

BUNIYAAD



*A TECHNICAL MAGAZINE BY
DEPARTMENT OF CIVIL ENGINEERING
AMBALIKA INSTITUTE OF MANAGEMENT &
TECHNOLOGY*

*EDITION
July' 2022*



Ambalika Institute of Management and Technology (AIMT) was established in 2008 as a private engineering and management college in (Mohanlalganj) Lucknow, Uttar Pradesh India and is affiliated to AKTU and BTE and Approved by AICTE. The Lucknow campus is spread over 200 acres and is located near NH-56B, surrounded by lush green field and enhanced by a beautiful lake. The institute is 24 kilometers from Lucknow Railway Station and 20 kilometers from Amausi Airport, Lucknow. It is very well connected to the district headquarters.

Ambalika center of excellence has become the most dominating center delivering high-end technical skills to our engineers to make them highly employable. AIMT, Lucknow is imparting training and joint certification programs of innovative technologies in collaboration with the Industry giants such as Microsoft, KUKA Robotics, Siemens, Ace Micromatics, MTab, and Master CAM etc.

DEPARTMENTAL VISION

To create high quality civil engineers with knowledge par excellence who may contribute in nation building with highest moral and ethical values as true citizens of a civilized society.

DEPARTMENTAL MISSION

- ❖ To adapt teaching and learning process that gives student power to think and to analyze.
- ❖ To impart practical knowledge by means of lab exposure and industrial interaction
- ❖ To conduct co-curricular activities for updation of technological advancement
- ❖ To impart moral and ethical values by means of various programs

HEAD OF DEPARTMENT

ADITYA .R. MISHRA

M.Tech Civil(Structural Engineering)

B. E (Civil Engineering)

Building something is not as easier as breaking it. We at AIMT feel pleasure that our students get a golden opportunity to bless themselves by knowledge and team work by integrating everything in this magazine, Buniyaad.

I feel honor to be a part of this as our students have given their level best and have emerged as a sustainably developed future. Our theme this time, “Sustainable Construction”, describes how concerned our students are towards a well-sustained future of innovative minds. In spite of taking up a technical theme, bringing up different ways to live desirably, we have come a long way.

And I would like to thank the mentors and editors for this brainstorming transition. The overall development of our students assures me for a bright and constructive future ahead of these budding minds.

I wish them luck and also bless them for their good work and capabilities to come up with the magazine this year

EDITORIAL'S DESK

Prashant Mishra

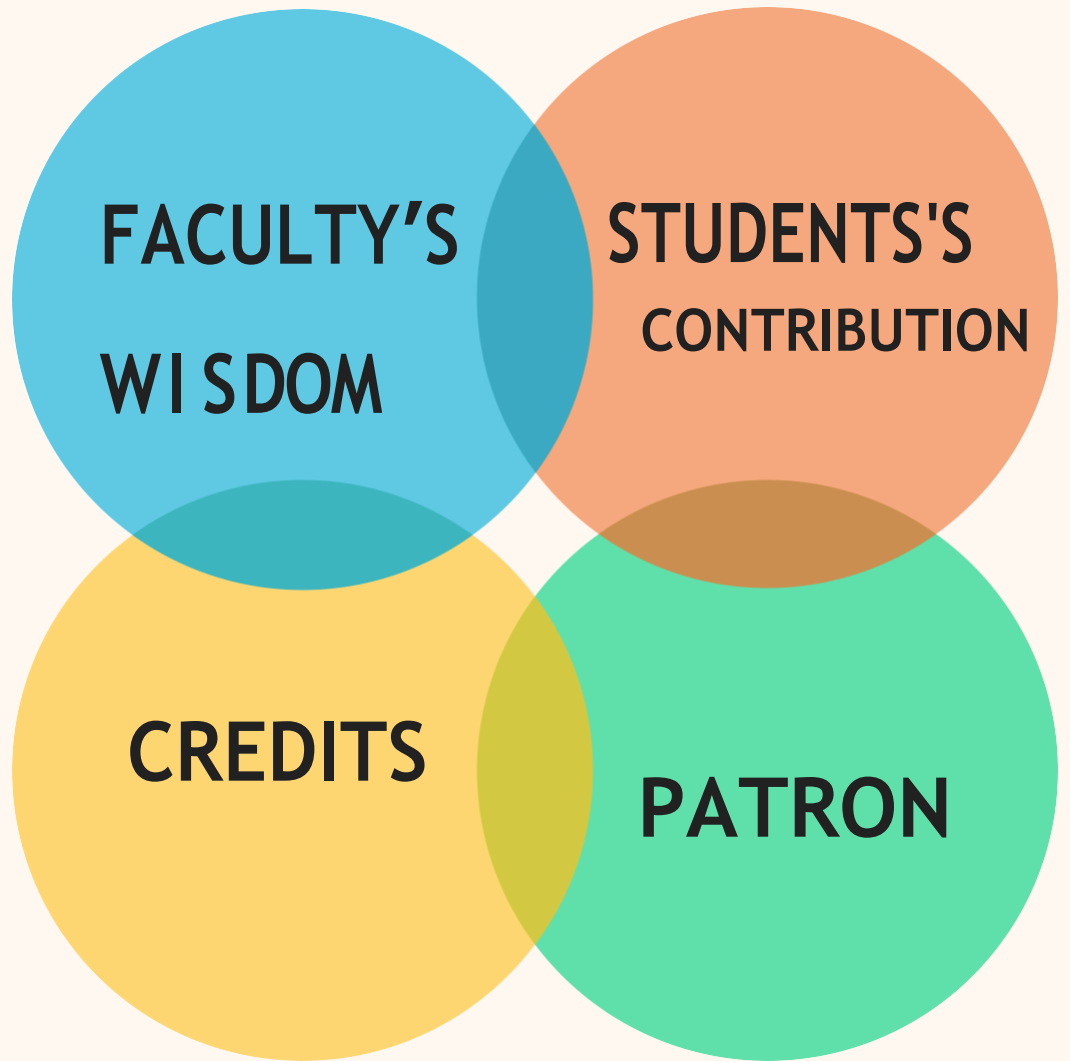
Life is not all about opportunities, it's about how we take them and use it to the fullest. I feel highly obliged and intense pleasure to bring into limelight our edition of Buniyaad. Our theme 'Sustainable Construction' reflects our mindset of bringing on a better and safe future ahead. To grab in this opportunity, I would like to give my utmost gratitude to our mentors and our team, for working hard and dedicatedly in the creation of our magazine.

It's been years and we always strive to come up with something different and that always keeps us in bringing it something out of the league. This year we have brainstorming articles based on research, projects as well as information regarding the development in construction with respect to sustainability. We have brought up information interviews which match with our similar interests.

I wish and hope that you all like our magazine this year too as always, and show your love to the hardwork and passion of civil engineers.

CONTENTS

BUNIYAAD





BUNIYAAD

FACULTY'S WISDOM

Civil Engineering as a profession

-Prof. Suryakant Shukla (CE Dept.)

Civil Engineers are indispensable part of the society, without them, we would have no streets, air terminals, structures, dams, harbors and so on. Civil engineers are structural designers that manage the plan, development, and maintenance of the natural and man-made structures, including works like streets, spans, trenches, dams, and structures. By ceaselessly creating and redesigning the administrations and offices of people in general, it not just gives the Engineer an awareness of others' expectations towards mankind but delivers a feeling of fulfillment that the work did by the Civil Engineer contributes essentially to the prosperity of the general public.

A profession in civil engineering is profoundly fulfilling. Civil engineers are respected all over, and you can say that the civil engineers are the fundamental structure square of society since they are the ones who create structures, streets, railroads, air terminals, frameworks, and water sewerage frameworks for us. A civil engineer is excellent with critical thinking and diagnostic abilities and henceforth, they are welcome with open hearts to any industry. Additionally, the compensation or pay of structural architects is likewise sufficient from the underlying stages. You can even think about joining PSUs (Public Service Undertakings) as an occupation after a degree in civil engineering. PSUs offer decent incentives and higher bundle than some other association. They additionally have rewards to bring to the table for their workers which are commonly given consistently.

Advantages are numerous when you consider beginning a profession in civil engineering. On the off chance that you like to travel, tackle complex issues, assemble aesthetical foundations, and accomplish something useful for the network then civil engineering is simply ideal for you. You can go for higher degree of education in civil engineering and there are bunches of choices to browse. You can go for B.Tech in Civil engineering, M. Tech in Civil engineering, the decision is yours. On the off

chance that you have something unique, you can even apply for Ph.D. what's more, present your exposition to turn into a guide of light for society.

Role of GIS in Civil Engineering

-Prashant Mishra (CE Dept.)

Geographic Information Systems commonly abbreviated as GIS one type of technology that helps modern civil engineers. Engineers can use GIS to collect, evaluate, manipulate and process geographic data. Digital geographic maps can then be used to showcase the data in layered visuals. It can be used across numerous industries to gather all kinds of information from environmental data to determining logistics.

Civil engineers can use GIS to include a multitude of material data and area history data into their designs. As a result, structural analysis is one of the most widely used GIS applications. Designs can benefit from past failures by combining 3D GIS maps with conventional design methodologies. Compared to tabular data, GIS mapping has a number of advantages. Engineers may anticipate problems before the first ton of concrete is poured using interactive overlays and 3D models. Another obvious area where GIS is a valuable tool is transportation because of its ability to help in planning and logistics of roadways. There have also been developments in GPS equipment that uses GIS technology. Traffic flow trends can be shown alongside population changes on the same map using GIS techniques at the same time. At any point, new map layers, such as those depicting the best paths for future bridges, can be added. The advantage of GIS in transportation engineering is that it allows for the superimposition of essentially endless amounts of data over the research region.

GIS can also be used as an essential tool in surveying because precise measurements are needed in order to create accurate mapping systems. Surveyors may easily assess environmentally sensitive regions, forestry, government control, road networks, previously established boundaries, zoning, permit status,

and other vital information using GIS technologies.

These improved capabilities reduce duplication of effort and encourage collaboration with other planning and government entities. The data is saved and conveniently accessible for use in future projects using the location.



Study of Delay in Execution of Infrastructure Projects - Highway Construction

1. INTRODUCTION

Roads are an important mode of transport of India and having the one of largest road network across the world, spanning over a total of 5.89 million km. of roads. This road network transports 69 per cent of all goods in the country and 90 per cent of India's total passenger traffic uses road network to commute. Road transportation has gradually increased over the years with the improvement in connectivity between cities, towns and villages in the country and In India sales of automobiles and movement of freight by roads is growing at a rapid rate. NHAI has accomplished construction of 3,979 km of national highways in the financial Year 2019-20. This is the highest ever highway construction achieved in a financial year. The construction pace as noticed in last years has seen a steady growth with 3,380 Km construction in the FY 2018-19. Continuing the same trend with the development of 3,979 km of national highways during FY 2019-20 The Government of India has set a target for construction of 12,650 km national highway in FY: -2020-21. Huge investments have been made in the sector with total investment increasing more than three times from Rs 51,914 crore in 2014-15 to Rs 170,000 crore in 2020-21(Allotted the fund in this sector). India has a well-developed framework for Public-PrivatePartnerships (PPP) in the highway sector. Asian Development Bank ranked India at first spot in PPP operational maturity and also designated India as a developed market for PPPs. The

Government of India (GoI) is planning to expand the national highway network to over 200,000 km. The Government launched the Bharatmala Pariyojana, which aims to build 66,100 km of economic corridors, border and coastal roads, and expressways to boost the highway network. It is envisaged that the programme will provide 4-lane connectivity to 550 districts, increase the vehicular speed by 20-25% and reduce the supply chain costs by 5-6%. The first phase of the programme will bring in \$ 82 bn investments by 2022 for the development of 34,800 km of highways. The government has forecasted an investment of \$350 bn towards road infrastructure in the North-East region of India during 2020-2025. The market for roads and highways is projected to exhibit a CAGR of 36.16% during 2016-2025, on account of growing government initiatives to improve transportation infrastructure in the country. Almost 40% (824) of the 1,824 PPP projects awarded in India until December 2019 were related to roads. The highway construction industry is one of the main sectors in India that provide important ingredient for the development of an economy. However, many projects experience extensive delays and thereby exceed initial time and cost estimates. Construction delays are considered to be one of project success in term of time, cost, quality, and safety.

2. Delays

The timely completion of road infrastructure projects is an important

objective. A significant annoyance to the public occurs when projects are not completed in a timely manner and when actual progress of the construction work is longer than necessary, thereby prolonging the inconvenience and disrupted business access. Economic & social welfare, and safety are all related to timely completion. In spite of the importance of timely completion, construction delays remain a common occurrence. This paper addresses the significant causes and factors of delays in road infrastructure projects and how one can predict the completion date for the project using earned value management. The Construction delay may be defined as the time overrun either beyond completion date specified in a contract, or beyond the project delivery date as agreed by parties defined delay as an act or event which extends required time to perform or complete work of the contract manifests itself as additional days of work. Delay in construction of highway/expressway projects, had a significant impact on economic activities in the country. Several highway and expressway constructions projects have littered the length and breadth of the country for which government has commenced that has yet to be completed. Unfortunately, the time line for these projects is unknown to the citizens of the country. This has led to an increased number of uncompleted road construction projects by Indian Government. The cost of a construction project is one of the most important factors in the construction industry. Due to many reasons, the total cost of a project can significantly vary from the initial estimated cost. The reasons could be changes in scope of work, specifications, or any other contract documents. In the construction industry, variation orders are created when changes occur. It is an official document that states the changes made into the original agreement between the client and the contractor. When a variation order is created, it brings several negative effects to both the client and the contractor. The construction industry is the tool through which a society achieves its goals of

highway and expressway development. It is one of the sectors that provide important ingredients for the development of an economy.

3. Types of Delay: - Delays in construction of highway/ expressway projects have been put in various classifications by several authors but most of these classifications have a lot in common in terms of their fundamentals. Although various types of in several studies, they are somewhat linked to one another. These classes have been elaborated in the arguments below. Most importantly, delays can be seen in these four major categories as mentioned below:

1. Critical and Non-Critical.
2. Excusable and Non-Excusable,
3. Compensable and Non-Compensable
4. Concurrent and Non-Concurrent.

1-Critical delay and Non-Critical Delays: - As indicated earlier in the above classification of delays as portrayed by Bolton J. this set of delay classification has some connection with previous ones. Critical delays are delays which prevent the contractor from finishing the work on the scheduled completion date as agreed upon in the contract as well as client are unable to handover the hindrance free site and required land to the contractor during appointed date. This concept has roots entrenched in the Critical Path Method (CPM) schedule which helps identify the critical activities in a construction of highway /expressway project. All projects have critical activities embedded in their execution irrespective of the kind of schedule being run. These critical activities are sometimes referred to as the controlling item of work. CPM seeks to accomplish following main objectives: -

- To calculate the project's completion date.
- To calculate the project's completion date
- To identify the extent to which each activity in the schedule could slip without delaying the project.
- To identify which activities in the schedule would have the highest risk of affecting the project completion date if they slipped.

How is the CPM used to estimate the

project's finish date? There are basically two methods of estimating the project's date using the CPM, the Forward Pass Calculation and the Backward Pass Calculation. The Forward Pass computes the early start and the early finish dates of the project while the Backward Pass estimates the late start and the late finish dates. That notwithstanding, identifying which activities truly impact the completion date of the project also depends on the following factors as given by Trauner (2009):

- The project itself.
- The contractor's plan and schedule (particularly the critical path)
- The requirements of the contract for sequence and phasing
- The physical constraints of the project – how to build the job from a practical perspective.

It is important to note that irrespective of how one chooses to analyze a construction project schedule to identify delays; there will always be an overriding factor which will need much attention. This is known as the contemporaneous information which refers to the daily reports, the schedules in effect and any other job data available to reflect the existing situation at the time of the delay (Trauner, 2009). From the above explanation, non-critical delays can be seen as those delays that do not impact the completion date of the project but in a way, affect the progress of the work. It can therefore be said that both excusable and nonexcusable delays are all critical delays. This leaves non-critical delays as a standalone delay classification.

2-Excusable Delays and Non-Excusable Delays: -

2.1 Excusable Delays: - Excusable Delays is a delay that is due to an unforeseeable event beyond the contractor's or the subcontractor's control or client's control. Normally, based on common general provisions in public agency specifications, delay resulting from the following events

would be considered excusable:

- General labor strikes.
- Fires.
- Floods.
- Acts of God.
- Owner-directed changes.
- Errors & omissions in the plans and specifications.
- Differing site conditions or concealed conditions.
- Usually severe weathers.
- Intervention by outside agencies.
- Lack of action by government bodies, such as building inspection.

Before the analyst concludes that a delay is excusable based solely on the preceding definition, he or she must refer to the construction contract documents. Decision concerning delays must be made within the context of the specific contract. The contract should clearly define the factors that are considered valid delays to the project that justify time extensions to the contract completion date, for example some contracts may not allow for any time extension caused by weather conditions, regardless of how unusual, unexpected, or severe.

2.2 Non-Excusable Delays: - Non-excusable delays are events that are within the contractor's control or that are foreseeable. These are some examples of non-excusable delays: -

- Less-experienced & incompetent manpower engaged.
- Inadequate resources (Manpower and Machinery) engaged.
- Delay in staff (Permanent/Contract) salary, Daily wages labour payment. Delay in Vendor (Sub-contractor, Supplier and design consultant) Payment.
- Frequently leaving the project by contractor's staff including top management.
- Less-experienced & incompetent design consultant (including Survey & Geotech work) engaged for design the highway/expressway.
- Inadequate major material provided by supplier.

- Faulty selection of the vendors. Untimely performance by suppliers. Late performance of subcontractors.
- Faulty workmanship by the contractor and subcontractors.
- A project specific labor strike caused by either the contractor's unwillingness to meet with labor representatives or by unfair labor practices.
- Non-excusable delays are events that are within the Client/Consultant control or that are foreseeable. These are some example of non-excusable delays: - Delay in handover the required Right of Way (ROW) to Contractor.
- Delay in Land acquisition and unable to handover timely.
- Delay in Approval of Electrical Estimates for shifting the Electrical poles and lines timely.
- Delay in Permission of Tree Cutting from Forest Department.
- Delay in Environment Clearance from Environment Department.
- Delay in removal of hindrance like school, house, temple building, boundary wall etc.
- Delay in shifting of gas pipe line, optical fiber Cable, & other utility shifting etc. Delay in decision for Additional work/Underpasses under Change of scope during execution demanded by local users.
- Delay in approval of General Arrangement Drawings (GADs) of Rail Over Bridge/ Rail under Bridge (ROBs/RUBs) as well as completed design and drawings from Railway Department.
- Delay in approval of design and drawings from Client/Consultant.
- Delay in Sources approval from Client/Consultant.

3-Compensable or Non-Compensable Delays: - A compensable delay is a delay where the Contractor is entitled to a time extension and to additional compensation. Relating back to the excusable and non-excusable delays, only excusable delays can be compensable. A noncompensable delay

means that although an excusable delay may have occurred, the contractor is not entitled to any added compensation resulting from the excusable delay. Thus, the question of wheatear a delay is compensable must be answered. Additionally, non-excusable delay warrants neither additional compensation nor a time extension. Whether or not a delay is compensable depends primarily on the terms of the contract. In most cases, a Contract specifically notes the kinds of delays that are noncompensable, for which the contractor does not receive any additional money but may be allowed a time extension.

4-Concurrent or Non-Concurrent Delays: - Concurrent delays like most other delays have several definitions as put forth by practitioners in the industry. A few definitions as prescribed by the Association for the Advancement of Cost Engineering (AACE) (Recommended Practice 10S-90) have been considered below;

- Two or more delays that occur or overlap within the same period, either of which occurring alone would have affected the ultimate completion date.
- Where two or more independent causes of delay occur during the same time period. The same time period being referred to is not always literally within the exact period of time but can be elated by circumstance, even though the circumstance may not have occurred during the exact same period.
- True concurrent delay is the occurrence of two or more delay events at the same time, one an employer risk event, the other a contractor risk event and the effects of which are felt at the same time.

Concurrent delay mostly refers to the situation where two or more delay activities occur at different times but the impact is felt (in whole or in part) at the same time. It occurs when both parties to the construction contract (owner and contractor) delay the project during an excusable but non compensable delay (such as severe

weather conditions). Such delays do not necessarily have to occur simultaneously but can be on two parallel critical path chains. Concurrent delays may also be an excusable delay with compensation which may grant some reliefs to the contractor in the form of extension of time, remission of liquidated damages and sometimes potential delay of damages subject to the given circumstance and the contractual agreement. In the same vein, a concurrent delay may also be inexcusable where the delay of the contractor, though concurrent with that of the owner, had a more severe impact on the finishing date. For instance, the owner's delay occurred from the 5th to the 8th month of the project period while the contractor's delay was from 4th to the 10th of the project period. Though these two delays happened around the same time, the contractor's delay would impact the completion date rather than the owners. Concurrent delays could be caused by the delaying effects of events that were either excusable (i.e. the events for which the employer takes the risk of time and for which extensions of time should be granted to the contractor) or culpable (i.e. events for which the contractor takes the risk of time) (Rawlings, 2003). However, the effects of two delaying events by both parties to the contract, which impacted upon progress of the contract at mutually exclusive time frames, could not be said to be concurrent.

5. Delay Factors: -

There are several causes or factors of delays that have been identified by researchers in the field of project management in the highway construction industry. Some of these researchers have even attempted to categorize the causes of delays based on certain factors. These categories may have some geographical limitations and as such cannot be applied using a wholesale approach. This probably explains why there are several

researches on the causes of delays in construction projects from several countries. Although there are some similarities in these findings, the differences reiterate the need to have geographic dimension to this subject matter. Some causes are major while some are minor in their prevalence as observed by various researchers hence, those who attempted classifying the causes based them on the ones identified by stakeholders as very pervasive in nature. A number of studies have been conducted in regard to delays in construction projects for decades with scholars advancing various factors and groups of factors that contribute to causing delays. Available literature reviewed indicate categorization of the various factors in groups of up to eleven categories of consultant-related, contractor - related, design-related, equipment-related, externality - related, labor-related, material-related, owner-related, project-related, engineer-related and human behavior related among others. This study however re-clustered these factors into four broad categories of client-related, consultant-related, contractor-related, and external-related factors: -

5.1-Client Related Delay Factors: -

Several studies have identified owner related delay factors to cause schedule delays. Client related factors are as under: -

- Delay in handover the required Right of Way (ROW) to Contractor.
- Delay in Land acquisition and unable to handovertimely.
- Delay in Approval of Electrical Estimates for shifting the Electrical poles and lines timely.
- Delay in Permission of Tree Cutting from Forest Department.
- Delay in Environment Clearance from Environment Department.
- Delay in removal of hindrance like school, house, temple building, boundary wall etc.
- Delay in shifting of gas pipe line, optical

fiber Cable, & other utility shifting etc. Delay in decision for Additional work/Underpasses under Change of scope during execution demanded by local public.

- Delay in approval of General Arrangement Drawings (GADs) of Rail Over Bridge/ Rail under Bridge (ROBs/RUBs) as well as completed design and drawings from Railway Department.
- Poor communication and coordination between client and other local departments. Slowness in decision making process by owner, conflicts between joint ownership.
- Unavailability of incentives or Client doesn't to give incentive for contractor for finishing ahead of schedule.
- Delay in making progress payments by the client as critical. Corruption has a serious impact on construction delay. Delay in finalization and mobilization of Consultant.

5.2-Consultant Related Delay

Factors: - The literature review was done through books, engineering journals, conference papers, masters and academic theses, the internet, and interview with experts from the highway construction industry to identify factors that are responsible for delays in delivering construction projects globally. Several studies have identified consultant related factors to cause schedule delays as mentioned below: - Delay in approval of design and drawings by Consultant.

- Delay in Sources approval by Consultant.
- Delay in technical decision approval of site during execution by Consultant. Less/un experienced & incompetent manpower engaged at site.
- Late issuance of instructions and inadequate supervision critically impacted by Consultant.
- Delay in performing inspection and testing by consultant.
- Inadequate site inspection as the main causes of the consultant.
- Late recommendations of RA Bill for

payment.

- Poor coordination between site office staff and design team (HO/CO). Identified delays in approving major changes in the scope of works by Consultant.
- Inflexibility (rigidity) of consultant regarding technical concern without consideration of any latest specifications. Conflicts between consultant and design engineer.
- Inadequate experience of consultant. Egoistic behavior with contractor staff during work.
- Non linking of progress with their wedges.
- Fixed the duty time of site staff. Corruption has a serious impact on construction delay.

6. CONCLUSIONS

The first step in reducing the delays in highway construction project is to understand the root causes of the delay. The results provide a listing of root causes and issues that are directly responsible for most infrastructure construction project delays. Additionally, it is found that fundamental principles must be adopted before significant improvements can be made. This study reviews the factors that cause delay in the construction industry particularly for highway/Expressway projects in India. Thus, it involved about various factors consisting of various construction phases. Based on this review, the top most common and frequently occurred factor that cause delay in the construction projects particularly for highway projects is the various reasons which is mentioned in previous chapters. Therefore, this review is of utmost important in construction industry especially in highway and road construction projects. The top five severe causes of delay as seen from the combined view of contractors and consultants are the following: - Political situation. • Award project to lowest bid price. • Unable to Handover the required • & Hindrance free Right of

Way (ROW) on time by Client. Progress payments delayed by owner. • Insufficient & incompetent manpower engaged. This study reviews the factors that cause delay in the construction industry particularly for road and highway projects worldwide. Thus, it involved about 92 factors consisting of various construction phases. Based on this review, the top most common and frequently occurred factor that cause delay in the

construction projects particularly for road and highway projects is the poor project planning and scheduling. The frequency of occurrences of the factor in the construction projects and the percentage value was 25 times and 2.5% respectively. Therefore, this review is of utmost important in construction industry especially in highway and road construction projects.



BUNIYAAD

STUDENT'S CONTRIBUTION

Self healing concrete

-Prashant Shukla (CE final year)

In recent days, there have been many innovations in every aspect of architecture. Materials that already exist have been experimented extensively, and there have been new inventions. The new materials aim to be more durable and corrosion-resistant. With the environment and surroundings in mind, the emerging materials are proven safer to the climate and are comparatively sustainable. A lot of research goes behind coming up with such solutions.

Concrete is one of the abundantly used construction materials. While it has its advantages, concrete is prone to cracks. It resists compressive stress but does not resist tensile stress, tending it to crack when tension is applied. Liquids seep through the cracks, reach the reinforcement and corrode it. Corrosion of reinforcement questions the stability and durability of the structure. Self-healing concrete is an invention in the construction field solving the problem of deterioration of concrete.

Hendrick Jonkers and a team of biologists, after long research, invented self-healing concrete. Hendrick got nominated for the European award of 2015 for the invention. As the name suggests, this material heals itself during any cracks. Concrete is mixed with a healing agent or bacteria that gets converted into limestone when cracks appear. Bacteria like genus *Bacillus*, along with calcium lactate, nitrogen, and phosphorus, are used. The bacterial spore is in the form of tiny water-permeable capsules when added to the concrete. Inert by nature, they become active when they come into contact with water. Bacteria germinate and move towards the water.

The activated bacteria consume oxygen, and the soluble calcium lactate within it converts into limestone. It solidifies when it comes in contact with the atmosphere. Since oxygen is one of the main reasons for corrosion in steel, consumption of it by bacteria proves self-healing concrete is more durable. The bacteria live for over 200 years and do not cause any harm to humans,

allowing us to use them more efficiently. According to research, it takes seven days for a crack to heal in a laboratory but several weeks in outside conditions.

Waste Plastic in road construction

-Prachi Verma (CE Final year)

The world population is growing up, so is the amount and types of waste. Many of the wastes produced today will remain in the environment for a long time. Non-decaying waste materials have resulted in a waste disposal crisis and solutions to this crisis are recycling and reuse.

One person's trash can be another person's treasure. Therefore, if we learn to see things we are throwing away as materials that can be reused, it may solve everyday problems and satisfy everyday needs. In this context, we can also reuse plastic waste into the building of roads. There are various types of waste materials used in road construction such as crushed concrete, pulverised bitumen, fly ash and bottom ash and plastic.

Plastics such as polymers can be used in road construction as fillers to replace some portions of the stone material or with bitumen to replace a certain percentage of bitumen. If the plastic has lower softening temperature than 170°C, it is used as an addition to bitumen, and if the plastic has a higher softening temperature than 170°C, it can be used as a supplement to fillers. As highway construction projects utilise natural rock materials such as aggregates, crushed rocks, broken stones, sand and gravel, all of these materials can be fully or partially replaced with recycled materials.

Recycled plastics can even replace aggregates or serve as a binder modifier. Waste plastic has potential for the use in road construction as its addition in just a small amount helps in improving the stability, strength, fatigue life and other desirable properties of bituminous mixes, leading to improved longevity and pavement performance.

STUDENT'S CONTRIBUTION

It also results in a reduction of bitumen consumption, thereby resulting in the reduction of costs for construction and maintenance as it

is fully sustainable. Using waste plastic for road construction also contributes to a longer road service life.

BUNIYAAD

CREDITS



CREDITS



CHIEF DESIGNER:
ADITYA .R. MISHRA



DESIGNER: PRASHANT
SHUKLA



STUDENT EDITOR:
PRANJAL SRIVASTAVA



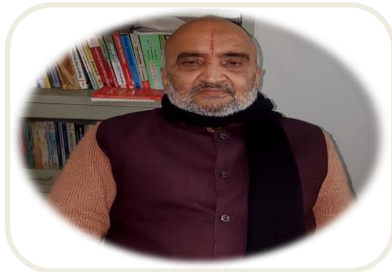
IN HOUSE: PRINCE
TIWARI



IN HOUSE: SYED
MOHD. HUMZAH



IN HOUSE: ABHAY PAL
SINGH



MAGAZINE HEAD-
RAVISHANKER MISHRA



EDITORIAL HEAD-
PRASHANT MISHRA

OUR PATRONS

OUR PATRONS



**Mr. Ambika.
Mishra**
Executive Director
AIMT, LUCKNOW



Dr S.Q.Abbas
Director General
AIMT, LUCKNOW



Dr. Alok Mishra
Director
AIMT, LUCKNOW

