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Study for Execution of the Second Floor of the G+5 Storey Building

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A B S T R A C T

The study on the execution of the second floor of a G+5 storey building delves into the meticulous planning, coordination, and implementation required for successful construction. It involves various aspects ranging from structural design and material selection to workforce management and safety protocols.

Initially, the study encompasses a thorough analysis of the architectural and structural plans to ensure compliance with building codes and safety standards. This involves detailed calculations, simulations, and consultations with engineers and architects.

The execution phase begins with site preparation, including leveling the ground, setting up temporary structures, and ensuring access for construction equipment. Foundation work follows, where the integrity of the building's structure is established through the laying of footings and columns.

As the construction progresses to the second floor, careful attention is paid to the sequencing of tasks to maintain structural integrity and safety. This involves erecting scaffolding, installing formwork for concrete pouring, and reinforcing beams and slabs.

Simultaneously, utilities such as plumbing, electrical wiring, and HVAC systems are integrated into the building framework. Coordination among different trades is crucial to ensure smooth installation without compromising the structural integrity.

Quality control measures are implemented throughout the process to monitor material specifications, construction techniques, and adherence to project timelines. Regular inspections by supervisors and engineers help identify and rectify any deviations from the plans.

Safety protocols are paramount at every stage of construction. Workers are provided with proper safety gear, and protocols are in place to mitigate risks associated with working at heights, heavy machinery operation, and material handling.

As the second floor nears completion, finishing touches such as wall partitions, flooring, and fixtures are installed to transform the structure into a habitable space. Final inspections ensure that all components meet quality standards and regulatory requirements.

Keywords: Components, Levels, R.C.C Elements, Plan, Section and 3D Model.

1. Introduction

In this project we have studied particularly execution of construction of Institutional building. How any phase of project is initiated, controlled and finished. How the quantities of materials such as steel, concrete (Sand, Cement, Aggregate) are determined. And formwork for the various components of structure.

We have performed compression test on concrete cubes to check its 14 days and 28 days strength also performed Auto level to avoid the undulation on the centering of slab. We have seen how the safety precautions are performed and we ourselves followed the safety measures while visiting the site.

The study of executing the construction of the second floor of a G+5 storey building involves careful planning, coordination, and execution to ensure the successful completion of the project. This phase of construction marks a significant milestone in the overall progress of the building and requires meticulous attention to detail to maintain quality and safety.[1], [2],

1.1. Need of Project

Studying its execution ensures that it is constructed according to the approved plans and specifications, ensuring structural integrity and safety for occupants. Proper study and planning help ensure that safety measures are in place throughout the construction process. This includes measures to protect workers on-site and to comply with building codes and regulations, reducing the risk of accidents and injuries.

Thorough study and oversight help maintain the quality of construction materials and workmanship. This ensures that the second floor meets the required standards for durability, aesthetics, and functionality. Studying the execution involves coordinating with various stakeholders such as architects, engineers, contractors, and suppliers. Clear communication and coordination among these parties are essential for resolving issues promptly and keeping the project on track.

A comprehensive study helps identify potential risks and challenges associated with the construction of the second floor. Strategies can then be developed to mitigate these risks, reducing the likelihood of project delays or failures. Building regulations and local codes must be strictly adhered to during construction. Studying the execution ensures that all legal requirements are met, reducing the risk of penalties, fines, or project shutdowns. . [11]–[20],

2. Literature Review

1. ***IS 10262 (2009):*** The process for designing concrete mix. With the help of concrete mix designing quantity of concrete ingredients can be determined. The process of determining these ingredients is given in IS 10262. IS 10262 explains the proper procedure for determining the different ingredients of concrete.
2. ***IS 456: 2000: IS 456-2000 Plain and Reinforced Concrete*** - Code of Practice is an Indian Standard code of practice for general structural use of plain and reinforced concrete. The latest revision of this standard was done in the year 2000, and reaffirmed in 2021. This code uses the limit state design approach as well as the working stress design approach; however, the Code recommends use of the limit state design approach. [1] It is written for use in India. It gives extensive information on the various aspects of concrete.
3. ***IS: 875 (Part 2) – 1987:*** -Code of practice for design load (other than earthquakes) for building and structures. In this code standard values of various types of loads can be referred to while analysing the structure. Earthquake load is covered in separate standards, namely IS 1893-1984 which should be considered along with other loads.
4. ***National Building Code of India (NBC) :*** - It is a comprehensive building code providing guidelines for regulating the building construction activities across the country. It serves as a Model Code for adoption by all agencies involved in building construction works be they Public Works Departments, other government construction departments, local bodies or private construction agencies
5. ***IS 1199-Part 2 2018*** : - the Indian Standard from 1959 on methods of sampling and analysing concrete. It establishes procedures for sampling and testing both fresh and hardened concrete. It aims to achieve quality control and ensure concrete's strength and durability through simple, direct testing methods. The standard was developed by a committee that considered practices in India and international standards. It is meant to be used along with other Indian Standards for concrete testing.
6. ***IS 2502: 2004(Code of practice for bending and fixing of bars for concrete reinforce):*** - This standard is prepared with a view to assisting designers, engineers and contractors in drawing up precise bending schedules for reinforcement used in reinforced concrete construction, and also in the fixing of reinforcement. Though, it is well appreciated that much of time and effort can be saved on the site if rational dimensions for shaping the bars are supplied to the bar benders; different practices have been followed hitherto in drawing up the bar bending schedule. It is attempted in this standard to unify the various practices followed and to rationalize the bending schedule to correspond with metric series of reinforcement [3]–[10]

3. Calculations

3.1. Calculation of reinforcement for two-way slab

TERRAZYME –

Thickness of Slab:- 150mm

L x B :- 5000mm x 5000mm

Main Bars alternate Bent-up 10 Ø @ 150mm along both sides

Distribution Bars 10 Ø @ 150mm (both directions)

Clear cover to Slab is 25mm

Determination of quantity of reinforcement of slab

Table No -1 Reinforcement Details

Sr. No.	Description	Dia. (mm)	No's	Length	Unit weight (Kg /m)	Total weight Kg
1	Main Bars	10	94	5.82	0.617	336.88
2	Extra Top Bars	10	68	1.25	0.617	52.45
			TOTAL			389.33 Kg

The total quantity of reinforcement required for a slab is 389.33Kg.

3.2. Determination of quantity of reinforcement of beams

Table No -2 Reinforcement Details of Beams

Sr. No.	Particular	Nos	Cutting Length(m)	Spacing	Dia.	Weight (Kg)
1)	TOP MAIN BAR	2	6.3	-	16	19.9
2)	BOTTOM MAIN BAR	2	5.7	-	16	18
3)	TOP EXTRA BAR	4	1.9	-	16	12.48
4)	BOTTOM EXTRA BAR	2	3.29	-	16	10.4
5)	STIRRUPS	38	3.04	125	8	45.63
			TOTAL =			**106.41**

So, the quantity of reinforcement for the beam is 106.41Kg

3.3. CALCULATION OF REINFORCEMENT FOR STAIRCASE

Table No -3 Reinforcement Details of Staircase

Sr.No.	Description	Nos	Spacing(mm)	Dia. Of bar(mm)	Cutting length(mm)	Total weight(Kg)	
						8mm	12mm
1)	Waist slab main bars	32	125	12	6.022		172
2)	Waist slab dist. Bars	56	150	08	1.77	39.2	
3)	Landing dist. Bars	12	150	08	3.74	17.73	
4)	Top extra bars	64	125	12	4.174		237.45
			TOTAL=			56.93	409.45

The total quantity of steel required for the staircase is 466.38 Kg.

3.4. Testing of Concrete Cubes After the Curing of 14 Days

Size of mould:- 150mm x 150mm x 150mm

Ratio of concrete:- 1:1:2

Date of casting:- 09/03/2024

Date of testing:- 23/03/2024

Observation table

After the curing of 14 days, the compressive strength of concrete cubes are as follows,

Table No -4 Test results of cubes of 14 days

SR.NO	GRADE OF CONC. CUBES	LOAD IN (KN)	STRENGTH IN (N/MM^2)
Sample 1		540	24
Sample 2		550	24.22
Sample 3	M25	505	22.22
	Average		**23.45**

The 90 % of strength is gained after 14 days of curing. So, for M25 grade cubes 22.5 N/mm^2 strength should be gain. In our test 23.45 N/mm^2 strength has been gained.

3.5. Testing of Concrete Cubes After the Curing of 28 Days

Size of mould:- 150mm x 150mm x 150mm

Ratio of concrete:- 1:1:2

Date of casting:- 09/03/2024

Date of testing:- 06/04/2024

Observation table s

After the curing of 28 days, the compressive strength of concrete cubes are as follows,

Table No -5 Test results of cubes of 28 days

SR.NO	GRADE OF CONC. CUBES	LOAD IN (KN)	STRENGTH IN (N/MM^2)
Sample 1		600	26.67
Sample 2	M25	650	28.89
Sample 3		635	28.22
	Average		27.87

The 100% of strength is gained after 28 days of curing. So, for M25 grade cubes, 25 N/mm2 strength should be gained. In our test 27.87 N/mm2 strength has been gained.

4. Conclusion

We conclude that, we are able to calculate the quantity of formwork, quantity of concrete required for beams, slab, columns, staircase. Compression test on cubes in laboratory. How the Safety rules are followed at site. [1],

the successful completion of a construction project requires accurate calculations and efficient management of resources. From determining the quantity of formwork needed to conducting concrete cube tests and managing labor at the site, every aspect plays a crucial role in ensuring the project's success. By utilizing advanced tools such as auto levels for slab preforming and closely monitoring the quantity of steel reinforcement required for columns, construction teams can organize their processes and achieve optimal results. Effective planning, precise calculations, and diligent labor management are key factors in delivering high-quality construction projects on time and within budget.

In conclusion, the accurate calculation of formwork quantity, column quantity, concrete cube testing, steel reinforcement quantity, and proper execution of auto level on slabs are crucial aspects of successful construction projects. Effective labor management at the site is also essential for ensuring timely completion and quality workmanship. By paying attention to these key factors and implementing best practices, construction projects can be completed efficiently and with high standards of quality.

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