

Construction Management Assignment-2

International Students Facility, IIT Guwahati (Ongoing)



Submitted by:

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Roll Number:

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Submission Date: 25 April 2024



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Introduction

The selected project for this assignment is the IIT Guwahati International Student Facility (Ongoing), which will be completed in October 2024. This project aimed to provide state-of-the-art hostel facilities to the students of IIT Guwahati, with a focus on comfort, sustainability, and safety. The project involved the construction of a G+2 -storey hostel building with a total area of 1200 sqm, including rooms, common areas, and amenities.

Objective of the project

- To discuss the construction practices and techniques adopted in the project.
- To identify and describe the equipment used for different works in the project and their operations.
- To analyze the challenges faced during the project and the strategies used to overcome them.
 - To evaluate the implementation of ICT and automation in the project.
- To assess the project's performance in terms of time, cost, quality, and safety.

Contract Details: Engineering, Procurement, and Construction (EPC Mode)

- **Type of Contract:** (a) EPC Contract
(b) LumpSum Turnkey Contract
- **Client:** Indian Institute of Technology Guwahati
- Consists of a Residential G+2 hostel accommodation
- Prequalification of bidders Required
- Earnest Money Deposit upto 20 Lakhs is Necessary.
- **Bidders Qualification Criteria(BQC):** performance Guarantee of 3% to be submitted.
- **Contractor Name:** Ganpati Construction Company



EPC Mode Projects

EPC Mode (for International Students' Facility at IIT Guwahati) is type of contract where the contractor is responsible for all aspects of a construction project, including project design, material procurement, and construction.

- **Engineering, Procurement, and Construction (EPC) Mode**
 - Single Contractor Responsibility: One entity oversees entire project lifecycle.
 - Streamlined Process: Ensures efficiency, accountability, and cost-effectiveness.
- **Benefits**
 - Simplified Management: Single point of contact for project execution.
 - Cost and Time Efficiency: Fixed-price contracts, strict timelines.
 - Quality Assurance: Comprehensive oversight ensures adherence to standards.
 - Risk Mitigation: Contractor manages risks, reducing liabilities.

- **Conclusion**

EPC mode offers a streamlined approach for the construction of international students' facility, ensuring efficiency, quality, and compliance.

Technical/ Experience Criteria

To be eligible to apply for the opportunity, the contractor must meet the following requirements:

1. Registration with Government/Semi-Government

Department/Autonomous Body:

- The contractor must be registered with a government, semi-government department, or autonomous body.

2. Satisfactory Completion of Works:

- The contractor should have satisfactorily completed specific works within the last seven years, ending on the previous day of the tender submission deadline.
- Three similar works, each costing not less than Rs. 3368.00 lacs, must have been completed.
- Additionally, two similar works, each costing not less than Rs. 5052.00 lacs, should have been satisfactorily completed.
- Furthermore, the contractor must have completed one similar work costing not less than Rs. 6737.00 lacs.

GANPATI CONSTRUCTION COMPANY
HALDI GALI, S.J. ROAD, ATHGAON, GUWAHATI - 781001, ASSAM

FORM 'C'

DETAILS OF ELIGIBLE SIMILAR NATURE OF WORKS COMPLETED DURING
LAST SEVEN YEARS ENDING PREVIOUS DAY OF LAST DATE OF SUBMISSION
TENDERS

Sl. No	Name of work/project and location	Owner of sponsoring organization	Cost of work in Crores of Rupees	Date of commencement as per contract	Stipulated date of completion	Actual date of completion	Litigation/arbitration cases pending in progress with details.*	Name and address of telephone number of Officer to whom reference may be made.
1	CONSTRUCTION OF NEW ASSEMBLY BUILDING AT ITANAGAR, ARUNACHAL PRADESH (G+3)	THE EXECUTIVE ENGINEER, CAPITAL DIVISION - 'A', PWD ITANAGAR - 791111, ARUNACHAL PRADESH	85.89 CR	05/08/2015	28/02/2017	14/02/2017	NIL	THE EXECUTIVE ENGINEER, CAPITAL DIVISION - 'A', PWD ITANAGAR - 791111, ARUNACHAL PRADESH
2	CONSTRUCTION OF ARUNACHAL PRADESH CIVIL SECRETARIAT BUILDING AT ITANAGAR - BLOCK NO.1 (G+4) & 2 (G+4), ARUNACHAL PRADESH	THE EXECUTIVE ENGINEER, CAPITAL DIVISION - 'A', PWD ITANAGAR - 791111, ARUNACHAL PRADESH	43.18 CR	18/08/2014	30/09/2016	15/08/2016	NIL	THE EXECUTIVE ENGINEER, CAPITAL DIVISION - 'A', PWD ITANAGAR - 791111, ARUNACHAL PRADESH
3	CONSTRUCTION OF MLA APARTMENT AT ITANAGAR (G+4), ARUNACHAL PRADESH	DEPUTY DIRECTOR, I.D & HOUSING, CC DIVISION ITANAGAR, ARUNACHAL PRADESH	47.37 CR	20/11/2017	30/09/2018	15/11/2018	NIL	DEPUTY DIRECTOR, I.D & HOUSING, CC DIVISION ITANAGAR, ARUNACHAL PRADESH

1. CONSTRUCTION OF NEW ASSEMBLY BUILDING AT ITANAGAR, ARUNACHAL PRADESH (G+3)

The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion i.e. 14/02/2017 to the previous day of last date of submission of tenders 28.09.2022 i.e. 5 Years 7 Months 14 Days.

So, Current costing for the work "CONSTRUCTION OF NEW ASSEMBLY BUILDING AT ITANAGAR, ARUNACHAL PRADESH (G+3)" is 95.59 Crore X 1.35 = 129.04 Crore.

GST NO. 18AA0FG7494C1ZZ

000293

GANPATI CONSTRUCTION COMPANY

Financial Criteria

1. Annual Turnover Requirement:

- Companies must exhibit a minimum annual turnover of Rs. **4210.00 Lacs.**
- This criterion applies to the **immediate last three audited financial years**, namely FY 2018-19, FY 2019-20, and FY 2020-21.
- It serves as an indicator of the company's financial stability and capacity to generate significant revenue consistently over time.

2. Solvency Certificate Mandate:

- Alongside meeting the turnover requirement, companies must possess a solvency certificate.
- The certificate should reflect a solvency of Rs. **3368 Lacs.**
- It must not be older than six months from the date of submission.
- This certificate validates the company's financial solvency and liquidity, ensuring its ability to meet financial obligations promptly.

FORM 'A'
FINANCIAL INFORMATION

1. Financial Analysis - Details to be furnished duly supported by figures in balance sheet / profit & loss account for the last five years duly certified by the Chartered Accountant, as submitted by the applicant to the Income Tax Department (Copies to be attached). (Rs. In lakhs)

Years	2016-17	2017-18	2018-19	2019-20	2020-21
Gross Annual turnover on Construction works	6386.14	3883.22	4677.89	4832.63	6172.14
Profit / Loss	304.29	202.26	251.05	220.80	316.70

I. Financial arrangements for carrying out the proposed work.

As per information and explanation given to us the firm has made financial arrangements for carrying out the proposed work through Working Capital Finance from banks, loans from relatives/friends and from Own Capital contribution.

II. Solvency Certificate from Bankers of the bidder in the prescribed Form "B" - Enclosed

For Navin P Jain & Associates
Chartered Accountants
FRN: 325688E

(CA. Navin Jain)
Proprietor
M.No. 063015
UDIN : 22063015AVWADV7371

Place : Dibrugarh
Date : 27.09.2022

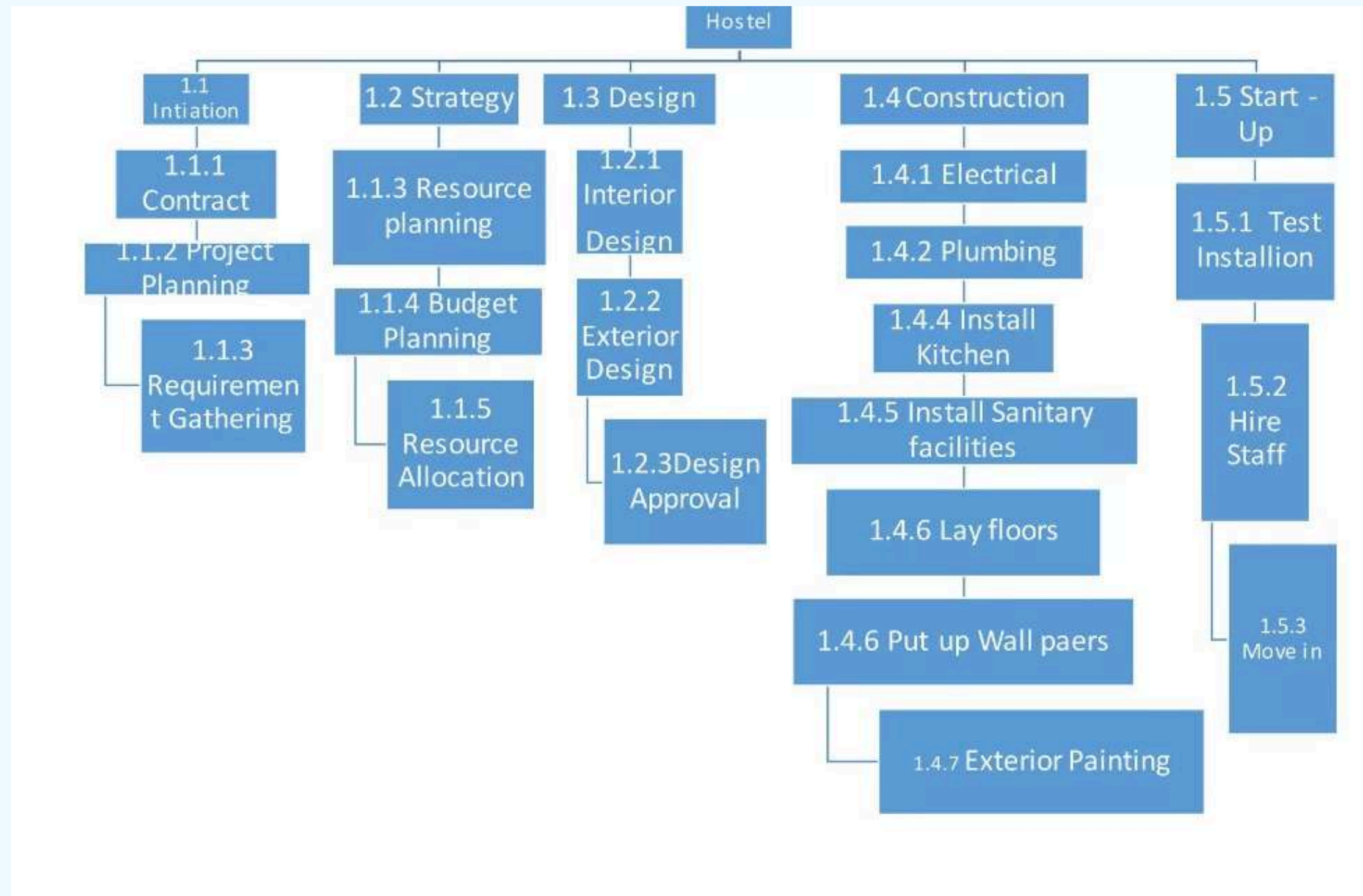
GANPATI CONSTRUCTION COMPANY
PARTNER
Signature of bidder (s)

Stakeholders

1. **IIT Guwahati Administration:** Oversees the entire project and ensures compliance with institution standards, including quality, safety, and budgetary considerations.
2. **International Students:** End-users of the hostel accommodation. Their feedback on cultural needs and preferences can inform design decisions and amenities to create a conducive living environment.
3. **Architects and Engineers:** Design professionals responsible for creating plans that meet the requirements of both the students and building codes. They translate the vision of the project into practical and functional designs.
4. **Construction Contractors:** Responsible for executing the construction work according to the EPC contract. They manage the construction process, ensuring that it is completed on time, within budget, and in compliance with quality standards.
5. **Suppliers and Vendors:** Provide materials, furniture, and fixtures required for the construction project. They play a crucial role in ensuring that the necessary resources are available for the construction process.
6. **Government Authorities:** Provide approvals, permits, and funding for the project. They also ensure regulatory compliance with building codes, zoning laws, and environmental regulations.
7. **Utility Providers:** Ensure the provision of essential services such as electricity, water, and sewage to the construction site. Their timely provision of services is crucial for the smooth progress of the project.
8. **Safety Inspectors:** Responsible for ensuring compliance with safety regulations to protect both workers and future occupants of the hostel accommodation. They conduct inspections and enforce safety standards throughout the construction process.

Work Breakdown Structure

Detailed WBS for Hostel Building



Construction Process

Civil/Structural: Excavation, earthwork, backfilling, sandfilling, foundation, PCC, RCC, shuttering works, brickwork, DPC, dry rubble pitching, plumbing works, shuttering works, drainage works, water supply

Architectural: Floor finishing, steel, aluminium works, door and windows, plastering, pointing, painting, polishing, roofing, waterproofing, sanitary fittings and fixtures.
Insulation, external and internal cladding, railings
fabrication, submission of drawings.

Electrical: Power distribution, earthing, lightning protection, Wire and cabling installation, Power Outlets and Switches, Panel and Distribution Board Installation

Construction Practices

Safety Protocols

- Strict adherence to labor laws, including the Apprentices Act 1961, ensures fair treatment of workers and upholds safety standards on the construction site .
- Stringent protocols for barricading and scaffolding are rigorously enforced, prioritizing the safety of workers and minimizing risks on the construction site
 - All Safety regulations are be followed as per safety codes of C.P.W.D., Indian standard institution , The electricity Act, Mines Act , etc. .

Quality Control

- A Quality Assurance Plan (QAP) is developed by the contractor, outlining organizational structure, quality policy, control procedures, and inspections
- Field tests are conducted by the contractor's Quality Assurance (QA) staff and witnessed by the Engineer-in-Charge, to ensure compliance with specifications and standards. as per contract provisons, CPWD Specification , BIS codes, IRC codes MoRTH specifications etc.

Construction Equipment and Operations Overview

1. Excavation and Earthwork:

- Equipment: Excavators, Bulldozers, Backhoe Loaders, Dump Trucks.
- Operations: Excavators are used for digging trenches, & foundation pits .Bulldozers are used for grading and leveling the ground. Backhoe loaders are versatile for digging, loading, and transporting materials. Dump trucks are used for transporting excavated materials.



2. Concrete Work:

- Equipment: Concrete Mixers, Concrete Vibrators,
- Operations: Concrete mixers are used to mix cement, aggregates, and water to produce concrete. Concrete vibrators are used to remove air bubbles and ensure proper compaction of concrete.



3. Masonry and Brickwork:

- Equipment: Bricklayers' Trowels, Masonry Saws, Mortar Mixers.
- Operations: Bricklayers' trowels are used for spreading mortar and laying bricks or blocks. Masonry saws are used for cutting bricks or blocks to size. Mortar mixers are used to mix mortar for bricklaying.



5. Steelwork and Reinforcement:

- Equipment: Portable Welding Machines, Rebar Cutters, Rebar Benders.
- Operations: Portable welding machines are used for welding steel components. Rebar cutters are used to cut reinforcing bars to size. Rebar benders are used to bend reinforcing bars to the required shapes.



6. Plumbing and Pipework:

- Equipment: Pipe Cutters, Pipe Threaders, Pipe Benders.
- Operations: Pipe cutters are used to cut pipes to the required length. Pipe threaders are used to create threads on pipes for fittings. Pipe benders are used to bend pipes to the required angles.



7. Electrical Work:

- Equipment: Cable Pulling Machines, Conduit Benders, Cable Crimping Tools.
- Operations: Cable pulling machines are used to pull electrical cables through conduits or trenches. Conduit benders are used to bend metal conduits to the required shapes. Cable crimping tools are used to create electrical connections.

8. Finishing Work:

- Equipment: Paint Sprayers, Tile Cutters.
- Operations: Paint sprayers are used for applying paint or coatings to walls or surfaces. Tile cutters are used for cutting tiles to size.



Navigating Challenges and Strategies Used to overcome

1. Hilly Terrain and Site Accessibility:

Challenge: The construction site being situated on a hilly area poses challenges for access, transportation of materials, and maneuvering heavy machinery.

Strategy: Develop specialized access roads and pathways to navigate the hilly terrain. Utilize smaller and agile construction equipment suitable for rugged terrain. Implement logistical planning to optimize material delivery schedules.

2. Weather and Environmental Factors:

Challenge: The project is susceptible to weather fluctuations, including heavy rainfall, landslides, and erosion, which can disrupt construction activities and compromise site safety.

Strategy: Monitoring weather forecasts and implement contingency plans to mitigate the impact of adverse weather conditions

3. Logistics and Material Management:

Challenge: Efficient logistics & material management are essential due to the remote location and limited access to suppliers in the hilly area.

Strategy: Establish centralized material storage areas near the construction site to minimize transportation distances. Utilize advanced tracking systems to monitor material inventory and streamline procurement processes.

4. Safety and Worker Welfare:

Community Engagement and Stakeholder Relations:

Challenge: Engaging with local communities and stakeholders, addressing their concerns, and maintaining positive relations amidst construction activities in a hilly area.

Strategy: Implementing community outreach programs, including employment opportunities and skill development initiatives, to promote local participation and support for the project.

ICT and Automation Used

Implementing ICT (Information and Communication Technology) and automation in the project involves integrating advanced technological solutions to enhance efficiency, productivity, and effectiveness throughout the construction process.

- **Autodesk Revit:** Revit is one of the most widely used BIM software tools. It offers comprehensive features for architectural design, structural engineering, and MEP (mechanical, electrical, plumbing) systems coordination. Revit allows users to create intelligent 3D models that contain parametric information about building components
- **Microsoft Project(Project 13) :** Microsoft Project is a widely used scheduling tool that offers robust features for creating Gantt charts, assigning resources, tracking progress, and managing project timelines. It is suitable for projects of various sizes and complexities and is commonly used in construction as well as other industries
- **IEEE 802.1X Authentication :** IEEE 802.1X Authentication is a standard for port-based network access control that provides a mechanism for authenticating devices connecting to a network switch port before granting access to the network resources . It enhances network security by ensuring that only authorized devices can access network resources, mitigating the risk of unauthorized access, data breaches, and network attacks.

- **IoT Devices:** IoT devices play a crucial role in enhancing security, access control, and water management within the hostel building at IIT Guwahati. Through the deployment of surveillance cameras and motion sensors, IoT-based security systems ensure comprehensive monitoring and safeguarding of the premises. Additionally, IoT sensors are employed for water management purposes, facilitating efficient monitoring of water usage and detection of leaks or abnormalities in plumbing systems.
- **Emergency Response Automation:** Automated emergency response systems can detect emergencies such as fires or gas leaks and trigger appropriate responses, such as activating fire suppression systems, sounding alarms, and notifying emergency services. Integration with building automation systems ensures coordinated and timely responses to emergencies.

Performance Report

1	Name of the work with Brief particular	Construction of International Student facility (Ongoing)
2	Agreement No.	IITG/IPM/CAP/22-23/AGMT/12
3	Date of commencement of work	1/11/2022
4	Actual date of completion	10/10/2024
5	Gross Amount of Work done	140, 882, 019.99 Rupees
i)	Civil work of main building	7.91cr
ii)	Plumbing and <u>sanitary work</u>	0.21 cr
iii)	Fire Fighting Work	0.13 cr
iv)	Sewage Unit	0.17 cr
	Total	8.42 cr
6	Name & Adress of Authority under whom work was <u>excuted</u>	Director of IIT <u>Guwahati</u> , Guwahati
7	Whether the contactor employed Qualified Engineers during <u>excution</u>	Yes
8	Quality of Work done	Good
9	Did the contractor goes for arbitrations?	N/A

Actual Cost (ACWP) = 7.91 crores
Planned Value (BCWS) = 10.2 crores
BCWP = 7.1 crores.

Cost Performance Index (CPI):
 $CPI = BCWP / ACWP$
 $CPI = 7.1 \text{ crores} / 7.91 \text{ crores} = 0.89$

Schedule Performance Index (SPI):
 $SPI = BCWP / BCWS$
 $SPI = 7.1 \text{ crores} / 10.2 \text{ crores} = 0.69$

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Improving Project Performance: Strategies

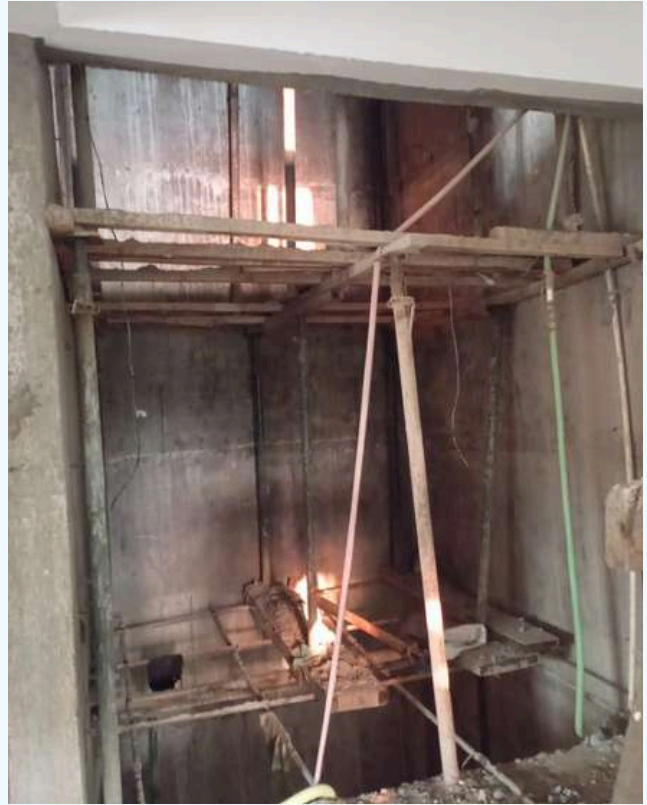
Risk Management: Effective risk management is crucial for the success of any construction project. As project manager, I would start by conducting a comprehensive risk assessment to identify potential threats to the project's timeline, budget, and quality standards. This assessment would involve evaluating factors such as supply chain disruptions, weather-related delays, regulatory compliance issues, and unforeseen site conditions.

Resource Management: Efficient allocation and management of resources are critical for optimizing project performance and minimizing waste. As project manager, I would carefully assess the project's resource requirements, including labor, materials, equipment, and subcontractors, and develop detailed resource management plans accordingly.

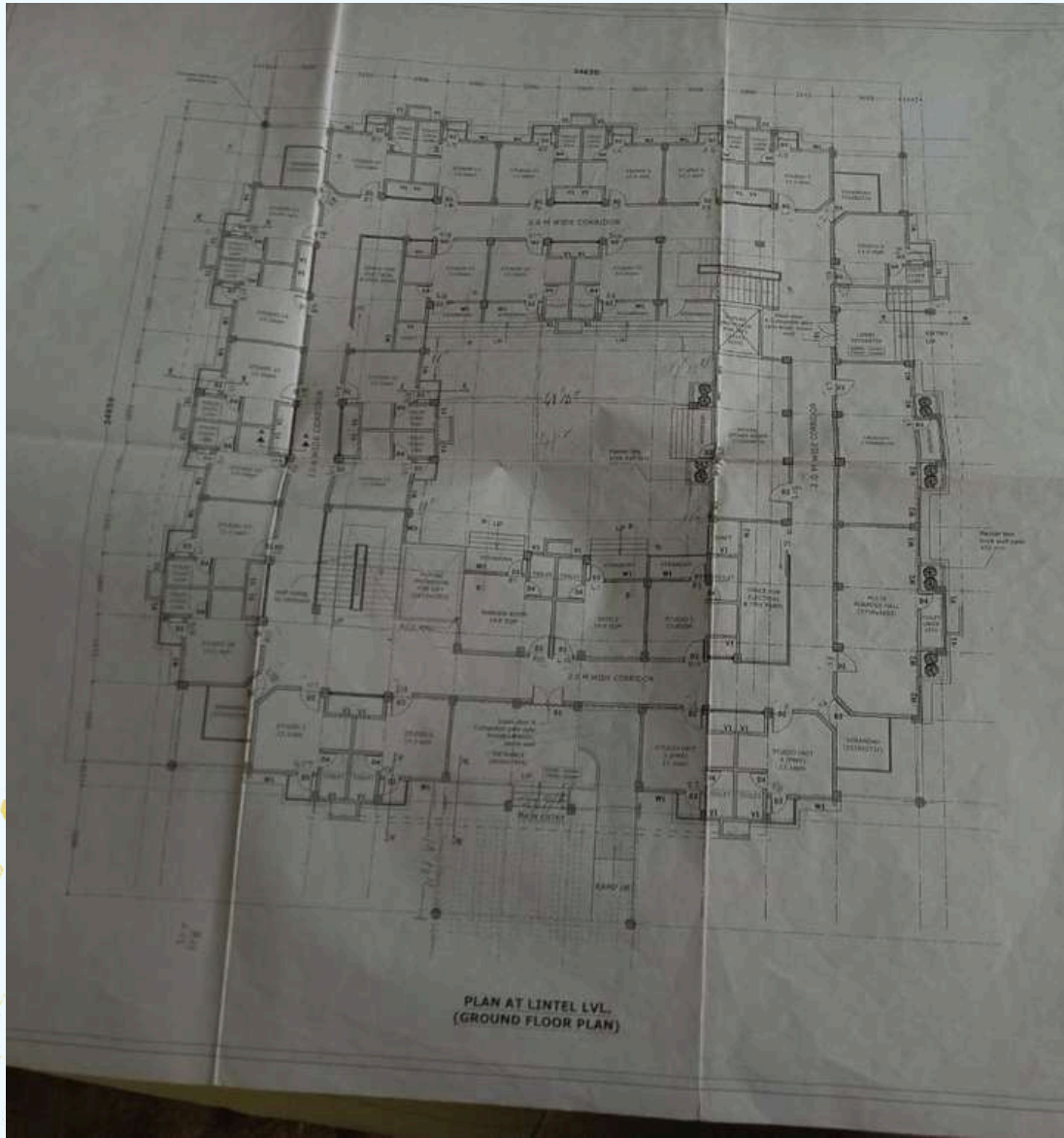
Technology Adoption: Embracing innovative construction technologies and digital tools can significantly enhance project management efficiency and effectiveness. As project manager, I would prioritize the adoption of technologies such as Building Information Modeling (BIM) for collaborative design, clash detection, and visualization of construction processes.



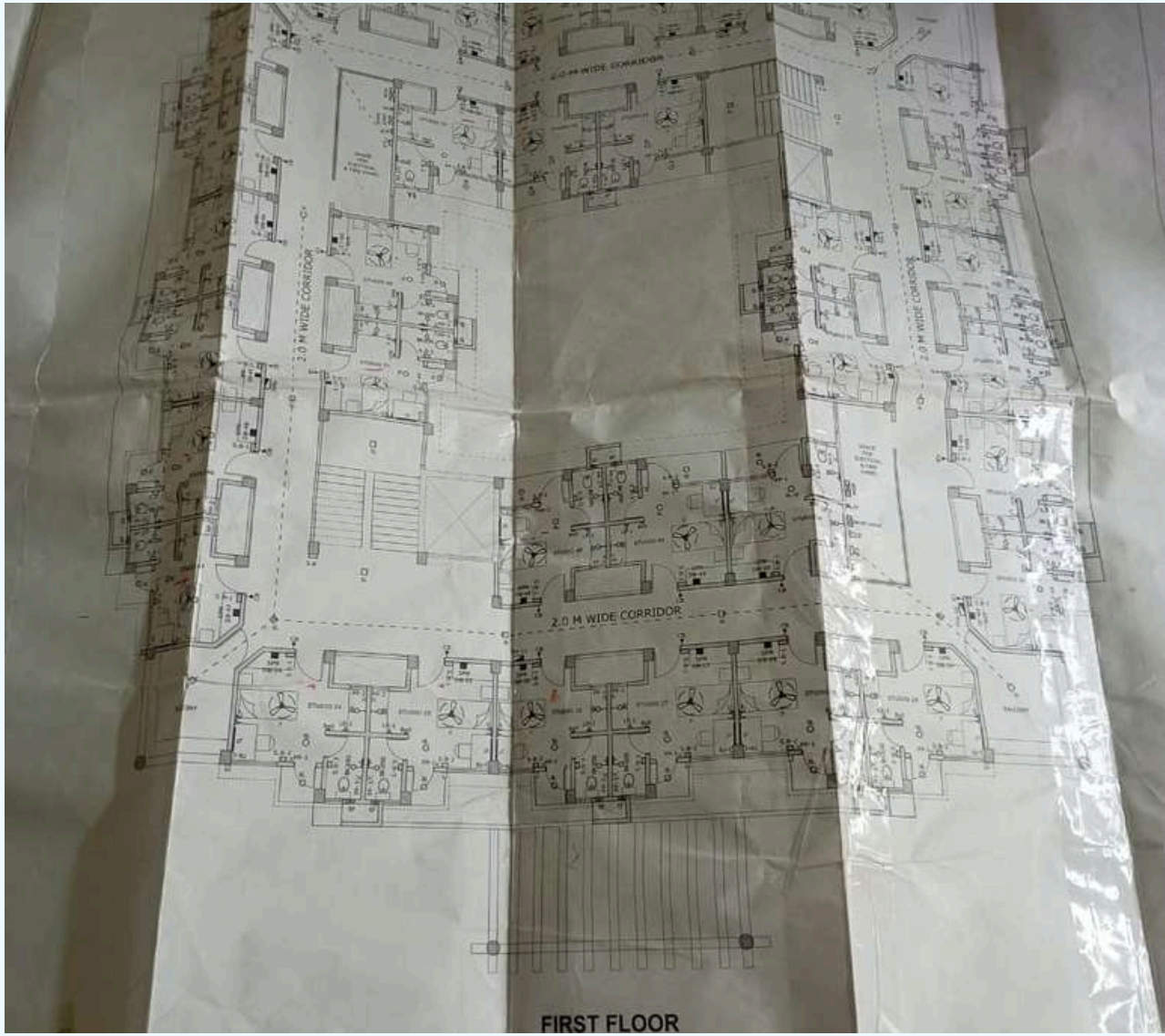
WORK PROGRESS



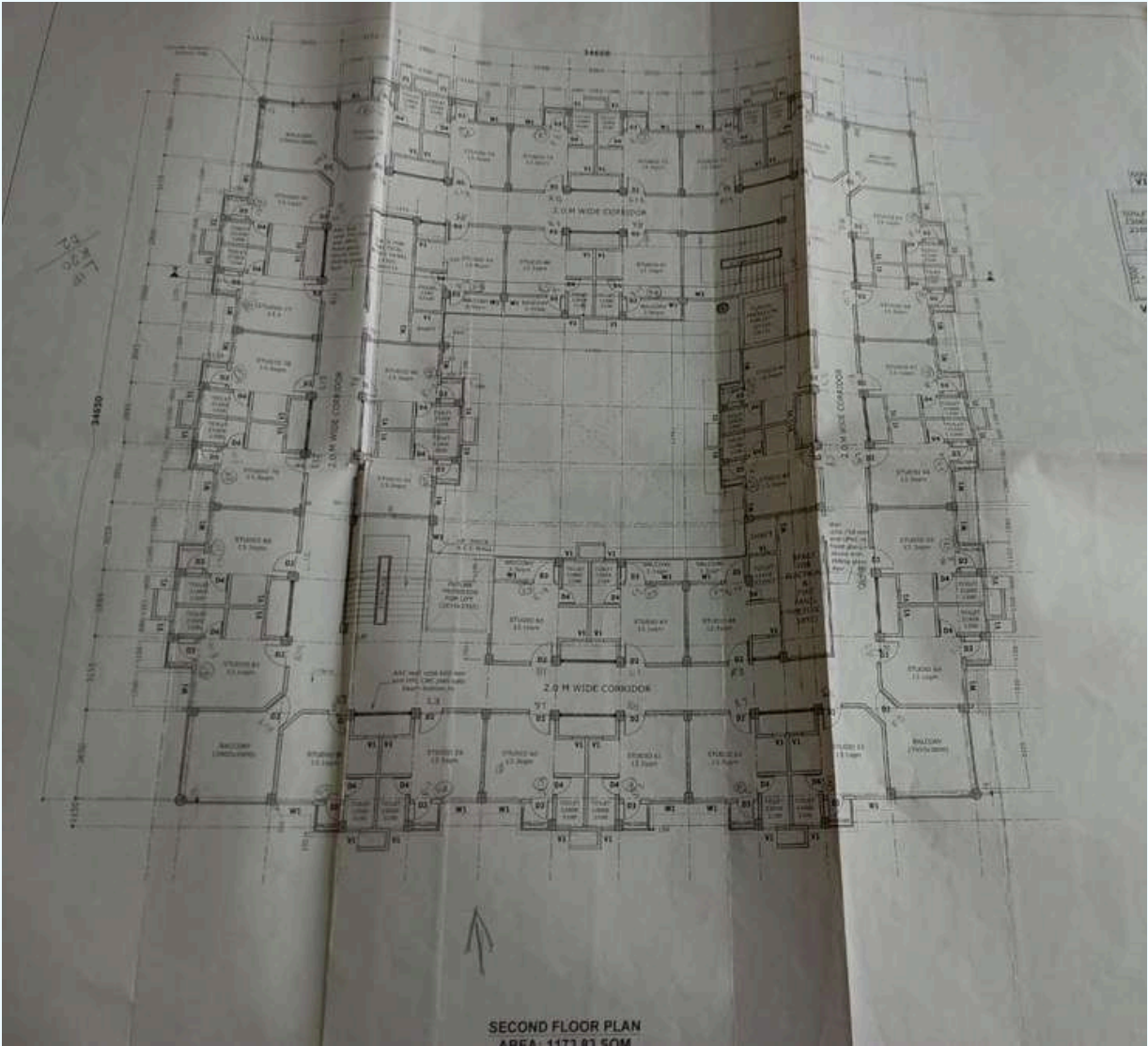
GROUND FLOOR PLAN



FIRST FLOOR PLAN




SECOND FLOOR PLAN



SITE PLANS



BOQ & SCHEDULE

 **INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI**
Guwahati- 781039, Assam
Phone : (0361) 2582061, 2582064 Fax : (0361) 2692771


TENDER ENQUIRY NO- : IITG/IPM/NIT/C/2022-23/03 DATED- 01.06.2022

NAME OF WORK: Construction of (i) BSBE building, (ii) Core Laboratory building & (iii) Hostel for International Faculty Students at IIT Guwahati campus

ESTIMATED COST- ₹ 84,20,82,107.00

SCHEDULE OF FINANCIAL QUOTE (PART- I & II)

NAME OF CONTRACTOR/ BIDDER		GANPATI CONSTRUCTION COMPANY		
SI No	Description of Item	Amount (₹)		Amount (₹)
		Part-I	Part-II	
1	Construction of BSBE building	97,062,719.00	471,851,000.00	568,913,719.00
2	Construction of building for CORE laboratory for first year students	40,987,171.50	138,317,089.51	179,304,261.01
3	Construction of International Students Hostel	10,057,019.99	130,825,000.00	140,882,019.99
Grand Total ₹ =				889,100,000.00

 **INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI**
Guwahati- 781039, Assam
Phone : (0361) 2582061, 2582064 Fax : (0361) 2692771

TENDER ENQUIRY NO- : IITG/IPM/NIT/C/2022-23/03 DATED- 01.06.2022

NAME OF WORK: Construction of Hostel for International faculty and students at IITG Campus

SCHEDULE OF FINANCIAL QUOTE(PART-II)

Name of the Contractor/Bidder: GANPATI CONSTRUCTION COMPANY

Sl. No.	Item Description	Unit	Qty	Rate in Figure (₹)	Rate in Words	Amount (₹)
Payment shall be made based on measurement of work executed and as per items & bill of quantity below:						
1	Site Development work					
1	Earth work in filling for site preparation with approved quality of earth including filling the portion within plinth area upto the formation level, peripheral apron & drains etc. complete upto formation level. in layers not exceeding 20 cm in depth including watering, ramming, consolidating to the acceptable density and dressing complete as directed including obtaining earth and removal of top vegetation, dressing the surface upto proper grade and slope. (The rate shall be inclusive of providing earth including all leads and lifts, payment of land compensation for obtaining earth, payment of royalty and taxes etc. (The payment will be made in profile measurement)	cum	2550.00	475.00	Rupees Four Hundred Seventy Five Only	1,211,250.00
	With the earth from outside the campus	cum	4000.00	156.00	Rupees One Hundred Fifty Six Only	624,000.00
1.2	Earth work in excavation by mechanical means (Hydraulic excavator)/ manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m, as directed by Engineer-in-charge 2 & 1 All kinds of soil	sqm	300.00	63.00	Rupees Sixty Three Only	18,900.00
1.3	Levelling the site					
2	ROAD WORK					
2	Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavating earth to an average of 22.5 cm. depth, dressing to camber and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earth lead upto 50 metres	sqm	1250	100.00	Rupees One Hundred Only	125,000.00
2	Supplying and stacking of graded stone aggregate at site of size range.					

Total estimated cost for project = 140,882,019 Rupees

Name of Work :- Construction of Hostel for International Faculty & Students (G+2) including Internal Electrical Installations, Fire Alarm System, Fire Fighting System, Land External Development.

Sl.No	Sub Head	Starting Date	Ending Date	Manpower Required (Nos)	Machinery Required
1	Site Cleaning	01.11.2022	30.11.2022	10	Excavator -2 nos, Dumper-4 nos
2	Footing Work	01.12.2022	28.02.2023	100	Batching Plant-1 Set, Barbending Machine-4 nos, Pilling Rig-10 Set
3	Grade Beam	15.02.2023	15.03.2023	100	Batching Plant-1 Set, Barbending Machine-4 nos
4	Base Floor RCC Beam & Slab	10.03.2023	30.04.2023	100	Batching Plant-1 Set, Barbending Machine-4 nos
5	1st Floor RCC Beam & Slab	01.05.2023	30.06.2023	100	Batching Plant-1 Set, Barbending Machine-4 nos
6	2nd Floor RCC Beam & Slab	20.06.2023	15.08.2023	100	Batching Plant-1 Set, Barbending Machine-4 nos
7	Terrace Level RCC Beam & Slab	01.08.2023	15.09.2023	100	Batching Plant-1 Set, Barbending Machine-4 nos
8	Ground Floor Brick Work, Lintel, Chajja	15.07.2023	31.08.2023	100	Mixer Machine -4 Nos
9	1st Floor Brick Work, Lintel, Chajja	01.09.2023	15.10.2023	100	Mixer Machine -4 Nos
10	2nd Floor Brick Work, Lintel, Chajja	01.10.2023	30.11.2023	100	Mixer Machine -4 Nos
11	Ground Floor Interior Plaster	20.08.2023	30.09.2023	100	Plastering Machine-4 Set

12	1st Floor Interior Plaster	07.10.2023	25.11.2023	100	Plastering Machine-4 Set
13	2nd Floor Interior Plaster	25.11.2023	31.12.2023	100	Plastering Machine-4 Set
14	Exterior Plaster	20.12.2023	15.04.2024	100	Plastering Machine-4 Set
15	Water Proofing (Roof Treatment)	01.04.2024	30.05.2024	10	
16	Doors & Windows (Wood, Aluminium) at all levels	15.12.2023	15.05.2024	20	Tools kit-5 Set
17	Flooring (Tiles, Granite, Marble) at all levels	01.01.2024	31.05.2024	60	Tools kit-5 Set
18	False Ceiling Work at all levels	15.01.2024	15.06.2024	10	Tools kit-5 Set
19	Railing Work (SS, MS)	01.03.2024	30.06.2024	10	Tools kit-2 Set
20	Main Gate Grill	01.03.2024	15.05.2024	5	Tools kit-2 Set
21	Internal Painting Works	15.01.2024	30.06.2024	60	
22	External Painting Works	10.04.2024	20.07.2024	60	
23	Miscellaneous Work	01.07.2024	25.08.2024	20	
24	Electrical Works	20.06.2023	31.08.2024	25	Tools kit-10 Set
25	Plumbing Work & sanitary	05.01.2024	31.07.2024	20	Tools kit-10 Set
26	Fire Fighting	05.01.2024	31.07.2024	10	Tools kit-5 Set
27	Site Development Work	15.06.2024	30.08.2024	50	Excavator-2 nos, Road Roller-1 nos, Dumper-4 nos
		01.07.2024	31.08.2024	25	Mixer Machine -4 Nos
28	Roads Work	10.08.2024	10.10.2024		
29	Finishing & Handover				

Note :- Assuming that work will be started by 01-11-2022

THE WORK IS GOING BEHIND THE SCHEDULE

*Thank
you!*