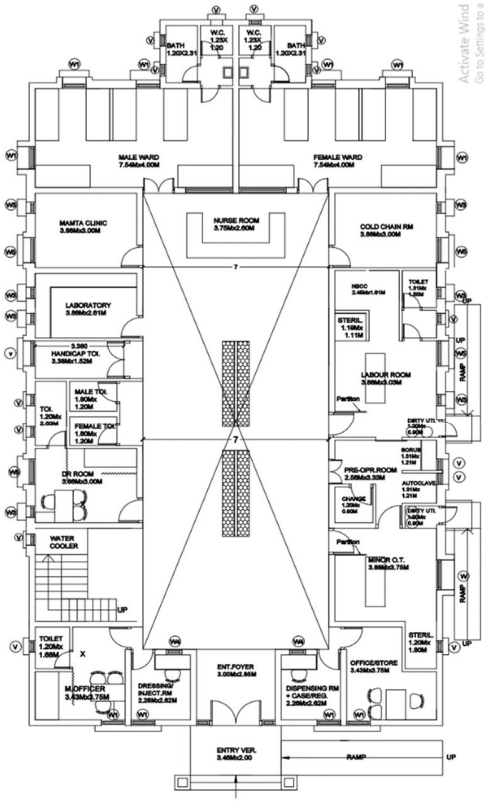
Please find here with attached,

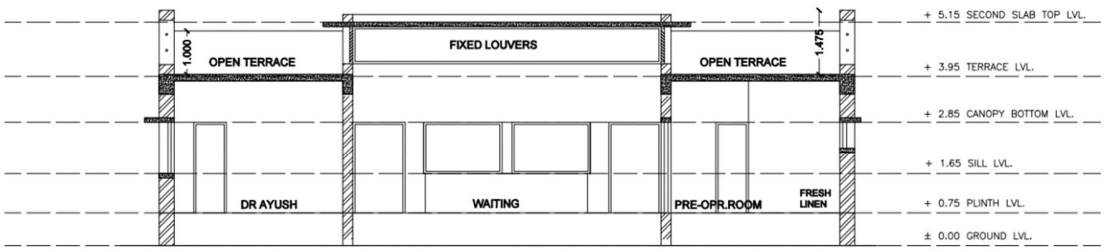
Kalipat_Village_VY-VIII_Report_VVP COLLEGE.pdf
20558K

Chapter: 21

Comprehensive report for the entire village

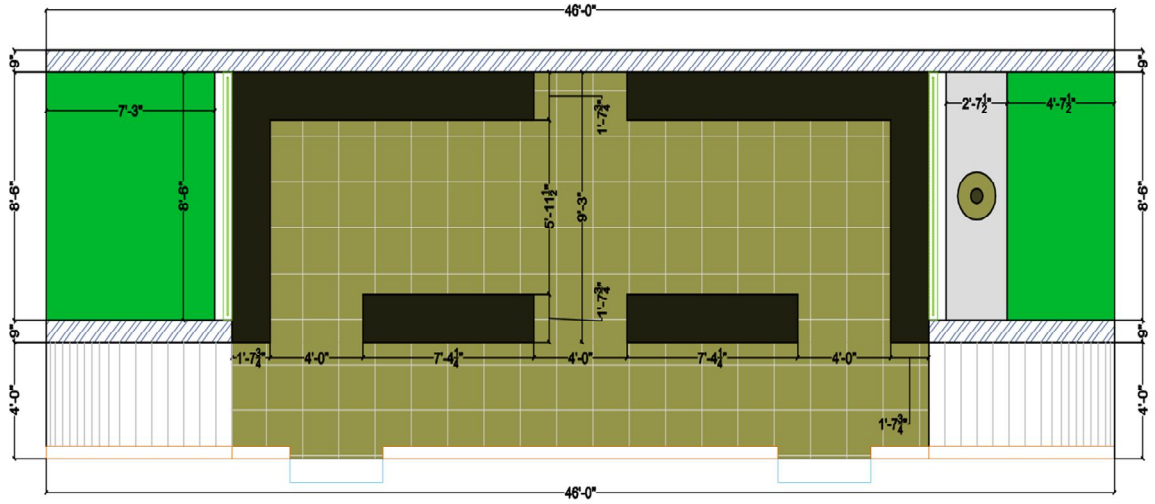
Design Infrastructure: PHC Building
Village: Kalipat **District:** Rajkot

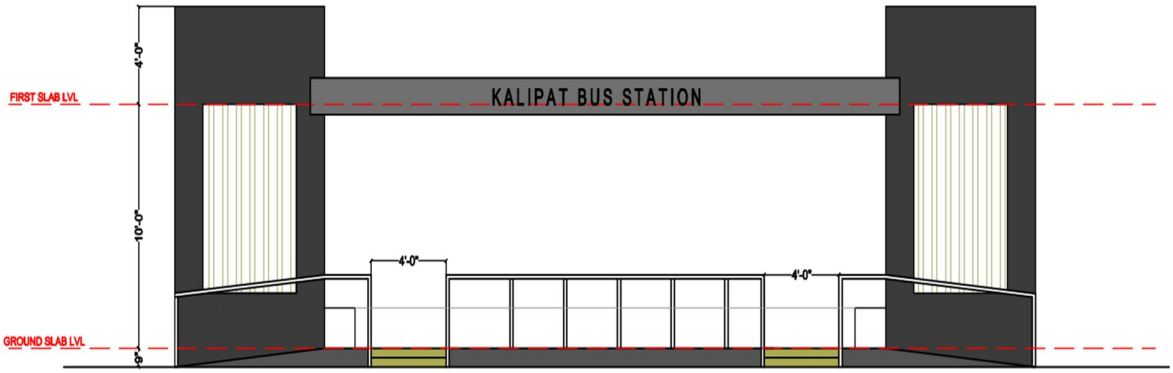




SECTION-1-1

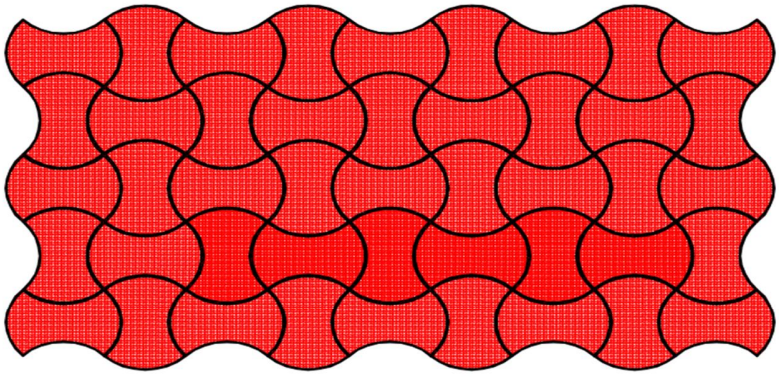
Design Infrastructure: Bus Station
Village: Kalipat District: Rajkot





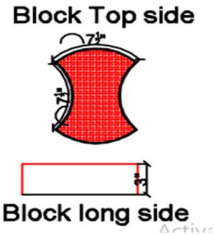
ELEVATION

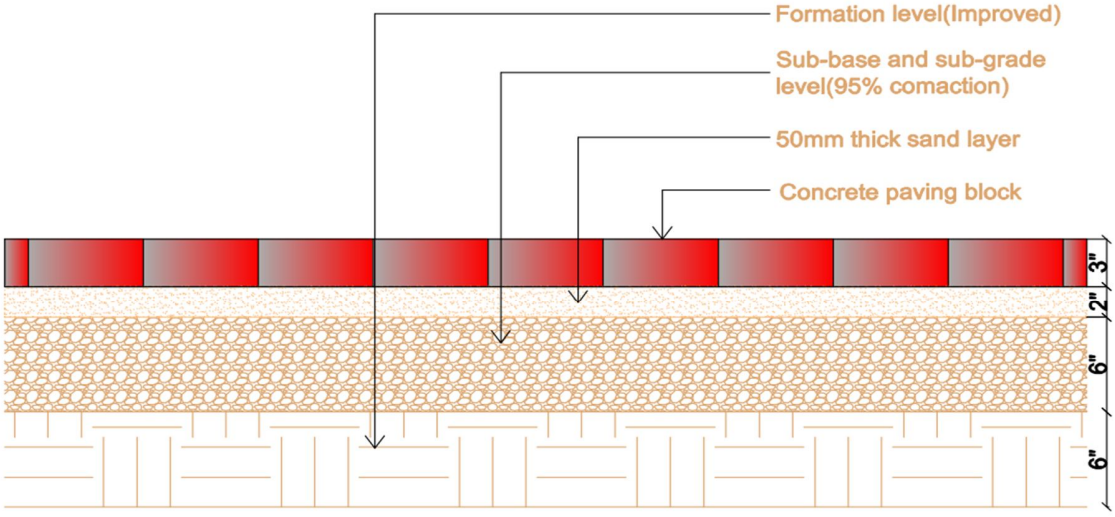
Design Infrastructure: Pavement Design
Village: Kalipat District: Rajkot



Block Paving Plan

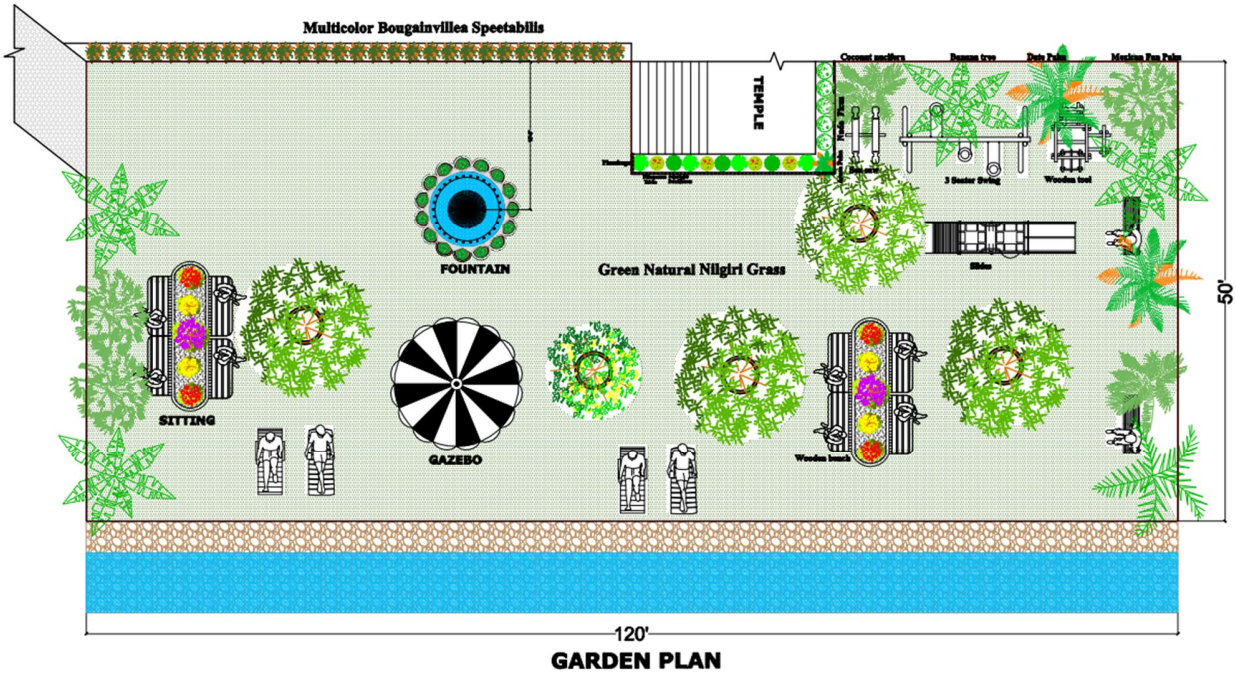
Block Paving section





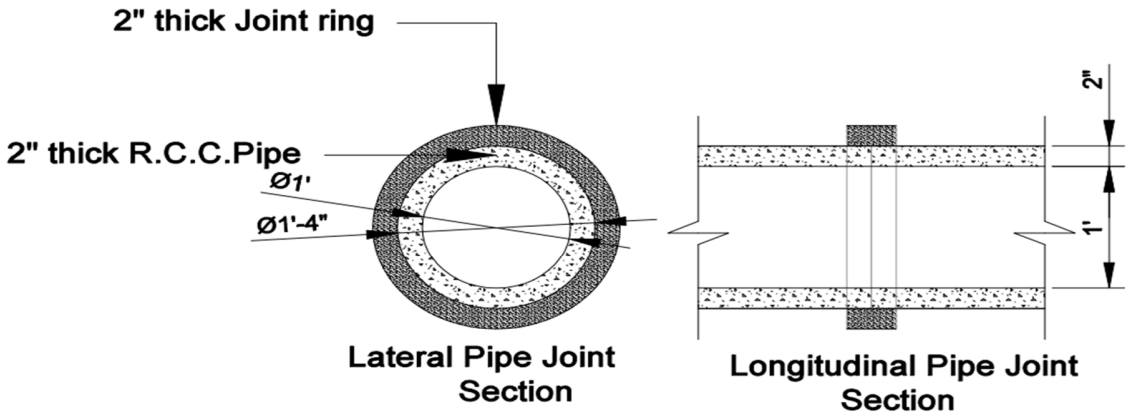
Typical section

Design Infrastructure: Garden
Village: Kalipat District: Rajkot

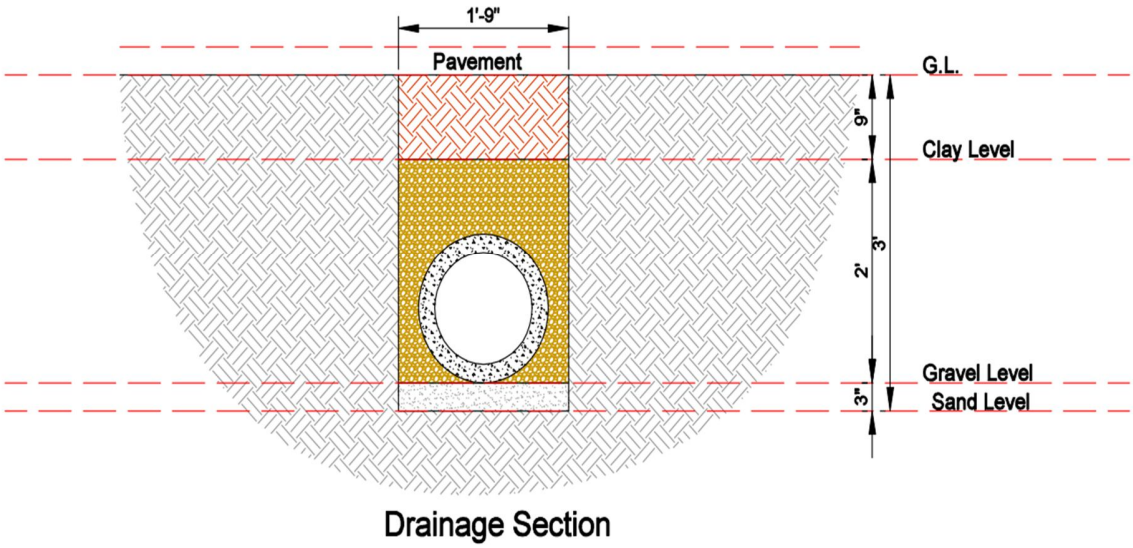


GARDEN PLAN

Design Infrastructure: Drainage Design
Village: Kalipat District: Rajkot

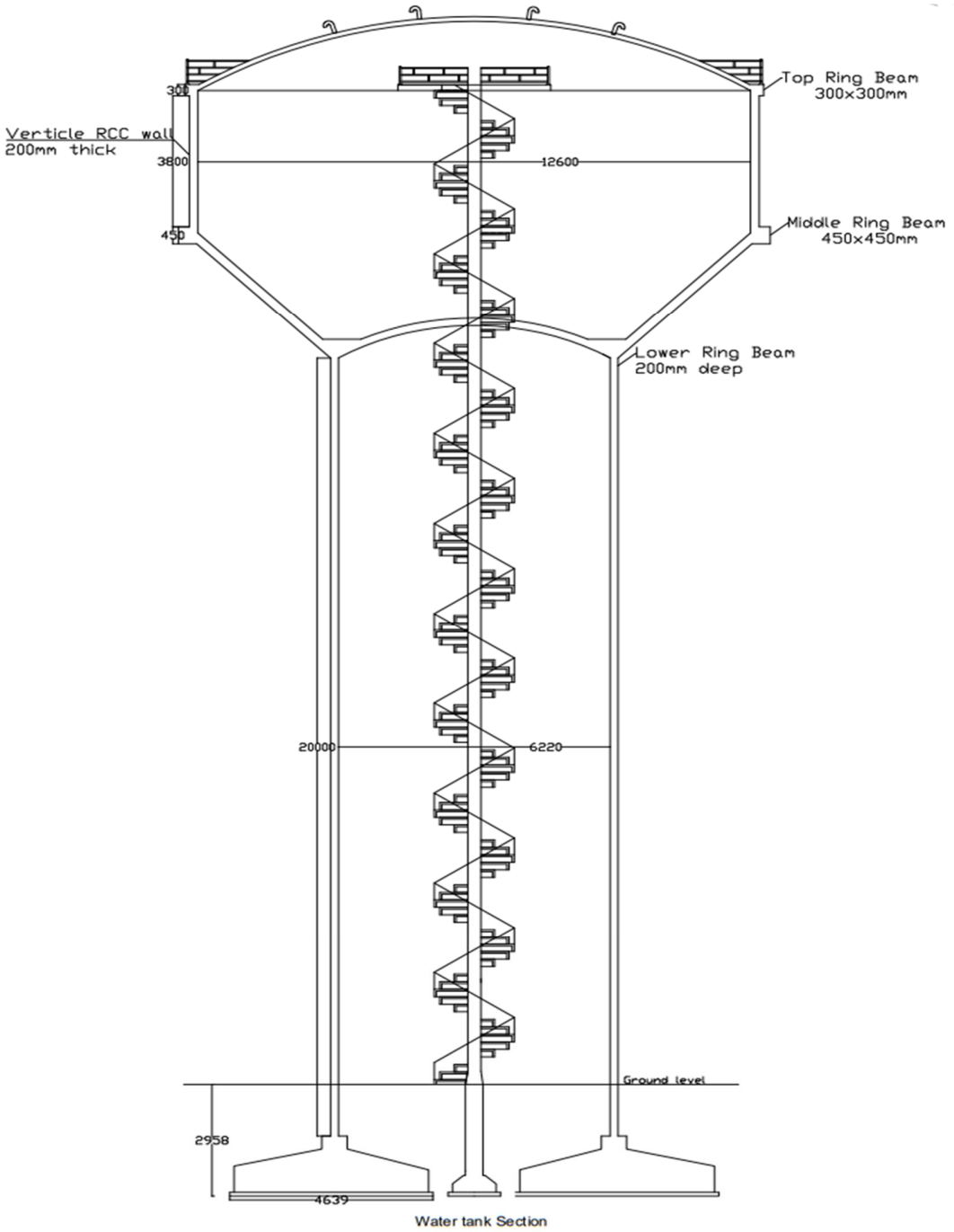


PIPE Joint Section



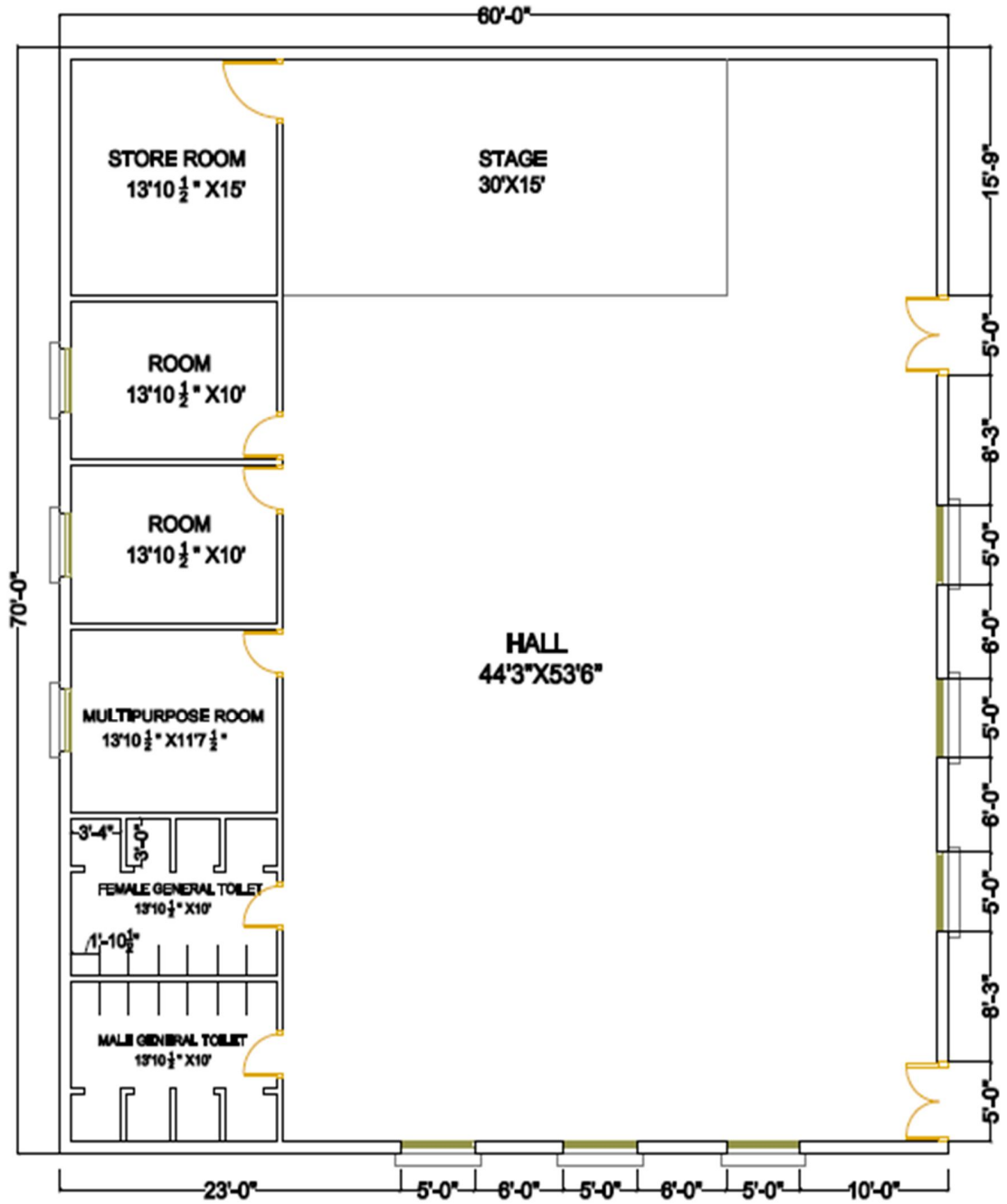
Drainage Section

Design Infrastructure: Water Tank
Village: Kalipat District: Rajkot

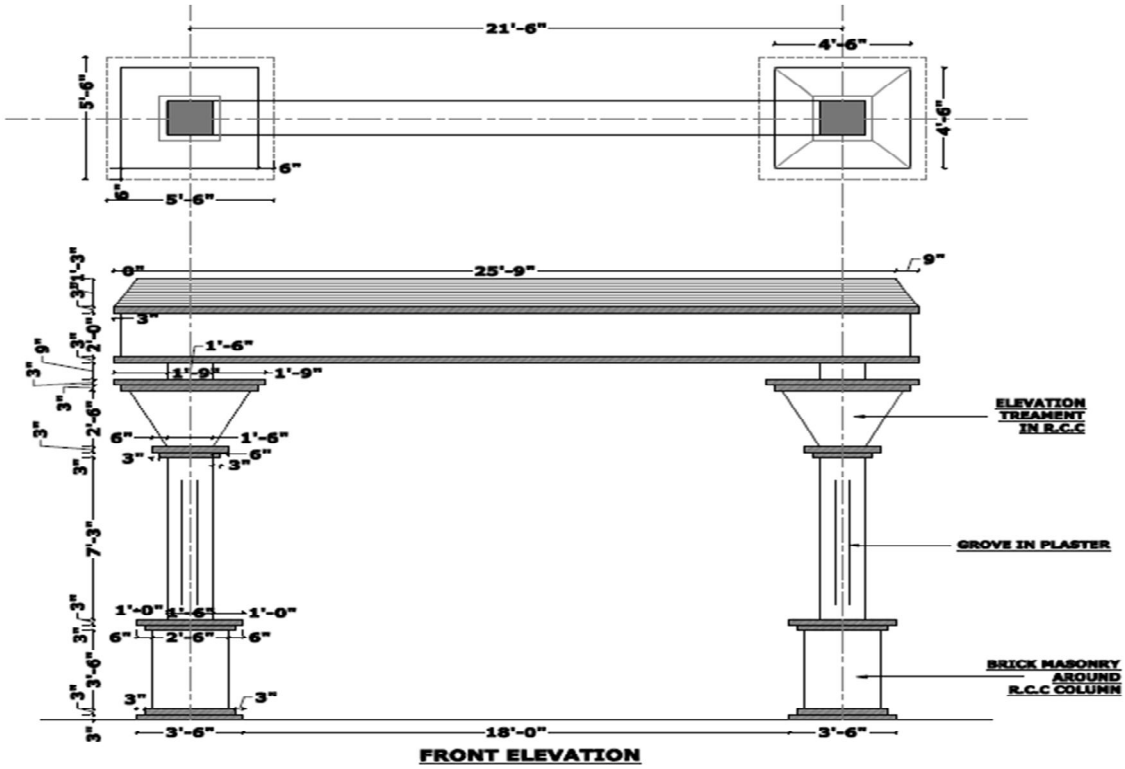


Water tank Section

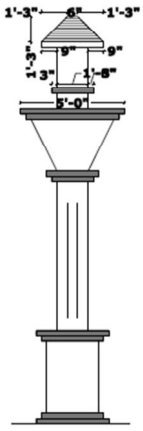
Design Infrastructure: Community Hall
Village: Kalipat District: Rajkot



Design Infrastructure: Entrance Gate
Village: Kalipat District: Rajkot

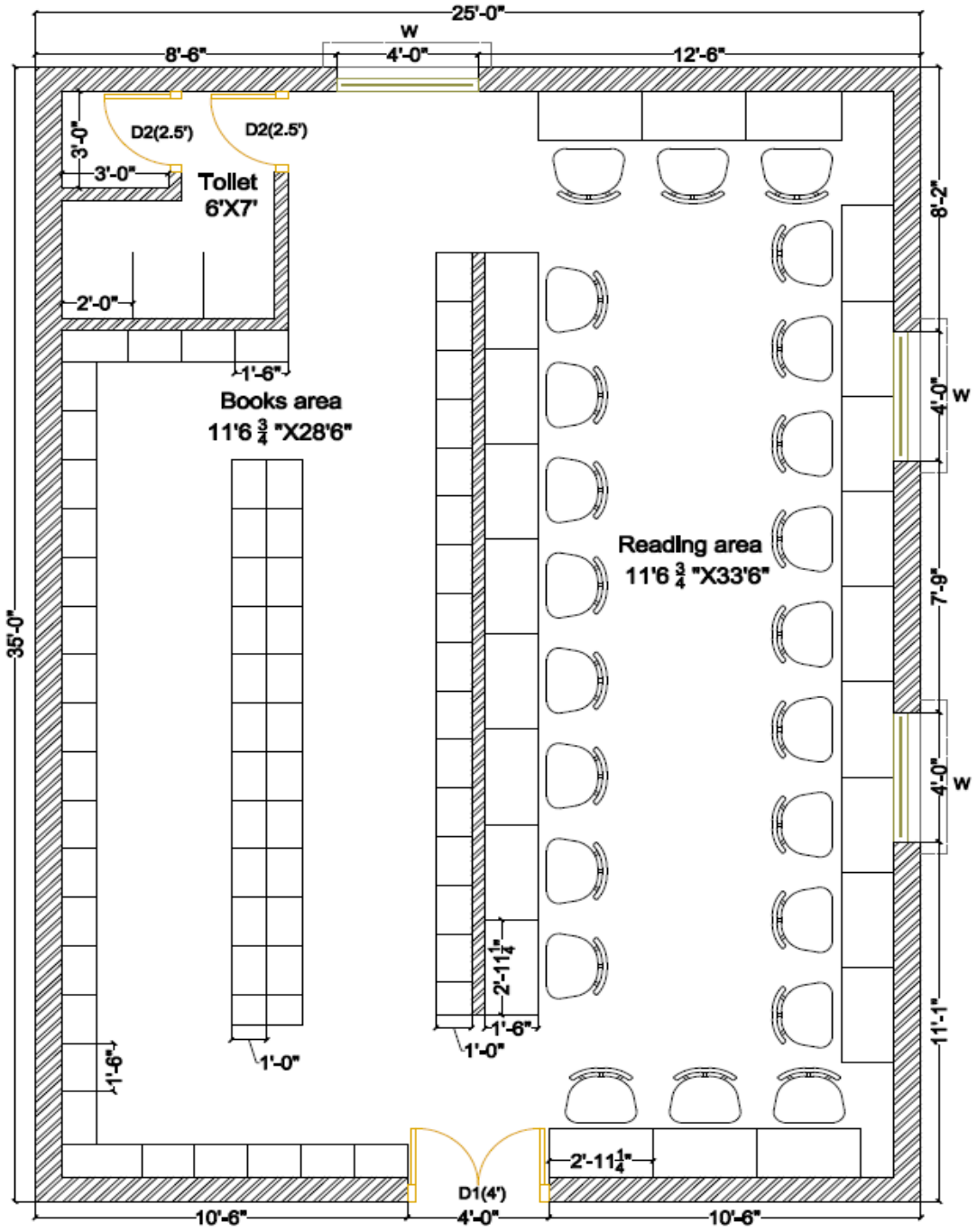


FRONT ELEVATION



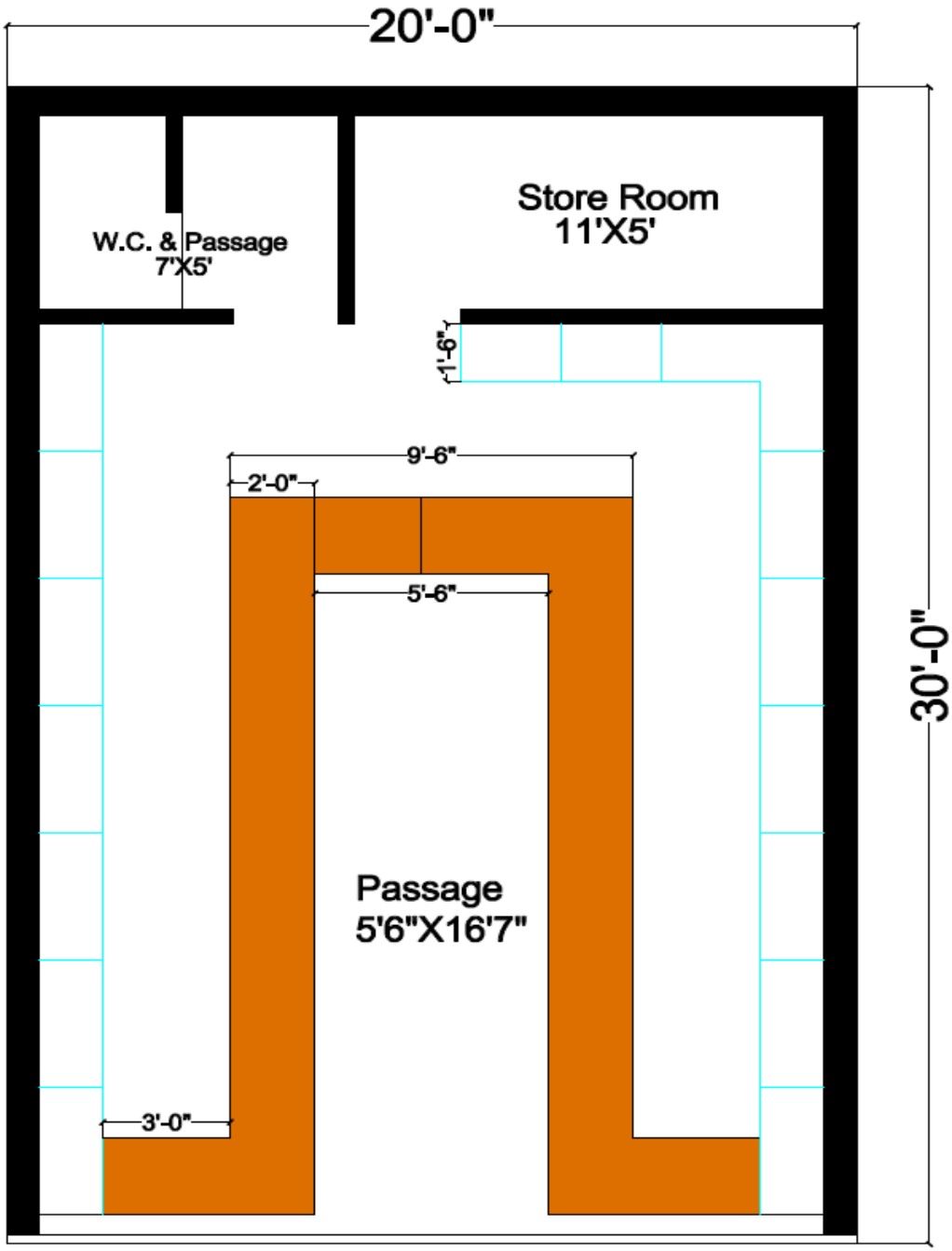
FRONT ELEVATION

Design Infrastructure: Library
Village: Kalipat District: Rajkot



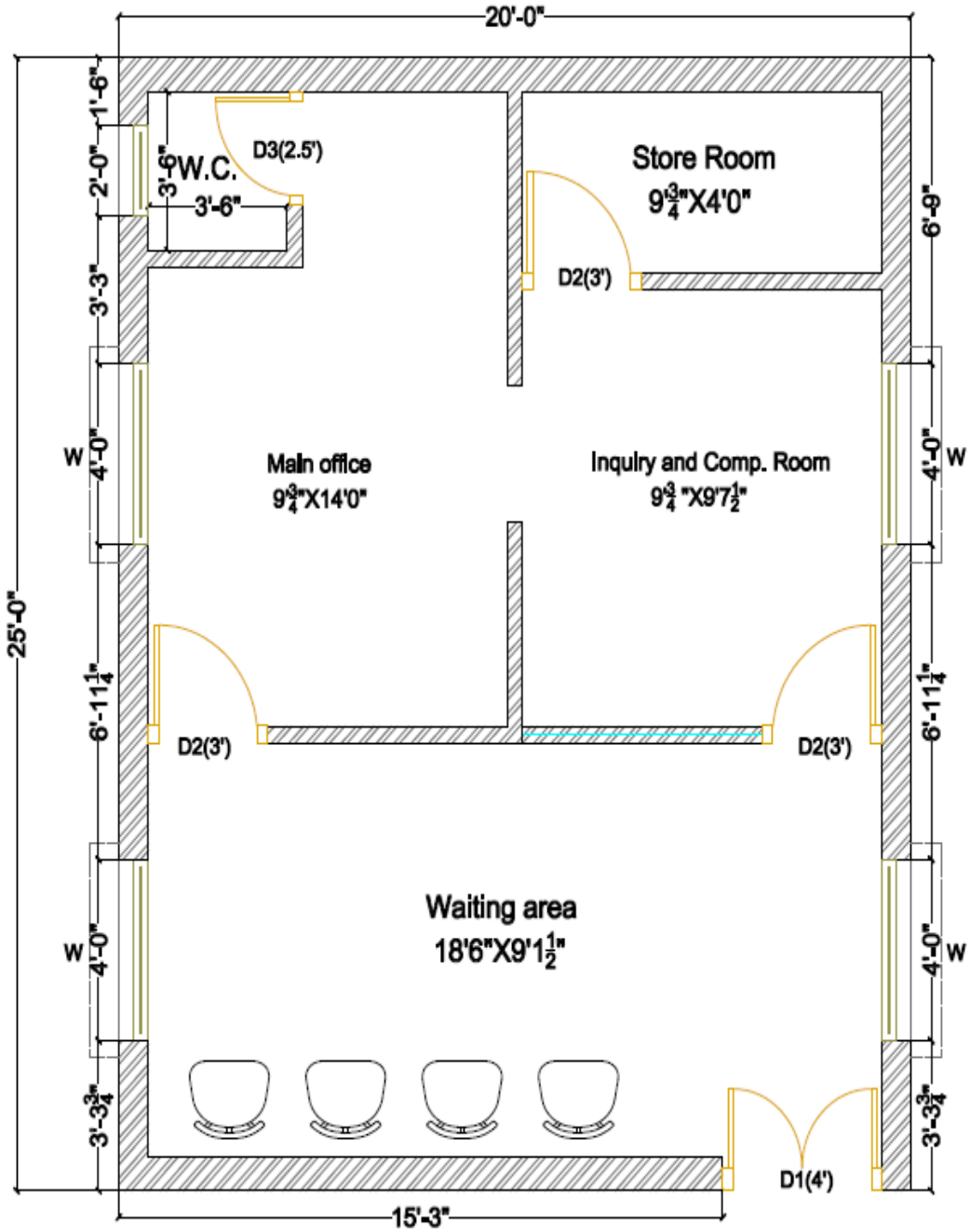
Library

Design Infrastructure: Medical Store
Village: Kalipat **District:** Rajkot



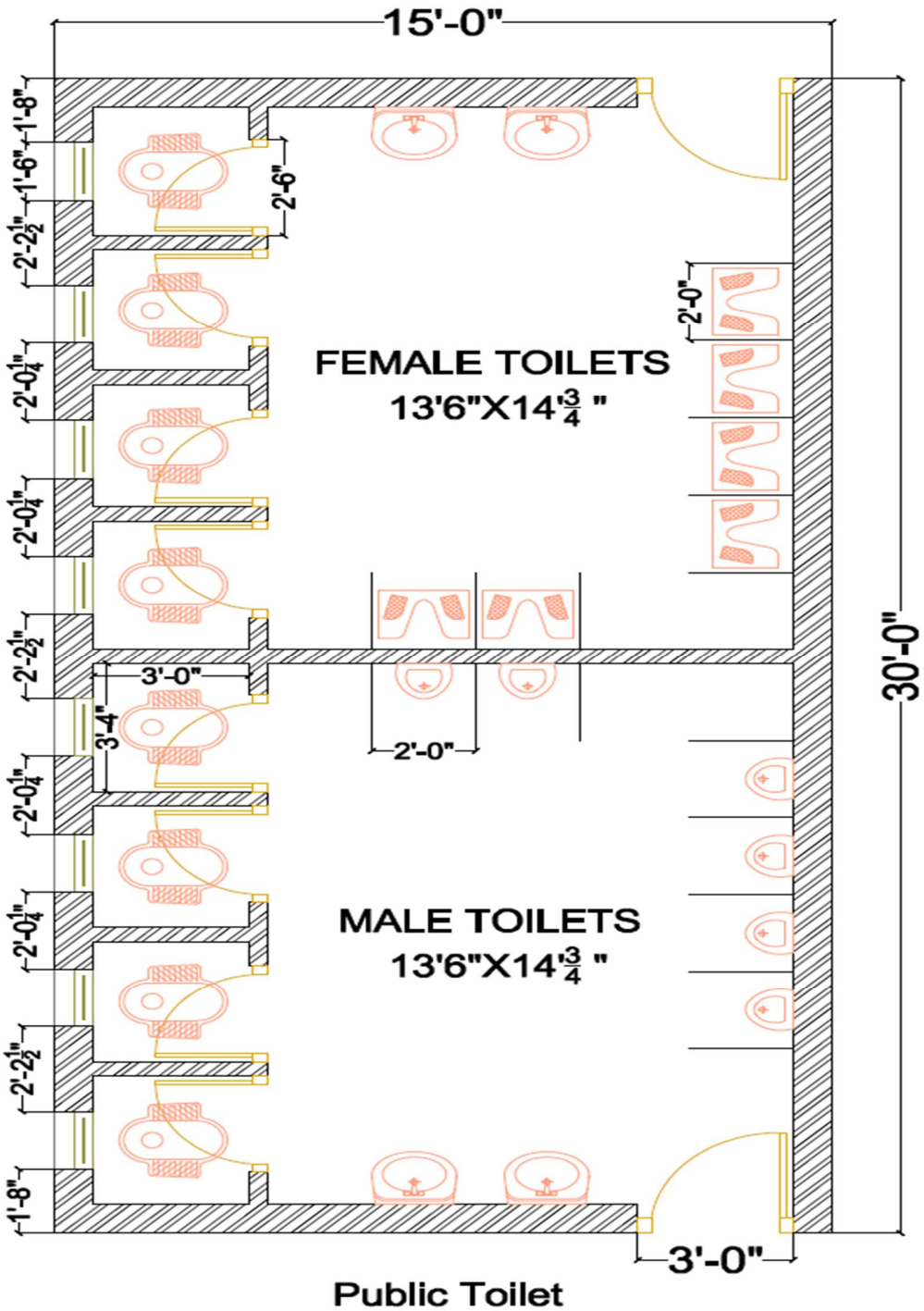
Medical Store Plan

Design Infrastructure: Post Office
Village: Kalipat District: Rajkot



Post Office

Design Infrastructure: Public Toilet
Village: Kalipat **District:** Rajkot



Public Toilet