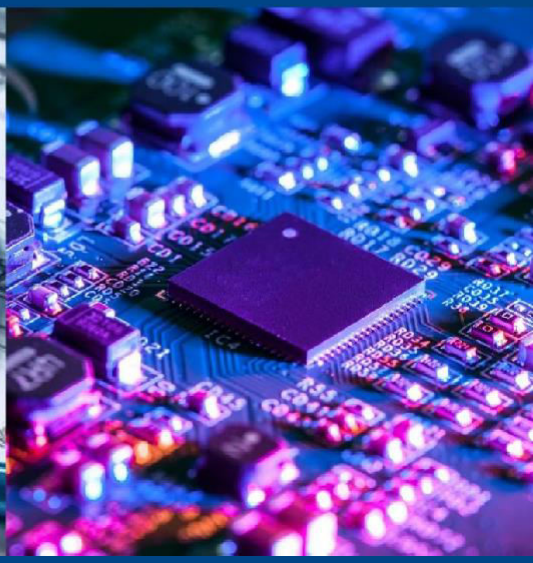
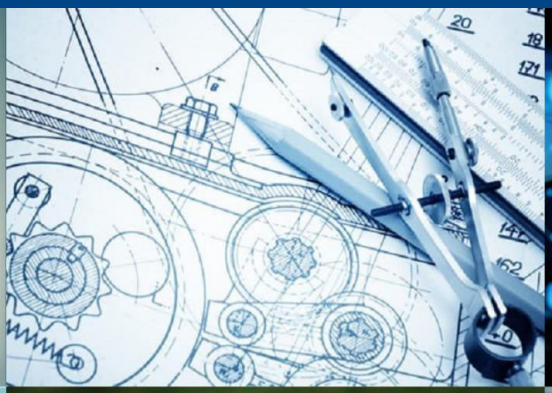
ISSN: 2582-7219

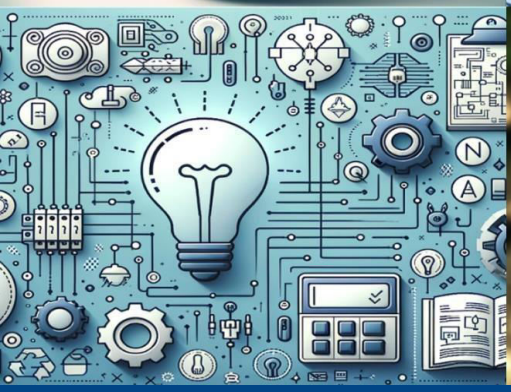




International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.206 **Volume 8, Issue 7, July 2025**

© 2025 IJMRSET | Volume 8, Issue 7, July 2025| DOI:10.15680/IJMRSET.2025.0807013

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

House Construction Management Project

Prathmesh M. Chaudhari[1], Prof. Hemant B. Dahake [2]

Student M.Tech. Dept. of Civil Engineering, G. H. Raisoni University, Amaravati, India[1]

HOD, Dept. of Civil Engineering, G. H. Raisoni University, Amaravati, India[2]

ABSTRACT: This project report presents the comprehensive planning and management of a G+2 residential building named Sunrise Villa, located in Nagpur, Maharashtra. The objective of this project is to demonstrate effective construction management practices applied to a real-world housing scenario, integrating academic knowledge with practical implementation.

The residential structure is designed as a G+2 RCC framed building, covering a plot area of 2,000 sq.ft and achieving a total built-up area of 4,800 sq.ft. It comprises three 2BHK units, one on each floor.

The project was scheduled for completion within 12 months and maintained a budget of ₹ 60 Lakhs.

The project encompasses detailed steps such as:

- Planning and Scheduling using modern tools (e.g., MS Project),
- Work Breakdown Structure (WBS) and Critical Path Method (CPM) for time management,
- Accurate cost estimation using Quantity Takeoff (QTO),
- Quality control through regular material testing and site inspections,
- Risk mitigation strategies for challenges like labor shortages and weather disruptions,
- Implementation of sustainability measures including rainwater harvesting, use of fly ash bricks, and local materials.

The successful delivery of the project within the planned time and budget illustrates the practical application of construction management principles. The study also aligns with IS codes (IS 456, IS 875) and the National Building Code 2016 to ensure safety, durability, and compliance.

I. INTRODUCTION

➢ BACKGROUND AND CONTEXT

Urban regions like Nagpur, Maharashtra, are witnessing a growing demand for quality residential infrastructure driven by population growth, urbanization, and changing lifestyles. To meet this demand, housing projects must be delivered efficiently, safely, sustainably, and within budgetary and time constraints. This requires a systematic and multidisciplinary approach to Construction Project Management (CPM), which integrates planning, execution, control, and continuous monitoring throughout the project lifecycle.

➢ NEED FOR EFFECTIVE CONSTRUCTION MANAGEMENT

Construction projects are inherently complex due to their scale, the involvement of diverse stakeholders, fluctuating market conditions, and site-level uncertainties.

Inefficiencies in project management can lead to cost overruns, delays, quality defects, and safety risks. To avoid these pitfalls, globally accepted frameworks and techniques have been developed, which this project seeks to apply and demonstrate in a local Indian context.

As noted by Kerzner (2017) and the PMI (2017) in the PMBOK Guide, project success depends on structured planning, scheduling, risk management, and control systems. Chitkara (2011) further emphasizes the importance of WBS and CPM in managing time and resource flow, which were used in Sunrise Villa to develop and monitor the construction sequence.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

1. OBJECTIVES OF THE PROJECT

The primary objectives of this project are:

- To integrate theoretical construction management principles with real-world project execution.
- To plan and execute a G+2 residential building using structured project management tools like WBS, CPM, and MS Project.
- To maintain budgetary control and resource efficiency through accurate quantity estimation (QTO) and cost forecasting.

II. KEY DOMAINS OF MANAGEMENT

2.1 PROJECT PLANNING AND SCHEDULING

Planning and scheduling form the backbone of any construction activity. The use of WBS and CPM methods ensured that critical activities in Sunrise Villa were prioritized and monitored. As per Gould & Joyce (2013), well-defined schedules prevent worksite clashes and material downtime. The study by Assaf & Al-Hejji (2006) also reinforces how improper planning is a common cause of delays in residential projects.

2.2 COST MANAGEMENT

Cost control was maintained through detailed QTO and tracking against budgeted values. Brook (2016) and Ashworth & Perera (2018) stress that tender accuracy and life-cycle costing are vital for financial sustainability. In volatile market conditions, strategies from Aibinu & Jagboro (2002) and Enshassi et al. (2013)—like early procurement and labor planning—helped reduce the impact of inflation and delays.

2.3 QUALITY MANAGEMENT

Construction quality was ensured by regular site supervision, material testing, and process reviews. Studies such as Jha & Iyer (2006) highlight how managerial commitment, communication, and technical capability directly influence project quality. Love & Li (2000) warn against the high cost of rework due to poor initial quality controls, a risk mitigated in this proje1ct through early interventions.

2.4 MANAGEMENT

Worksite safety was addressed through risk assessments, PPE enforcement, and daily safety briefings. Theories by Hinze (1997) and Toole (2002) underline how clearly assigned safety roles and regular training reduce accidents. This approach was further reinforced by Lingard & Rowlinson (2005), who advocate for worker welfare and compliance with safety codes.

III. METHODOLOGY

1. Research Design

The project follows a case study model, allowing for systematic application of project management practices. It involves planning, execution, and evaluation stages using industry-standard tools and techniques, facilitating practical validation of theoretical concepts.

2. Data Collection Methods

- Primary Data: Gathered through site observations, daily logs, test reports, and engineer feedback.
- Secondary Data: Referenced IS Codes (IS 456:2000, IS 875), NBC 2016, academic literature (Kerzner, Chitkara, Kibert), and manufacturer data sheets.

3. Tools and Techniques Used

3.1 Planning & Scheduling:

- Work Breakdown Structure (WBS)
- Critical Path Method (CPM)
- MS Project for timeline generation
- Gantt charts for resource smoothing

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

3.2 Cost Management:
- Quantity Take-Offs (QTO)
- Unit rate-based cost estimation
- Excel-based cost tracking
- Earned Value Management for performance monitoring

3.3 Quality Control:
- Use of checklists and inspection forms
- Routine material testing (cement, concrete, steel)
- Compliance with IS codes and quality standards
- Documentation of non-conformities and corrective measures

3.4 Safety Management:
- Risk assessments and daily safety briefings (toolbox talks)
- Use of PPE, site safety audits, and first-aid protocols
- Safety log maintenance in line with NBC guidelines

3.5 Sustainability Assessment:
- Rainwater harvesting system integration
- Eco-friendly materials (e.g., fly ash bricks)
- Waste minimization through reuse and recycling
- Consideration of lifecycle environmental impacts

4. Monitoring and Control Methods
- Weekly progress review meetings
- Schedule tracking through bar and milestone charts (MS Project)
- Cost and time variance analysis
- Inventory and material usage checks to minimize waste
- Periodic audits for safety and code compliance

IV. WORK PLANNING

The project schedule was developed using MS Project, outlining major phases and activity durations, forming the basis of a detailed Gantt Chart. Key phases and durations were:

Phase	Activities	Duration
Pre-construction	Design, approvals, procurement	15 days
Foundation	Excavation, PCC, RCC footing, plinth beam	30 days
Ground Floor	Column, slab, wall construction	35 days
First Floor	Slab, beam, walls	35 days
Second Floor	Slab, parapet, staircase	35 days
Roofing & Services	Waterproofing, electrical, plumbing	30 days
Finishing Works	Plastering, tiling, painting, doors/windows	60 days
Sustainability Features	Rainwater harvesting, landscape, fly ash brickwork	15 days
Final Handover	Snag list, audits, occupancy clearance	10 days

- Total Project Duration: ~12 months, including buffer time for unforeseen delays.

© 2025 IJMRSET | Volume 8, Issue 7, July 2025| DOI:10.15680/IJMRSET.2025.0807013

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

V. PROJECT EXECUTION STRATEGY

The project was executed in seven distinct phases, with weekly tracking for progress, resource consumption, and cost variance:

Phase	Key Activities
Pre-Construction	Site survey, soil testing, drawing approvals, procurement planning
Foundation & Plinth	Excavation, PCC, RCC footing, plinth beam construction
Superstructure	Column casting, slab shuttering, beam laying, masonry wall construction
Services & Roofing	Plumbing, electrical wiring, waterproofing, roofing slab construction
Finishing	Plastering, flooring, painting, door and window installation
Sustainability Works	Rainwater harvesting (RWH), improved ventilation, landscape and green features
Post-Construction	Final audits, snag list rectification, safety compliance, and documentation

VI. PHASE OF CONSTRUCTION

1. Planning and Estimation

- **Site Setup & Feasibility**: Assessed land use, zoning laws, and setback requirements to ensure regulatory compliance.
- **Estimation**:
- Prepared **Quantity Take-Offs (QTO)** and **rate analysis** for a projected **₹60 Lakhs** construction budget.
- **Tools Used**:
- **MS Excel** for estimation,
- **IS 1200** for measurement standards,
- QTO templates.
- **Outcome**: The budget and timelines were aligned realistically with the defined project scope and site conditions.

2. Design Phase

- **Architectural Design**:
- Developed **2BHK layouts** for each of the **three floors**, emphasizing **natural lighting** and **cross ventilation**.
- **Structural Design**:
- RCC framed structure planned as per **IS 456:2000** for safety and durability.
- **Safety and Building Services**:
- Included **dual staircases**, **modular kitchens**, and optimized plumbing and electrical layouts.
- **Tools Used**:
- **AutoCAD** for drafting,
- Design compliance ensured with **NBC 2016**.
- **Plan Highlight**: Efficient mirrored 2BHK units with centralized stairs and standard room dimensions (e.g., 12' x 10'/11').

3. Execution Phase

Structured via Work Breakdown Structure (WBS) and Critical Path Method (CPM) for organized workflow and monitoring:

Phase	Key Activities	Duration
Site Setup	Site clearing, layout marking	1 week
Foundation Work	Excavation, PCC, footings	4 weeks
Structural Framework	RCC columns, beams, slabs	14 weeks
Brickwork & Plastering	Block masonry, internal plastering	8 weeks

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Phase	Key Activities	Duration
Electrical & Plumbing	Conduits, piping, fixture installation	6 weeks
Finishing & Painting	Doors, tiling, surface finishing	12 weeks
External Works & Handover	Landscaping, RWH installation, snag resolution	2 weeks

VII. DATA ANALYSIS AND RESULT

1. Introduction

The analysis evaluates project performance across five key dimensions—Time, Cost, Quality, Safety, and Sustainability—based on data collected throughout the planning, execution, and monitoring phases. Both qualitative and quantitative metrics were assessed to determine project outcomes.

2. Time Performance

- Planned Duration: 12 months
- Actual Completion: 12 months + 8 days
- Total Delay: 8 days (≈2.2%), caused mainly by weather-related plastering delays
- Monitoring Tools: MS Project and Critical Path Method (CPM)
- Result: Project remained within acceptable time limits, with minimal impact from delays due to effective scheduling and tracking.

3. Cost Performance

- Budgeted Cost: ₹60 Lakhs (inclusive of contingencies)
- Actual Cost: ₹60 Lakhs
- Variance Summary:

Component	Estimated (₹)	Actual (₹)	Variance (%)
Civil Works	38,00,000	37,80,000	-0.50%
Plumbing & Electrical	8,00,000	8,20,000	+2.50%
Finishing	10,00,000	9,80,000	-2.00%
Sustainability Features	2,00,000	1,95,000	-2.50%
Misc./Contingency	2,00,000	2,25,000	+12.50%

- Result: Budget control was successfully achieved through real-time tracking and efficient procurement strategies.

4. Quality Assessment

- Testing & Inspection Tools: Cube tests, IS-code checklists, grading audits
- Concrete Strength Results:

Component	Avg. Strength (MPa)	IS Requirement (≥25 MPa)	Result
Foundation	27.4	✅	Pass
Slabs	28.2	✅	Pass
Columns	30.1	✅	Pass

- Additional Notes:
- Finishing quality scored above 90% in audits
- No structural defects post-handover
- Result: Full compliance with IS 456 & IS 875, with high workmanship quality.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

5. Safety Performance

- Practices Followed: Daily toolbox talks, PPE enforcement, weekly audits
- Safety Record:
- Zero major accidents
- 2 minor incidents (scrapes, fatigue)
- 95% PPE compliance
- Result: A zero-accident project, showcasing a strong safety culture and effective risk management.

6. Sustainability Metrics

- Green Practices:
- Fly ash bricks used in 80% of wall construction
- 5,000 L rainwater harvesting tank installed
- Passive design for natural ventilation and daylight use
- Environmental Benefits:
- ~10% reduction in carbon footprint
- ~20% water savings via RWH and low-flow fixtures
- Result: Met basic green building benchmarks with no major cost impact, aligning with sustainable construction recommendations.

7. Project Performance Summary

Parameter	Target	Actual	Result
Time	12 months	12 months + 8 days	✅ On Schedule
Cost	₹60 Lakhs	₹60 Lakhs	✅ On Budget
Quality	IS Standards	100% Compliance	✅ High
Safety	Zero Accidents	No Major Incidents	✅ Achieved
Sustainability	Green Features	Fully Implemented	✅ Achieved

Conclusion:

The Sunrise Villa project was a well-managed residential construction effort that met or exceeded its performance targets across all key domains. The use of structured WBS, CPM, and real-time monitoring enabled efficient execution, while proactive safety and sustainability strategies ensured quality outcomes and environmental responsibility.

VIII. CONCLUSION

1. Outcome Measurement

Project success was evaluated based on the following measurable outcomes:

- Time: Completed within the scheduled 12 months (with only a minimal 8-day delay).
- Cost: Delivered within the allocated ₹60 Lakhs budget.
- Safety: Achieved zero major site accidents.
- Quality: Verified through material testing and client satisfaction feedback.
- Sustainability: Integrated eco-friendly features like rainwater harvesting and fly ash bricks without cost overruns.

2. Project Completion and Handover

Final project closure activities included:

- Final inspection by Project Management Consultant (PMC) and quality engineer.
- Snag list resolution before client handover.
- Occupancy certificate obtained from the authority.
- As-built drawings and documentation provided to the client.
- Site demobilization and submission of final project report.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

3. Conclusion

The Sunrise Villa project:

- Successfully applied integrated construction management practices.
- Was completed on time, within budget, and without compromising on quality or safety.
- Demonstrated the effectiveness of tools like Work Breakdown Structure (WBS), CPM, MS Project, and checklist-based quality controls.
- Integrated sustainable design into a budget-conscious residential construction.

4. Recommendations

Based on the learnings, the following recommendations are made for future projects:

- Adopt BIM (Building Information Modelling) tools early for coordination and accuracy.
- Finalize design and procurement before execution to avoid delays.
- Conduct quality audits at every phase of construction.
- Promote green building strategies, even in low-cost housing.
- Ensure continuous documentation and monitor progress using software like MS Project.

REFRENCES

1. Ashworth, A., & Perera, S. (2018). Cost Studies of Buildings. Routledge.
2. PMI. (2017). A Guide to the Project Management Body of Knowledge (PMBOK® Guide).
3. Kerzner, H. (2017). Project Management: A Systems Approach to Planning, Scheduling, and Controlling.
4. Nimbal, S., & Jamadar, M. (2017). [Study on Primavera P6 in G+8 Building Planning].
5. Brook, M. (2016). Estimating and Tendering for Construction Work. Routledge.
6. Kibert, C. J. (2016). Sustainable Construction: Green Building Design and Delivery. Wiley.
7. Darko, A., & Chan, A. P. C. (2016). Review of green building research trends. Habitat International.
8. Lou Yongli. (2016). [Bidding Strategies and Evaluation Methods in Construction].
9. Zuo, J., & Zhao, Z. Y. (2014). Green building research – current status and future agenda. Renewable and Sustainable Energy Reviews.
10. Enshassi, A., Mohamed, S., & Abdel-Hadi, M. (2013). Factors affecting the cost performance of construction projects. International Journal of Project Management.
11. Gould, F., & Joyce, N. (2013). Construction Project Management.
12. Chitkara, K. K. (2011). Construction Project Management: Planning, Scheduling and Control. Tata McGraw-Hill Education.
13. Rezaian, A. (2011). [Survival Pyramid Model on Time, Cost, Quality, and Risk Trade-offs]
14. Azhar, S., Carlton, W. A., Olsen, D., & Ahmad, I. (2011). Building Information Modeling for Sustainable Design. Automation in Construction.
15. Choudhry, R. M., et al. (2008). Management in construction: Best practices. Journal of Professional Issues in Engineering Education and Practice.
16. Tam, V. W., et al. (2007). Green construction assessment using cost and time criteria. Building and Environment.
17. Jha, K. N., & Iyer, K. C. (2006). Critical factors affecting quality performance in construction projects. Construction Management and Economics.
18. Jha, K. N., & Iyer, K. C. (2006). Factors affecting quality performance in construction projects. Construction Management and Economics.
19. Lingard, H., & Rowlinson, S. (2005). Health and Safety in Construction Project Management. Spon Press.
20. Pheng, L. S., & Teo, J. A. (2004). Implementing TQM in construction firms. Journal of Management in Engineering.
21. Low, S. P., & Teo, J. A. (2004). Implementing ISO 9000 quality management systems in construction firms. Journal of Construction Engineering and Management.
22. Gambatese, J. A. (2003). Safety in design and construction. Journal of Construction Engineering and Management.
23. Aibinu, A. A., & Jagboro, G. O. (2002). Time–cost performance of building construction projects in Nigeria. Journal of Construction Research.
24. Toole, T. M. (2002). Construction site safety roles. Journal of Construction Engineering and Management.

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

25. Love, P. E., & Li, H. (2000). Quantifying the causes and costs of rework in construction. Construction Management and Economics.
26. Arditi, D., & Gunaydin, H. M. (1997). Total quality management in the construction process. International Journal of Project Management.
27. Hinze, J. (1997). Construction Safety. Prentice Hall.
28. Elinwa, A. U., & Buba, S. A. (1993). Construction cost factors in Nigeria. Journal of Construction Engineering and Management.

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com