

Analysis the Integrated Approach of Construction Management in India's Smallest Diameter Sewer Tunnel

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Abstract - India has a large population and is the world's second most populous nation, behind China. As a result, the nation has a strong need for infrastructure. Infrastructure has been developed, but unfortunately there is a lack of policy and foresight. Any government's long-term goal for the economy and its citizens must be reflected in its infrastructure development policies. In particular, sustainability was not a priority throughout the building of necessary infrastructure. This initiative looks at how India may build its infrastructure more sustainably. The drivers and constraints of sustainable infrastructure development are also discussed in this chapter. There has been a little shift in recent years toward environmentally responsible building practices in India. The government's latest plans strongly suggest a dramatic change in direction toward sustainability. The government is placing a greater emphasis on sustainable infrastructure activity. Modern construction management is the art of planning, organizing, and controlling all aspects of a construction project to ensure that it is completed on time, within budget, and to everyone's satisfaction. Based on the results of this research, the Indian construction sector now has to use Construction Management Techniques in order to build India's smallest diameter sewer tunnel.

Keywords - Infrastructure Development ,Construction management, Smallest Diameter Sewer Tunnel

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INTRODUCTION

Sustainable infrastructure funding is now provided by commercial banks, National Development Banks, and refinancing agencies. In addition to this, there are a number of mechanisms in place to entice investors to fund infrastructure projects. Diverse local and foreign sources are now being tapped for the funding. Long-term funding is essential for sustainable infrastructure. Sustainable infrastructure projects need close monitoring and management. There has to be some kind of system put in place to track their development. For inclusive development to get the attention it requires, there also has to be cooperation across different finance and refinancing organizations. If this doesn't happen, the money might end up in the hands of a few giant corporations. Health and elementary education are only two examples of socially important programs that might benefit from more readily accessible funding in both rural and urban locations. There should be a central body responsible for reviewing current initiatives on a regular basis and making recommendations for corrective measures if they are found to be inadequate. Sustainable infrastructure projects have access to funding thanks to the efforts of refinancing agencies. Remove the bad items from a bank's balance sheet with the use of takeout financing and credit improvement measures.

Despite the presence of specialized organizations, commercial and nationalized banks continue to bear a disproportionate share of the cost of infrastructure development.

Need of Effective Management in Infra Project :

The likelihood that a construction project will be completed on time, within budget, and without financial or legal difficulties is increased when owners use effective construction project management. The planning, design, and construction phases of a project are best managed by a skilled construction management team. Construction management is meant to maximize best industry practices, prudent management decision making, and effective and transparent project controls and reporting systems while project monitoring services change as the project progresses.

When it comes to the potential for difficulties that might severely delay the project and waste money, construction management is especially important for large-scale projects. Each design choice is evaluated by the construction manager in terms of its potential financial and time-related consequences. The whole project may be derailed without a skilled construction management staff.

Involving a construction manager early on in a project's lifecycle allows for improved problem-prevention planning, and also allows the construction manager to identify cost- and time-saving options.

Significance:

Benefits of Construction Project Management

Some owners try to save money on overhead by cutting corners on construction management, but this strategy often backfires and ends up costing them more. Having a competent project management team in place may save the owner a lot of money by reducing the likelihood of disputes and claims. A faulty concrete pour or an inappropriate steel connection, for instance, may be seen immediately by a knowledgeable construction manager instead of being discovered weeks or months later. If this kind of problem isn't spotted until a considerable amount of time has passed, fixing it might end up delaying the whole project and costing a lot of money. The owner has a better chance of discovering disputes, decreasing unexpected modification orders, discovering possible design problems, identifying bad construction practices, and avoiding claims if the construction management team performs frequent reviews of construction operations.

The owner may be safeguarded against construction delays, disagreements, and cost overruns if the construction management team performs regular audits of the project. Estimators, accountants, and cost control experts are on staff at the bigger, more professional construction management organizations. There are several ways in which these supplementary capabilities might improve project outcomes. A project audit is useful because it increases the likelihood of spotting fraudulent activity early on. Overbilling by contractors, improperly shifting costs, abusive change order tactics, and similar irregularities fall under this category. Government regulations (such as prevailing wage and disadvantaged business enterprise standards) may also be checked for compliance via audits of contractors. Failure to comply with these regulations may halt an ongoing project. Finally, an audit may aid in sticking to a set budget by identifying who is responsible for any unforeseen expenses.

The construction management team's regular reporting is another measure used to guarantee the project remains on schedule and within budget. Despite what may appear like an excessive amount of paperwork, the construction management team's constant monitoring makes any deviations from plan immediately apparent. When delays in the timetable are caught early on, it's far simpler and cheaper to make the necessary changes.

There are also construction management companies that depend largely on cutting-edge digital tools. Building information modeling (BIM), drones, and AI are just a few examples of the digital technologies that

are revolutionizing the whole lifecycle of a capital project, from initial conception to final decommissioning.

LITERATURE REVIEW

Debby Willar, Estrellita (2019) Indicators of sustainable procurement are identified in this research, together with the barriers to implementation faced by government agencies and private firms. In a study, respondents indicated that they would be surprised to see concepts such as water and energy efficiency and the use of eco-friendly materials mentioned in the procurement agreements.

Er. Om Prakash Giri(2019) Author stated that the role of the project manager is to control all aspects of the project and to optimize the use of resources to create a well designed and soundly constructed facility which will meet the client's requirements of function, cost, time, and future operation and maintenance. The whole system is dependent on the human management skills of the project manager, whose expertise will determine the project's final form and success. **Davidson Rajan Philip (2018)** — The author concludes that in many nations with aged civil infrastructure, maintenance management of structures is a significant challenge for owners and managers. To keep a facility in good working order throughout time requires careful planning, directing, controlling, and coordinating of its available resources. The state of the art in maintenance management systems is outlined, along with its essential features, as well as a discussion of the most competitive practices in Chennai.

OBJECTIVES

- 1)To study the construction techniques and norms for tunneling in India
- 2) To study reasons for hurdle in progress of site works of India's Smallest Diameter Sewer Tunnel

METHODOLOGY

The purpose of this case study is to determine the accepted methods of tunnel building in India. Analyze the roadblocks impeding the construction of India's narrowest sewer tunnel.

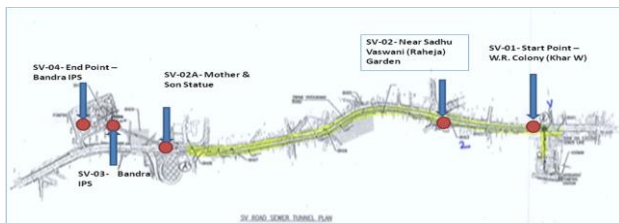
DATA COLLECTIO

Name of Project : SEWER TUNNEL AND ALLIED WORKS FROM JAI BHARAT PUMPING STATION TO BANDRA IPS ALONG SWAMI VIVEKANAND ROAD BY SEGMENTAL TUNNEL (MSDP STAGE II - PRIORITY WORKS

Objective of the Project

- Improving the quality and reliability of wastewater collection, treatment and disposal,
- The S.V.Road Sewer Tunnel is intended to act as a deep collector sewer for all sewage flows of S V Road
- To provide a healthier and improved environment for the people of Mumbai
- To decommission the existing JAI BHARAT pumping station.
- To decommission the existing CHIMBAI pumping station
- To relieve the flooding situation in in front of Railway colony along the SV road .

Tunnel Alignment:



DATA ANALYSIS

Risk Identification and Response Strategies In Case Study :

Man Risks. The projects' most common and basic risk was related to the involvement of humans. Resumption of construction activity was reported to be hampered in almost all instances by employees' difficulties in returning owing to the lockdown policy. In late March of 2020, when the COVID-19 pandemic broke out in India, most Indian workers were at home with their families celebrating the end of the year. When the COVID- 19 pandemic unexpectedly struck, it triggered the nation's greatest degree of emergency preparedness across the board.

Teams working on projects have made every attempt to address concerns about a lack of available workers. The most typical solution was to arrange for chartered buses to bring employees from their homes to the sites.

Material Management: Today, social, environmental, and economic factors must all be taken into account for a tunneling project to be successful. Avoiding trash deposits, conserving minerals, energy, and money may all be achieved via careful planning of the excavation process for a tunnel building project. Therefore, a sustainable tunnel design benefits from careful planning of excavation material management.

However, there are a lot of unknowns that make planning difficult.

Purpose of Material Management

- In order to save money when shopping
- In order to meet consumer needs during restocking
- Stock up on extra supplies just in case!
- In an effort to dampen consumption swings
- In order to provide satisfactory support to paying customers,

Four Basic Needs of Material Management

1. To ensure availability of necessary resources
2. To spend as little as possible without sacrificing quality or value on things like food and clothing.
3. Reduce money spent on stocking supplies
4. For optimum performance

The most common steps involved in effective materials management have been elaborated below:

Bid procurement

The bidding process might be impacted when the project's scope changes while it's being put together. This might happen, for instance, if the owner of the property decides they want to upgrade the quality of the materials used without increasing the total cost of the project. In most cases, the general contractor will agree to this and then consult with the electrical contractors and other onsite specialists to figure out exactly what modifications may be made and how they can be implemented. Because of their late involvement in the process, electrical contractors may be requested to reduce their bids if all of the project's specifics have been finalized before they are brought in.

Avoiding this problem is as easy as keeping all of the contractors informed and involved in the process as it progresses. This issue may be avoided by include the electrical contractor within the first group of contractors. The contractors will be able to provide the owner more accurate estimates of costs and deadlines, and they will be able to advise the general contractor on the extent to which the requested modifications can be implemented. Buying materials may be broken down into two broad groups:

1. Major Materials: materials that are specific to the project, and include things like switchgears, lighting fixtures, and alarm systems
2. Miscellaneous Materials and Commodities: off-the-shelf items like cables, fittings, conduits, ties, and straps.

Negotiating with suppliers over pricing and quantity is a common part of the buying process, but it may take a lot of time. To guarantee that supplies will be on hand when required, whomever is in charge of making purchases must arrange a delivery timetable. Blanket purchases of the various materials are less prevalent than bidding processes owing to the competitive market, but distributors are still the go-to source for these purchases. Waiting until later in the building process may not delay your construction since these supplies are simpler for the contractor to source on shorter notice. The primary components must be custom-made for this task, which will take some time. If you put off ordering them, you might cause significant delays in the building process. It's possible that the manufacturer is running low on materials or may take longer than expected to complete production.

Many contractors order items on a daily basis, compiling lists of what each department will require the next day. The difficulty is that the order may not arrive on site until after the employees have left for the day, leaving them waiting for part of the day. One easy way to avoid this problem is to plan ahead and order all the supplies you'll need so they arrive the day before you need them. Many suppliers will collaborate with you to help you divide the job into manageable chunks of shipments.

Prefabricated steel construction kits are another option that many people are choosing. These kits include everything you need to get your structure up and running in half the time it would take with conventional construction materials. They can be altered in the same ways that a structure created with more conventional materials may. The building timeline won't be affected by missing parts since the kit contains everything you'll need.

Material procurement

The waiting game begins after a supplier is chosen and materials are ordered. As your supplies start to arrive, your contractor will need to establish a procedure for receiving and keeping tabs on them. Many businesses achieve this by producing a material requisition schedule that details the types, amounts, and due dates of all incoming items. Many contractors, in order to avoid having a surplus of materials, will only purchase 80% of what is assessed as being required for the project, and then order the remaining 20% when the project nears completion.

Usually, goods will be transported straight to the project site, but if that isn't possible owing to storage constraints, the contractor's warehouse or some other storage place will be used. However, for reasons of space or security, seldom used items may be kept in the warehouse rather than onsite. If the contractor intends to have everything prefabricated before transporting it to the project site, it is also typical for everything to be sent to a warehouse beforehand. Delays, storage issues, unanticipated charges, and other complications might arise after the delivery date and location have been established. The following are just a few examples of potential hiccups:

- If there is a misunderstanding, items may not arrive in a timely manner.
- Sending a shipment to the incorrect place, such the construction site when it was supposed to go to the warehouse, or vice versa
- Getting the incorrect amount. Storage issues arise when there are too many materials, and delays occur when there aren't enough. Holding up construction while waiting for a crucial item to arrive.

You may prevent similar issues from appearing in your project in a number of different ways. The ideal practice is to document everything thoroughly before submitting it. Maintaining open lines of contact with your suppliers is another important step in avoiding these traps. It is also important to work with reliable vendors to guarantee a problem-free process. In order to ensure that your project goes off without a hitch, it is sometimes necessary to spend a little extra for your supplies.

- Points to be Considered While Purchasing Materials
- Specification that is accurate
- Solicit price estimates from well-known companies
- Basic pricing, freight & insurance, taxes & levies, and other fees are all taken into account when comparing offers.
- Quantity and payment discounts
- Payment Schedule
- Time of delivery, assurance of receipt
- The credibility of the vendor in question (in terms of dependability, technical proficiency, ease of use, availability, follow-up service, and sales support).

- Narrowing down options to negotiate more favorable conditions
- Inquire about the status of your order

Inventory control and stockpiling

Troubles with inventory management, stockpiling, and access to materials are commonplace in construction. A simple misunderstanding among several individuals might cause items to be lost, delaying or reordering the operation. When working on a major construction project, it may be difficult to keep track of your supplies. A reliable tracking system will not only help you discover what you're looking for more quickly and conveniently, but it will also reduce the likelihood of theft and loss. Fortunately, there is a simple answer: installing an electronic monitoring system. In order to indicate that something has been received or withdrawn from the site, automated methods using bar codes are widely used. It also provides a method for organizing stock so that you can easily locate items. You can choose the ideal electrical system for your needs from the numerous available options. When stock is low, some systems may even be programmed to place an order on your behalf.

Inventory Management's Roles

- Our goal is to maximize supply service while maintaining the highest levels of productivity and profitability.
- As a buffer between expected and actual material demand

Damaged items should be recorded in a distinct section of your tracking system from the rest of the inventory. This aspect of monitoring may also be used to ascertain whether or not the location or method of transporting an item is causing problems. Another potential source of problems in material management is the remanding of stock during transportation from warehouse to construction site. If materials are not handled with care, they may get lost or broken, which would have a negative impact on the project. You may lessen the dangers by keeping goods on-site rather than in a warehouse, but you should always be on the lookout. Your monitoring system will also be useful for preventing theft during transport.

Remember that every task requires unique material management solutions due to its unique specifications. If you have a good system in place, though, you should only need to make minor adjustments from one project to the next. Finding the best method to manage your supplies and prevent losses and damage is essential to the success of your business, and there are endless options available.

Points to be considered for Effective Storage of Materials

- There has to be enough room in stores.
- It's important to know where and how to properly store materials.
- Faster identification and retrieval are made possible by filing things in groups and by letter.
- The first-in, first-out rule must be adhered to.
- Track the date of expiration.
- To prevent running out of supplies, use a two-bin or double-shelf arrangement.
- Stock the reserve bin with enough supplies to last the required lead time plus a margin of safety.

Setting up a Materials Management System

1. When managing many projects, it's important to give each one a distinct numbering scheme.
2. To guarantee that the names of resources in the MMS system correspond with building plans, it is necessary to employ defined part number catalogues for handling tagged equipment, sub-components, commodities, and bulk material.
3. All materials must be easily and quickly located, thus it is imperative that their descriptions, units of measure, and classifications be precise.
4. In order to prevent problems later on, a clear coding system for project costs has to be established from the outset of the project.
5. Prior to the commencement of construction, all Construction Work Packages must be completed.
6. Warehouses, laydown yards, module yards, field and vendor shops, and other sites where materials are stored must all be properly identified and labeled.
7. Accurately estimating key shipment dates is essential to guaranteeing enough resources for offloading cargo.

8. Digital tracking of quality standards, hold points, inspections, and certifications is essential.
9. Up-to-date documentation and preservation practices are required.
10. Documentation and needs for logistics should be easily accessible.
11. Forms and procedures for accepting and releasing materials from storage must be adhered to.
12. Setting up systems for inventory counts and material receipts as part of site materials management
13. Integrity of the System's data may be guaranteed by automated integration with Project ERP and Engineering systems.

Equipment Management in Case Study: The mechanized construction of the tunnel has experienced three stages: small equipment drilling and blasting construction, large trackless transportation equipment drilling and blasting construction, and non-drilling and blasting construction. Part of the mechanized operation is gradually embarked on a process of comprehensive mechanized operation. From manual excavation to the use of TBM (tunnel boring machine), the current comprehensive level of tunnel mechanization construction has made a qualitative leap compared with the last century

PRINCIPLES OF TUNNEL CONSTRUCTION MACHINERY CONFIGURATION

Productivity: refers to the comprehensive performance and production capacity of the production work surface formed by the combination of single machines. The selection and configuration of tunnel construction machinery should start with the overall capacity after the configuration of the machinery, so that the mechanical performance of each single machine can be matched with the overall production capacity to achieve the best combination that is both economical and reasonable.

Reliability: refers to the requirement that each single machine can maintain its good technical performance stably during operation, and reliably complete the rated power required for the construction period under the specified time and construction conditions.

Safety: One refers to the safe operation function of the machine itself; the other refers to the safety guarantee for equipment operators and surrounding construction personnel when the machine is running, and the machine should be equipped with corresponding safety protection devices.

Durability: It means that each single unit in the

configuration unit should be durable and match the technical life.

Maintainability: Refers to the configuration of the equipment is easy to check, repair and maintain, which is conducive to the purchase and storage of equipment spare parts.

Economical: It means that economical and reasonable energy-saving equipment should be considered first when configuring mechanical equipment, and it should be based on national conditions and try to face the domestic market. The equipment configured should be adapted to the status and investment capacity of the tunnel itself.

Adaptability: It means that the equipment can adapt to different construction schemes under various geological conditions and can meet the construction needs of auxiliary construction methods.

Quality management In Tunneling: Knowledge is the key to quality tunneling. In order to provide appropriate responses to the questions posed by the Design for an underground job that is envisioned as a solution in civil, environmental, or industrial domains, specific knowledge is required. To create innovative solutions for tunnel building, it is vital to learn from the past Designers' mistakes and "replicate" their methods as accurately as possible. Sharing information on why things go wrong and how they might be fixed is crucial in the technological realm. To carry out subterranean work in accordance with the Quality method, which requires experience, excellent contracts, professionalism, individual accountability, and clear guidelines, is possible only with these factors in place.

CONCLUSION

Without a shadow of a doubt, every expert in the building sector has to make use of construction management approach. Gantt chart, work breakdown structure (WBS), critical path method (CPM), line of balance, lean construction management technique (MSP), Microsoft project, and many others are used by construction industry professionals, as evidenced by the responses to our survey. Other factors, including project size, location, client type, source of financing, complexity, material vitality, and lack of planning also play a role. The likelihood that a construction project will be completed on time, within budget, and without financial or legal difficulties is increased when owners use effective construction project management. The planning, design, and construction phases of a project are best managed by a skilled construction management team. Construction management is meant to maximize best industry practices, prudent management decision making, and effective and transparent

project controls and reporting systems while project monitoring services change as the project progresses. When it comes to the potential for difficulties that might severely delay the project and waste money, construction management is especially important for large-scale projects. Each design choice is evaluated by the construction manager in terms of its potential financial and time-related consequences. The whole project may be derailed without a skilled construction management staff. When a construction manager is brought in from the beginning of a project, not only can they help anticipate and prepare for any issues that may arise, but they can also help uncover ways to save time and money.

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