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Applying Work Breakdown Structure (WBS) Methodology to Enhance Efficiency in Residential Projects: A Case Study in Visakhapatnam, Andhra Pradesh, India

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Abstract: *Effective project management relies heavily on a well-defined progress structure. Planning, the cornerstone of any undertaking, underpins execution, monitoring, control, and ultimately, project closure. Work breakdown structures (WBS) excel at streamlining this process by decomposing objectives, activities, and sub-activities into manageable work packages. This study explores the potential of WBS in residential building construction, focusing on planning, scheduling, and tracking progress. By visualizing activity interdependencies, WBS empowers continuous monitoring and timely course correction, enhancing overall project efficiency.*

Keywords—Planning, Scheduling, MS Project, Work Breakdown Structure.

Objectives:

- *To Implement WBS methodology in residential project management.*
- *To Assess the impact of WBS on efficiency improvement.*
- *To Analyse how WBS enhances project planning and execution.*
- *To Identify challenges and benefits of applying WBS in residential projects.*
- *To Provide actionable insights for optimizing project management efficiency using WBS.*

INTRODCUTION

The importance of a work breakdown structure (WBS) in software project management is examined in this paper, with a focus on how it affects organizational planning, resource allocation, and project design. Successful software development depends on a well-defined roadmap that outlines the tasks required to accomplish project objectives. Establishing a WBS early in the proposal stage fulfils several crucial functions, according to the Project Management Institute (PMI, 2021).

Project clarity and stakeholder communication are enhanced when needs and scope are clarified early on in the work breakdown structure (WBS) (Frame, 2003). A WBS makes it easier to estimate the number of resources needed and the length of the project with more accuracy by dividing it into smaller, more manageable work packages (Herzanita, 2019).

The WBS is dynamic, though. The WBS must change in accordance with the demands, restrictions, and complexity of the project (PMI, 2021). Therefore, maintaining a WBS's correctness and efficacy throughout the project lifetime requires regular updates and changes, even though starting a WBS early is critical. Moreover, a WBS has effects that go beyond planning. By outlining roles, duties, and lines of communication, it promotes robust organizational structures and ensures effective resource allocation and teamwork (Kubr, 2002)

LITERATURE REVIEW

A. *Scheduling resources in a residential building project using MS Project*

To determine the different elements needed for effective project planning and execution, a case study of a residential project in Visakhapatnam, Andhra Pradesh, India, was examined. To learn about various approaches to be used, a number of journal articles were consulted.

B. *Using MS Project to manage time and expenses in Real Estate Construction Projects*

Construction projects related to real estate include the creation of residential and commercial structures that are liveable environments. These projects have sponsors that provide financial support, with the remaining teams managing the project and overseeing its construction.

C. An analysis of project's schedule using MS Project

Any construction project's primary goal should be to execute or finish it as soon as possible, but it should also be completed with more economy and efficiency within the allotted time frame, as these factors are critical to the project's success.

D. Planning and scheduling of project using MS Project

International journal publications were consulted in order to identify different features that demonstrate effective project planning and execution, the adoption of divergent approaches, and the identification of corrective procedures. The approach used consists of identifying the problem statement, deducing the goals from the data that is gathered into two categories—primary and secondary—analysing the data, and drawing a conclusion.

E. *Using Primavera P6 for resource scheduling and planning of a residential project (G+6)*

It concludes that by utilizing Primavera, four months were cut off the project's real base timeline. Additionally, it helps to reduce cost overruns, which ensures the project's successful completion.

F. Planning and scheduling of a residential building using Primavera P6 software

The primary goal of this project is to arrange for the appropriate planning, scheduling, and prompt completion of the construction of a five-story residential building in Visakhapatnam City of Andhra Pradesh. The studied project can be finished before the deadline within the budget.

G. Primavera-based construction management of a residential building

Effective construction project planning, scheduling, and management has the advantage of minimizing construction time, cost overruns, and conflicts. It also aids in preventing delays in construction and associated costs, maintaining job continuity, and preventing construction disruptions.

H. *Utilizing Primavera P6 for residential project planning, scheduling, and tracking:*

According to the findings of the study, which examines the shortcomings in the planning and scheduling process of the client organization, contractors and subcontractors play an essential role in ensuring the project's timely completion.

I. A case study on a Road Project

This article offers an appropriate approach to construction project planning, scheduling, and resource use, as well as an implementation of activity-based computerized planning, scheduling, and utilization (MS Project and MS Excel).

METHODOLOGY

By providing an open framework for tracking project progress across the project's hierarchical structure, the Work Breakdown Structure (WBS) acts as a method for project control. As such, every team is accountable for the assignments given to them. The WBS is valuable because it provides a visual depiction of the complete program and a methodical strategy of identification for every stage of the project. *Figure 1* illustrates the methodology adopted for the accurate and comprehensive development of the Work Breakdown Structure.

Result & Discussion

The several tasks involved in building construction are summarized in this project. The project is broken down into its constituent parts by the work breakdown structure, in order to provide a structure that would allow the scope, timeline, and planning of the project to be managed effectively. Figure 2 shows the G+5 Residential building's main work breakdown structure, delineating the various phases, activities, and sub-activities essential for project execution and management.

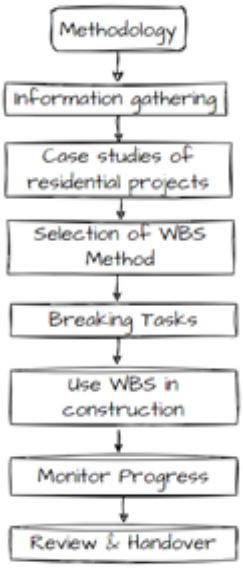

Figure 1. Flowchart of Methodology

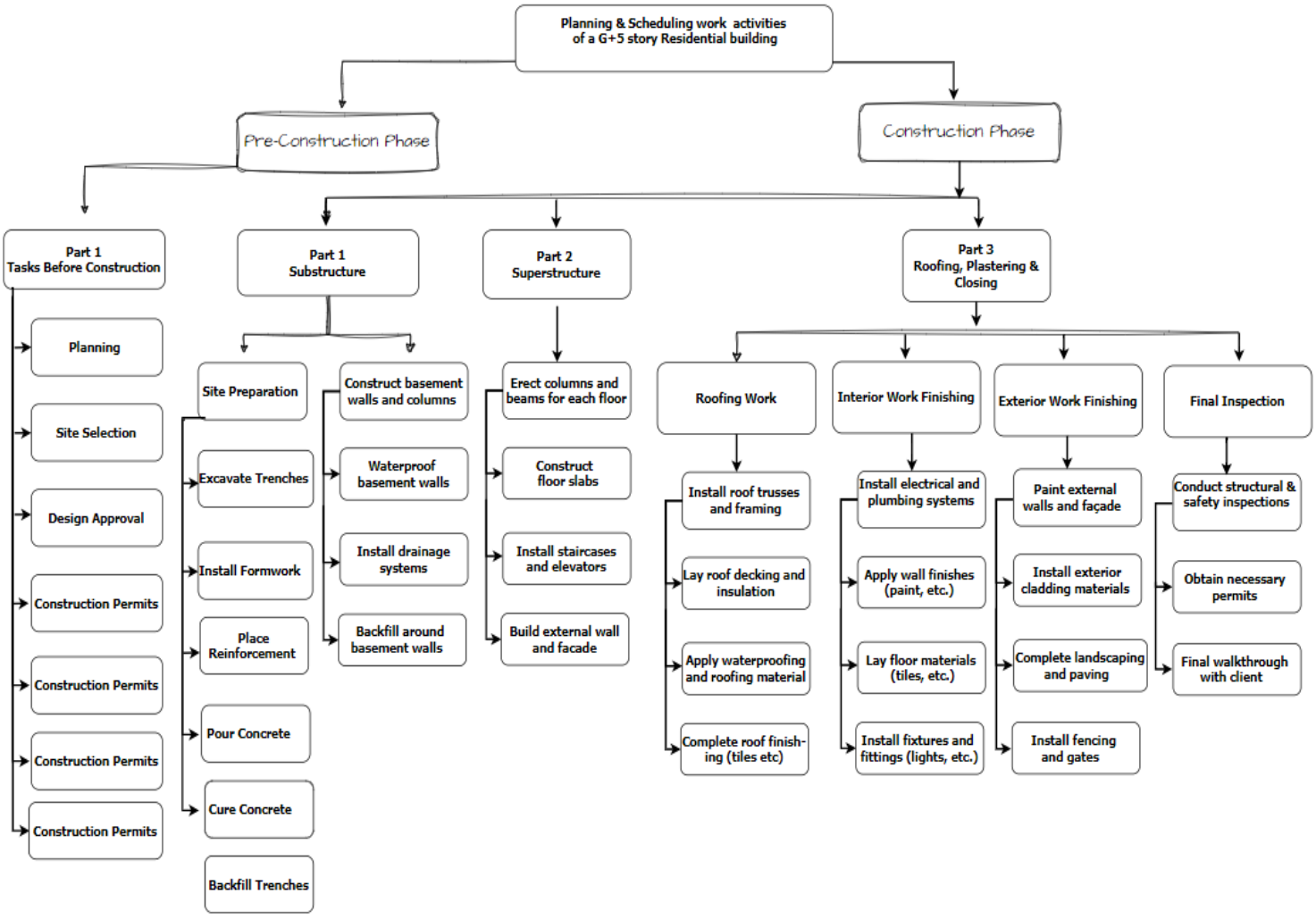

Figure 2. WBS of a G+5 Story Residential Building

The Work Breakdown Structure (WBS) is vital in construction project management, especially for tasks like foundation excavation (Kumar, 2020). It breaks down the excavation process into smaller tasks, ensuring clarity and organization, and enabling efficient resource allocation (PMI, 2021). Additionally, the WBS aids in time management by facilitating realistic scheduling (Danny, 2022) while also playing a crucial role in risk management by identifying critical tasks (Shahid Iqbal, Jan, 2015,). Furthermore, it enhances cost control through accurate estimation and tracking (Turner, 2013), and serves as a communication tool, fostering collaboration among stakeholders (Yvonne Valerie Leonard Doudilim, Dec, 2021).

Figure.3 shows the WBS of foundation excavation process including the mobilization and site preparation.

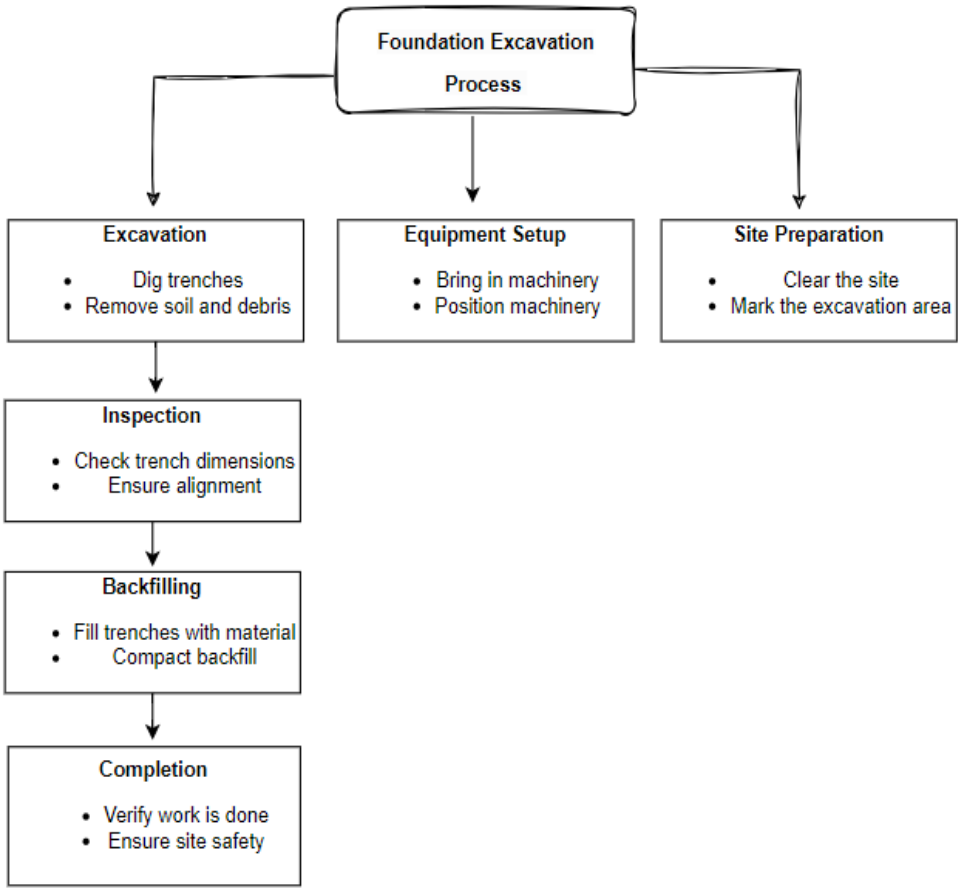

Figure 3. WBS of Foundation Excavation

Creating a new house involves various tasks, including building the foundation, walls, and stairs, all detailed in a WBS (Work Breakdown Structure). For the ground floor, it begins with site preparation, followed by foundation construction, superstructure assembly, wall erection, utility installation, and finishing touches. The staircase WBS covers planning, excavation, step construction, finishing work, and adjustments. Each step, from ground floor to staircase, is crucial for a safe and functional home, ensuring nothing is overlooked in bringing your dream house to life. *Figure 4.* shows the WBS of plinth works, ground floor and staircases activities.

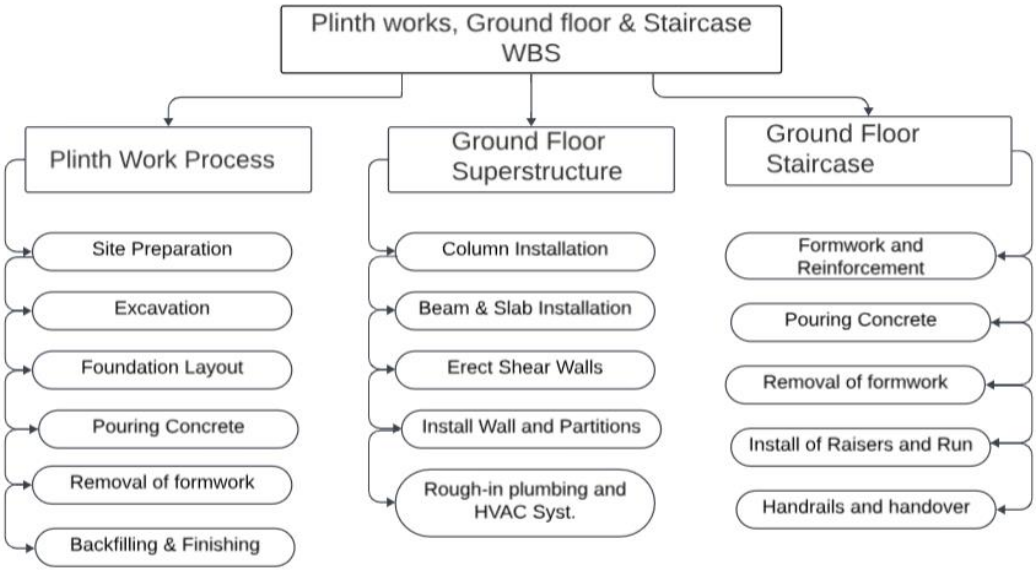

Figure 4. WBS process of ground floor and staircase

Significance of WBS in Construction Projects

Construction management involves planning, coordinating, and overseeing a construction project from initial steps to closing. It includes five main phases: design, pre-construction, procurement, construction, and owner occupancy. To understand this process better, we looked at a case study of a five-story residential building in Visakhapatnam, Andhra Pradesh. We focused on planning and scheduling using Diagram Drawio and Concept map software's. We created a detailed breakdown of tasks, dividing them into pre-construction and construction activities, and further into smaller sub-activities.

This breakdown, called a Work Breakdown Structure (WBS), is a crucial tool in project management. It helps communicate project details effectively and manage tasks more efficiently.

Conclusion

Our goal with this case study was to provide insight into the construction project, with a special focus on the WBS. The WBS we developed helped us understand the project's graded structure and dependencies between different tasks. In summary, the WBS gives us a detailed overview of every step involved in building construction at a micro level.

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