

## A CASE STUDY ON NAGPUR METRO PROJECT

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**Abstract** - The Butibori metro Site forms a vital component of the Nagpur Metro Rail Project Phase 2, which aims to enhance urban connectivity and provide a sustainable mode of mass transportation to the people of Nagpur. The extension towards Buttibori, an important industrial and residential area located on the outskirts of the city, is designed to link this region with central Nagpur through an efficient and environment-friendly metro system. This expansion aligns with the objectives of the Maharashtra Metro Rail Corporation Limited to promote faster, cleaner, and more reliable urban mobility while reducing road congestion and pollution. The Buttibori metro section includes the construction of elevated viaducts, modern stations, and associated infrastructure. The project adopts advanced civil engineering methods and materials, such as the use of Ready-Mix Concrete (RMC) for maintaining uniform quality, high strength, and faster construction. The work involves extensive geotechnical surveys, pile foundation design, pier erection, and segmental construction techniques to ensure safety, durability, and structural stability. Special attention is given to the site's planning, material handling, and quality control to meet international metro construction standards. This site also integrates sustainable development practices, including rainwater harvesting, waste management, and dust control measures to minimize environmental impact. Safety protocols are strictly implemented to protect workers and ensure smooth project execution. Moreover, the project promotes employment generation and industrial growth by improving accessibility to the Buttibori MIDC area, which houses several large and medium-scale industries. Upon completion, the Buttibori metro corridor will serve as a major lifeline for the southern industrial zone of Nagpur, offering a convenient, fast, and reliable commuting option for thousands of daily passengers. It will reduce dependence on private vehicles, thereby saving time, cutting fuel consumption, and lowering carbon emissions. Overall, the Buttibori metro site represents a significant step towards sustainable urban transport development and contributes to Nagpur's vision of becoming a modern and environmentally conscious "Smart City."

**Key Words:** Smart City, Metro Rail, uniform quality, metro corridor, mass transportation.

### 1. INTRODUCTION

After the successful completion & operation of Nagpur Metro Phase 1, the city witnessed a significant improvement in public transportation & a reduction in road congestion. Encouraged by this success, the Maharashtra Metro Rail Corporation Limited (Maha Metro) proposed the phase 2 expansion to further extend metro connectivity to suburban & industrial areas around Nagpur. The Nagpur Metro Phase II project was approved by the Government of India on 8 December 2022. It aims to enhance accessibility for people living in outer parts of Nagpur and to promote balanced regional development. The project will provide efficient, comfortable, and eco-friendly transportation for thousands of daily commuters from nearby towns and industrial zones.

The project covers 43.8 km with 32 new stations, connecting areas like Kanhan, Hingna, Butibori, and Transport Nagar. , at an estimated cost of ₹6,708 crore. It includes extensions of all four existing corridors from Phase I:

1. Automotive Square to Kanhan (13 km)
2. Lokmanya Nagar to Hingna MIDC (6.7 km)
3. MIHAN to Butibori MIDC (18.5 km)
4. Prajakta Nagar to Transport Nagar (5.6 km)

The present work focuses on expanding the metro network to reduce traffic congestion, promote eco-friendly transport, and support sustainable urban growth.

#### 1.1 Background of Present Work :

After the successful completion & operation of Nagpur Metro Phase 1, the city witnessed a significant improvement in public transportation & a reduction in road congestion. Encouraged by this success, the Maharashtra Metro Rail Corporation Limited (Maha Metro) proposed the phase 2 expansion to further extend metro connectivity to suburban & industrial areas around Nagpur.

#### 1.2 Scope of Present Work :

The Nagpur Metro's current work primarily revolves around the execution of Phase 2, as Phase 1 is fully operational. The present scope of work includes laying foundations, segment casting for viaducts, and other preparatory activities for the

new extensions that will connect the city's suburban and industrial areas. The ongoing work is focused on expanding the Orange and Aqua lines to satellite towns and industrial hubs like Kanhan, Hingna, and Butibori, aiming to significantly extend the metro network and improve regional connectivity. While Phase 1 was completed and inaugurated in December 2022, minor remaining tasks, such as the opening of the delayed Indora station, are being finalized alongside the full-scale construction of the new phase. The main scope includes:

**2. 4.1 PROJECT BACKGROUND:**

Client/Project Name: NAGPUR MAHA METRO  
 Location: At Impressia Rise, Flat No. 802 Shivaji Nagar, Nagpur 440010

**2. SITE OVERVIEW:**

- Name of Contractor:- GR Infrastructure Ltd (GRIL ),
- Sub Contractor:- Arigato Universe Ltd.
- Date of Work Order:- January 2025
- Time Limit 35Months
- Date of Completion:- November 2027
- Length:- 18.7 km
- Total Station :- 10 Station
- Alignment: Elevated corridor

Catchment Area: Includes Jamtha, Dongargaon, Mohgaon, Butibori, MHADA colony, and Indorama Colony

. The initial setting time is the period when the cement paste starts to stiffen but is still workable. It shows how much time we have for mixing, transporting, and placing the cement before it begins to harden. Normally, the initial setting time of ordinary Portland cement is about 30 minutes. The final setting time is the period when the cement has completely hardened and gained enough strength to bear some load. After this time, the cement cannot be molded or reshaped. The final setting time is usually about 10 hours .These times are important to ensure proper handling and quality of construction work.

**Table No 6.11 Result of Initial and Final setting time of cement**

Test Report for determination of Initial and Final setting time of cement IS 4031 Part-5		
Name of work : Concrete		Make of cement : OPC
Name of laboratory : GRIL		Grade of cement : 53
Name of Source: Ranksilicon		Batch No : 33
% of water added : 24.65		Consistency of cement ( P)% : 29
Test No	Duration Time (Mins)	Needle Penetration (mm)
Initial setting time		
1	30min	0
2	60min	0
3	90min	0
4	120min	1
5	140min	2
6	150min	4
7	161min	5.5
<b>Result :</b>		
<b>Initial setting time: 161 minutes</b> The period elapsing between the time when water is added to the cement and the time at which the needle fails to pierce the test block to a point 5.0+- 0.5mm from the bottom of the mould shall be the initial setting time		
<b>Final setting time: 250 minutes</b> The period elapsing between the time when water is added to the cement and the time at which the needle makes an impression on the surface of the test block while the attachment fails to do so shall be the final setting time		

**Chart -1:** Name of the chart

**3. CONCLUSIONS**

IRJET sample Internship experience working on a metro rail project was invaluable in providing practical insights into construction management.

- Gained hands-on experience in overseeing various aspects of the project, from quality

control to safety management.

- Moreover, developed essential skills in communication, problem-solving, and documentation, which are vital for success in the construction industry.
- The internship training provided valuable insights into the advanced structure's analysis. Overall, the structure exhibits increase our physical knowledge on site. Recommendations provided aim to enhance the structure's longevity and performance.
- The three-month progress review of the construction activities for the metro rail project **h i g h l i g h t s** significant advancements and critical insights regarding the project's execution.
- During this timeframe, careful planning and adherence to timelines have been crucial in achieving important milestones.
- From the foundational work to the ongoing construction of the superstructure, the project has progressed at a commendable pace. Effective coordination among site engineers, contractors, and the labor force has played a key role in keeping the project on schedule.
- The use of advanced machinery and modern construction techniques has improved efficiency and minimized material waste, aligning the project with sustainable construction practices.
- Safety measures have been a top priority throughout this period. Regular safety drills, inspections, and strict adherence to health and safety protocols have significantly reduced workplace incidents.

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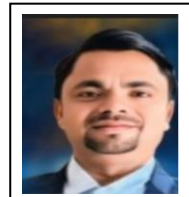
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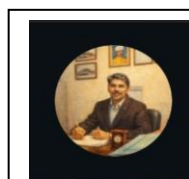
## BIOGRAPHIES



Mr. Atul R Khobragade, Working as Assistant Professor from 20 Years, Head Department of Physics, Raje Dharamrao College of Science, Aheri, 2 Patent and 8 International Research papers published.



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