

# HOW TO MINIMIZE DELAYS IN CONSTRUCTION OF COMMERCIAL PROJECT

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**Abstract** - An undertaking put off is topic of subject inside the creation enterprise. This task studies is carried to examine the reasons of delays and its outcomes on the economic constructing initiatives. The reasons are related to the diverse sorts of uncertainty associated with the activities all through the construction system. The delays are investigated and its motives & outcomes are analyzed to reach at pointers to reduce the delays, that's the goal of venture research. Understanding the cause of any particular put off in a construction project in advance might assist in avoiding the identical.

**Key Words:** Minimise, Delays, Construction, Commercial, Guidelines,

## 1.Introduction

The development industry is large, risky and requires extraordinary capital outlays. Delays on construction projects are a standard phenomenon. Put off is the maximum extensively held reason for creation disputes. Within the beyond it changed into general to have delays in production projects crowning glory time. However, these days with a consumer tight price range, delays became a completely substantial cost object. Therefore, these delays emerge as as production claims. Lines in construction industry, goal and objective of challenge, task technique, scope, and output of project in addition to bankruptcy outline is mentioned inside the bankruptcy of advent.

### 1.1 Strains in Construction Industry:

In one of these giant industry, there's lot of lines due to above all irrational risk-sharing association coupled with its aggressive person. Therefore today, there are increasing disputes and differences bobbing up out of contractual relations among contractors and owners whether proprietors are character, corporations or public. Construction contracts have very sensitive arrangement of weaving any one of a kind companies to perform various responsibilities to exesimplee the process as close to one conceived as possible. Because of complexity of such interwoven, duties, superimposed by way of statutes, monitored through environmentalists, exposed to vagaries of nature and uncertainties of markets, it might be a miracle if any construction mission can come out without getting greatly distorted on time, money or idea scale.

### 1.2 Sources of disputes:

The problem posing disputes are related to the following areas:

- Changes include addition, alteration, variations and deletions.
- Delays and suspension.
- Differential Site conditions
- Unjust enrichment by owners.

### 1.3 Aim of the project:

The study aims at formulating the guidelines for minimizing delays during construction of commercial projects.

### 1.4 Objective of the project:

1. The objective of this research is to study the impact of put off business homes.
2. The motives or reasons of delays in production of commercial initiatives could be analyzed.
- Three. The motive is to apprehend the outcomes of delays in phrases of price overrun.
- Four. The intention is to attract a flowchart displaying interdependency of different motives and its consequences, for you to understand essential section inside the lifecycle of the task.

## 2. Literature Review

The secondary data referred for the undertaking studies is incorporated below this chapter. It includes necessity of assignment crowning glory on time, incidence of delays, delays and their kinds, delays and fee overrun, concurrency in construction delays, importance of business constructing tasks, construction postpone claims, identity, results, causes of delays and research and evaluation of delay with numerous methods.

### 2.1 Necessity of Project Completion on Time:

The period of creation tasks rights from inception to of completion is first-rate significance within the construction enterprise. Customers or customers are now not content material merely with minimum cost and adequate functional overall performance for their tasks, increasing hobby

charges, inflation and other business pressures, among other factors, imply that it's far maximum value-effective to complete a venture inside the shortest feasible time.

The construction manner is subjected to the have an effect on of incredibly converting variables and unpredictable factors, which can result from distinct sources. These resources include the performance of production parties, assets availability, environmental situations, involvement of the alternative parties, and contractual family members. Because of those sources, the construction of projects may additionally face troubles, that may reason delay within the assignment finishing touch in time. Production sports in society consume a superb chunk of its resources and in turn create greater magnitudes of sources. In this kind of large industry, there are plenty of traces because of exceptionally irrational risk-sharing arrangement coupled with its aggressive character. Consequently today, there are increasing disputes and variations arising out of contractual members of the family among contractors and proprietors whether or not owners are man or woman, company or public. Creation contracts have very touchy association of weaving many one of a kind agencies to perform diverse obligations to execlear-cute the process as near one conceived as viable.

Delays might be because of one or extra of the following corporations:

1. Owners and his team-friends.
2. Contractor and his group-friends.
- Three. Nature, i.e. Cause of principal kind.
4. Society via a few change in statutes, byelaws etc. Or thru its impact of socio-political nature.

Sizeable contracts overruns are nearly continuously traced to weaknesses on the part of the patron in preference to the expert consultants and contractors engaged to supply the undertaking. The maximum common deficiencies are susceptible client briefing and frequent client adjustments for the duration of the design and construction stages.

As a part of the preliminary briefing method the patron will normally have some ideas in their preferred timescale. Consultants, each in residence and external have usually used their revel in to provide a practical timescale or on the ramifications of sticking to faster program. Production tasks are extensively visible as unpredictable in terms of transport on time, inside finances and to the standards of quality predicted.

Boom inside the time taken, unlike boom in expenses, constantly after the predictability. The lock of facts at the actual time taken on projects leads to postpone in constructing production. Expanded charges that occur

during a constructing assignment might be allocated between the consumer and the contractor according with the phrases of the settlement. Consequently they'll, or may not affect the expected fee. Time is plenty much less bendy. Whoever is accountable for a put off, and even if economic settlement is made, the client gets his completed mission later than anticipated.

Building mission length is defined as the "The duration from the date of patron sanction to the assignment to the date of real final touch. Earlier constructing creation duration turned into defined because the time period from the date of the construction contract start on web page to the date of realistic crowning glory.

### 2.3 Occurrence of Delays:

Delays are most of the maximum common phenomena in the production enterprise. During the last 3 a long time delays have befallen in most sorts of projects from simple constructing projects to the maximum complex initiatives which includes nuclear energy wherein a agenda is being used to plot paintings, delays appear. It's what is being that determines if a project, or a few other cut-off date including a milestone, may be finished late.

Delays in creation projects are luxurious, in view that there is mostly a production mortgage worried which prices hobby, control personnel dedicated to the tasks whose charges are time structured, and on-going inflation. However, in extra complex projects, issues will rise up that aren't foreseen inside the unique agreement, and so other felony construction forms are finally used, which include trade orders, lien waivers, and addenda. Many small and big size contractors in recent years have voiced their problem over the issue to conquer delay problems. The primary purpose is due to the fact the contractors have no potential to pick out the critical reasons of postpone during the development process. Ranking the significance of postpone variables by using mission Managers allows identification of the maximum vital variables and assists them to are looking for satisfactory opportunity answers.

### 2.4 What are Delays?

Put off is a relative time period in construction. It method the time-overrun both beyond the final touch date distinctive inside the settlement, or beyond the date that the parties agreed upon for shipping of the challenge in each cases, the postpone is often a pricey. In simple phrases, a postpone constitute as act or occasion, which extends the time, required to perform or whole as a part of the work or all works beneath the settlement. Production delays are delays in progress as compared to the baseline construction time table. Generally, delays may be caused by: the consumer, the contractors or acts of god or a 3rd celebration.

Delay is commonly acknowledged as the maximum not unusual, costly, complex and risky problem encountered in production tasks. Due to the overriding significance of time for both the proprietor (in terms of performance) and the Contractor (in phrases of cash), it's miles the supply of frequent despites and declare main potential delay conditions earlier and to define and attach obligations to avoid such controversies. A tremendous wide variety of fashionable conditions clauses address this situation in one way or any other.

### 2.5 Types of delays:

before analysing creation delays, a clean understating of the overall styles of delays is necessary. There are 4 fundamental ways to categorize delays:

1. Critical or Non-crucial
2. Excusable or Non-excusable
- three. Concurrent or Non-Concurrent
4. Compensable or Non-Compensable

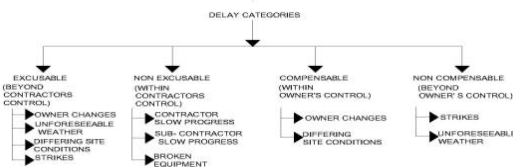


Fig 2.1 Delay Categories (It represents exorability & Compensability can vary depending upon contract)

All delays are both excusable or non-excusable. Before figuring out the impact of a put off on the challenge, one must decide whether the postpone is important or non-important. Each excusable or non-excusable delays may be defined as both concurrent or non-concurrent. Delays may be in addition broken into compensable or non-compensable delays.

Whilst may contractors be entitled to compensation whilst such delays? Typically, four exams should be satisfied before recuperation for postpone prices might be allowed a contractor should show that the put off turned into (1) excusable, (2) compensable, (three) important and (4) non-concurrent.

- Excusable or non-excusable delays Delays that excuse a contractor from appearing inside the contract length and justify an extension of time to perform are called "Excusable". Generally whether delays are excusable or no longer depends on contract provisions.

Pressure majeure, acts of god, sudden climate, labour disputes, owner layout trouble, proprietor-initiated changes and similar factors for put off had been beyond the contractor's capability to control or foresee. To position it in some other manner, delays are generally excusable while any other birthday party has referred to as it however should have averted them, or after they had been due to environmental factors past the manage of foresight of all people.

There are various kinds of unexcusable delays. If whether or not conditions, labour troubles, or subcontractors or dealer late delivery could and should have been predicted, then the postpone can be unexcusable.

Failure to offer good enough personnel or tools, inexperience, or coins waft trouble also can bring about unexcused delays. Settlement lays tricky regions of duties. Disasters to fulfill obligations, supply upward thrust to the opposite events to excuse or not to excuse the put off. The attention to excuse would be,

1. Non foreseeable state of affairs.
2. Non crucial in effect.
3. Concurrent with birthday party's postpone (In widespread the most not unusual)

Non - Excusable Delays may be as follows:

1. Lack of Competence and ability for the process.
2. Inadequate deployment of labour - force.
- Three. Inadequate economic assets.
- Four. Failure to deliver proper device.
- Five. Terrible workmanship - removal and replacement delays.
6. Non delivering a website and/or get admission to.
7. Non - supply of centers promised in contract.
8. Non - deliver of promised materials.
- Nine. Fallacious of inadequate drawings.
10. Failure to make timely - bills.

- Compensable or Non - Compensable Delays agreement clauses typically determines whether or not delays are compensable or non - compensable. Different forms of settlement clause try and limit compensability. One not unusual form of contractual clause that attempts to

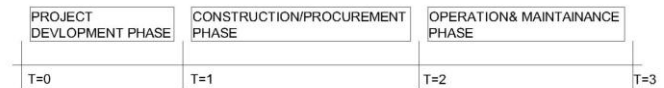
restrict delay claims is a “no damages for postpone” clause. Essentially, four theories restriction the applicability of the sort of clause: if the delay is (1) because of other parties’ movements or state of no activity, (2) no longer governed via the agreement, (3) Unreasonably long or (four) became one whose expectancies to the applicability of contractual limitations on delay claim, contractors must review such clauses with in a position prison counsel.

- Important or Non important delays  
A delay won't effect the overall undertaking final touch date. The contractor should consequently establish that the delay was excusable, compensable, and at the vital course. Evaluation of as-deliberate as built schedules is the important thing approach for determining which sports are essential to the finishing touch of the assignment. There will be delay in a part of general performance stipulated as agreement duty. However, all delays which won't disturb general time body of the agreement and might not be of essential nature. However, there are delays which may be shall but visit dissatisfied the time frame and can be designated as critical.

- Concurrent or non - concurrent delays or greater unbiased delays the same length is called “concurrent delays”. If the Contractor is faced with delays damages, contractor need to without delay start documenting the claim, notify the alternative celebration to the agreement, evaluation your contract for pertinent clauses, and are seeking for capable legal recommend. While one birthday celebration undergoes a phase of delay of its personal making. The other party too is not on time no longer because of put off on other facet but because of its very own deficiencies, such postpone is of concurrent nature and is excusable. Hence, a Non important, concurrent delay is excusable and therefore what gives upward thrust to claim for damages is vital, non-excusable, non-concurrent delay.

## 2.6 Delays and Cost Overruns

The extents and the reasons in the back of the time and the value overruns have remained understudied. As a result, the styles of the coverage interventions required to rectify the illness have additionally remained unidentified. Delays and price overruns have tremendous implications from economic system. Because of delays in challenge implementation, the humans and the economic system must await the provisions of public is going and offerings longer than is essential. Thus, delays restriction the increase potential of the financial system. Similarly, price overruns lessen competitiveness of the economic system. Services by means of infrastructure initiatives sever as enter for other sectors of the financial system. Value overruns in these initiatives lean to an growth in the capital - output - ratio for the entire financial system. Delays and value overruns reduce the efficiency of available economic sources and restriction the increase potential of the entire economic system.



In the starting of the improvement phases, the mission sponsoring branch prepares estimates of time and value (price range) want to finish the projection. An anticipated date of entirety is also announced.

The real date final touch is invariably unique from the expected date. “Time overrun’ may be described because the time distinction among the real and the to start with deliberate dates finishing touch. The time difference is delay. For each mission you’ll define percentage time overrun as the ratio of the time overrun and the implementation levels for the assignment (multiplied with the aid of 100). Surely, the time overrun and consequently the chances time overrun may be tremendous, zero or maybe negative. Further, one defines “fee Overrun’ because the difference between the actual cost and the to start with predicted cost of the projects. The initial expected cost is referred to as the preliminary assignment cost. That is the expected cost of mission works. It's miles anticipated when a mission is deliberate and generally is arrived at the use of clearstraight forward enter prices. The actual cost will become acknowledged only at time finishing touch at the give up of construction section. Percent price overrun for a challenge is described because the ration of the fee overrun and the initially projected fee of the challenge. Again, percentage price overrun can be wonderful, 0 or bad.

## 2.7 Concurrency in Construction Delays

while consisting of or engineering contracts face put off it is often asserted via one birthday party or the opposite that there are concurrent reasons of this put off. Suppose that the enterprise has been at fault perhaps by way of providing essential information past due or in a piecemeal fashion. Suppose also, but, that the contractor has executed poorly, been dis-organised or missing labour sources on web site. Simply, the organisation can be sad approximately having to pay loss and fee in such occasions or foregoing his right to claim liquidated damages for any put off. But, the Contractor might also had been at fault however he might also have perfectly sound grievances in terms of the past due provision of the information. Why should he ought to pay liquidated damages? Why, additionally, have to his initial and different sources be prolonged on web page with out additional reimbursement?

Wherein delay occurs every party might also have a declare bobbing up out of this put off towards the opposite. The Contractor will be asserting that the postpone is caused by the business enterprise. But, one has to arrive at an approach to causation which does justice to both of those contentions. Issue in relation to causation in production contracts is that the issue is regularly factually complex. There can be many



event stated to purpose delays. Each of those may additionally effect upon a myriad of activities. Via the same token, an event occurring at one time might also supply upward push to delay much later or not at all. "If there are two reasons, one the contractual obligation of the claimant, the claimant succeeds if he establishes that the cause for which the defendant is accountable is the effective, dominant reason. The approach has the notable advantages this is it could be carried out equally to each declare and counterclaim. There can best be one dominant reason of any precise length of put off. If the dominant reason is the contractual duty of the enterprise, the contractor gets loss and charges and does no longer pay liquidated damages. If the Dominant purpose is the contractual obligation of the Contractor, his claim for loss and price fails and he have to pay liquidated damages throughout put off.

The goal is to mixture period of time within which the settlement Works as in the end defined need to were finished having regard to the prevalence of non-contractor's hazard occasions and to calculate the extra time if any, over that length, which the contractor to reach the works. In essence, the Architect is involved to reach at an mixture duration for completion of the contractual works, having regard to the occurrence of non - contractors risks occasions and to calculate the volume to which the completion of the Works has been exceeded that duration.

The general precept is if an organisation prevents the of entirety of the Works as, as an instance, by using failing to offer ownership of the site, he loses his proper to claim liquidated damages for non - of entirety on time for he "cannot insist on a situation if it is his personal fault that the circumstance has now not been fulfilled. There can, inside the circumstances cited above, be no possibility of the liquidated damages regime being preserved through a legitimate extension of time on account that, ex-hypothesis, there may be no scope for such an extension of time to take delivery of.

If there are two concurrent causes of postpone, considered one of which is a applicable occasion, and the opposite isn't, then the Contractor is entitled to an extension of time during postpone because of the relevant event notwithstanding the concurrent effect on our web page for every week no longer only due to the fact the contractor has a scarcity of labour (no longer a relevant occasion), and if the failure to paintings at some stage in that week, then if he considers it truthful and reasonable to do so, the Architect is required to provide an extension of time of one week.

### 2.8 Importance of Commercial Building Projects:

Put off of venture completion is a serious problem in creation. In a certain case, delays often contribute to pricey dispute and adverse relationship amongst the venture individuals together with clients, specialists, contractors, sub-contractors and suppliers. While designing, planning as

well as constructing a commercial assets the prices concerned are of paramount significance. Delay is commonly encountered in industrial construction tasks. Because of the overriding significance of time for both the owner (in terms of performance) and the contractor (in phrases of cash), it's miles the source of frequent disputes and claims leading to complaints.

Commercial constructing tasks are essential priority in u . S . 's national plans. Improving financial system led human beings to demand higher carrier from the construction industry; as a result it is necessary to pay attention within the vicinity. Each construction undertaking have to employ an unbiased and professional fee supervisor or quantity surveyor who can police as well as have a clear evaluate of the entirety that is occurring on the way to defend the financial interest of the individual that is having the development venture done. Commonly, these people will use their engineering judgement and enjoy which they then observe to scientific ideas and techniques to allow them to analyse and develop the quality movement that have to be taken if you want to offer a good estimation of the costs involved in addition to being capable of manage the commercial prices once the venture begins on web page. By the use of a terrific set of cost management ideas, the price manager or quantity surveyor will ensure that the development project remains in the budget limits and nevertheless meets performance and excellent objectives. In truth, whilst a commercial construction assignment is being organized the price supervisor or amount surveyor is an vital a part of the crew and can carry delivered price to any creation and design team. But, if there are any delay at some point of pre-production segment, put up - creation segment and at some stage in execlear-cution of labor on web site, creation costs will exceed the price range.

### 2.9 Construction delay claims:

Production postpone claims, or disputes associated with time table affects, are one of the most common styles of disputes inside the creation enterprise. But, delay claims will be inclined to be a number of the least understood and often complex disputes inside the construction area. To keep away from claims from contractors in postpone conditions, it is pleasant to:

- trouble formal (exchange order) schedule extension in a timely way when justified.
- Avoid ordering early or beside the point final touch.
- Respond in a well timed manner to any word of declare from the contractor.

Delays claims usually relate to unanticipated tasks occasions and/or situations which expand the venture, which include, however are not restricted to, mismanagement and

misadministration; web site access restrictions; faulty web page situations; allows and approvals; economic hassle; faulty plans and/or specification, exchange within the paintings, labour productivity problem; file review/approval; trying out/inspections; inclement weather, and pressure majeure events. Below a few occasions, a contractor can be entitled to say put off damages if he finishes later than an proprietor-accepted early crowning glory agenda but remains beforehand of the respectable agreement completion date. This will arise if the contractor establishes a right away purpose-and-effect courting among proprietors breach of a contractual obligation and the delay. In addition, the contractor has the weight of setting up its extended costs due to the put off. It's miles located in exercise that no longer the whole thing inside the agreement can be taken at face value and applied in cookbook fashion. Instances play a first-rate deal in figuring out which clauses may be carried out to a specific postpone claim. Also, contract regulation encompasses principles of reasonableness and fair dealing, implied obligations and warranties, positive acceleration, and so on. An excellent standard understating of the principals worried and the operation of the relevant clauses are important to help make appropriate choices and take proper action in the ones postpone conditions. In large and complex initiatives there may be a certain quantity of supply and take policy among the events competing for the identical time and space. Time, energy, and money must now not be diverted in pursuing claims and disputes over minor delays, disruptions and interferences. Thus, the general conditions in proprietor issued contracts normally contain clauses that the contractor on note can plan for sure activities. In addition delays that arise because of those events may be termed as non-excusable delays. Regularly settlement clause would require that a postpone declare be submitted in writing inside a stipulated range of days from the commencement of a postpone. In addition, inside those stipulated quantity of days, after the termination of the sort of delay, the contractor is required to record a written notice specifying the actual period of the delay. Failure to give either of the above notices shall provide enough floor for denial of as extension of time. Via giving be aware, the contractor warns the owner in taking trade action to keep away from or reduce the excess expenses.

However, delays do not constantly result from a single catastrophic occasion. They frequently expand slowly in the course of the course of work. Minor delays are generally neglected till their cumulative effect emerge as financially apparent. By the point of contractor recognizes effect become financially apparent. By the time a contractor acknowledges that there may be a hassle, many one-of-a-kind parties and natural forces would have contributed to the situation. Failure to conform with the notice requirements can make a contribution to the scenario which can also or won't defeat the claim.

Three not unusual points of connection relative to time table postpone claims are whether or not an difficulty affects the crucial course of the undertaking, the delay quantification, and the roots-motive of the postpone and entitlement to a time extension and/or extra repayment. One have to evaluate the contract to understand the premise of the agreement and determine who time-honored precise risks and what constitutes compensable or excusable delays. Therefore, a clear information of the basic excusable delays. Consequently, a clean expertise of the primary factors essential to substantiate postpone claims is useful. Interface representative's creation claims experts have superior hand-on information of CPM agenda and huge sensible revel in within the contact claims environment related to construction delay claims.

Consulting gives contemporaneous and ahead-looking CPM agenda evaluation to facilitate the early resolution of time extensions, in addition to delay analysis for the preparation and/or defence of construction postpone claims. Creation claims consultants focus on CPM schedule evaluation via the subsequent enterprise-recognized methodologies:

- windows evaluation or Contemporaneous duration evaluation.
- Time effect evaluation (TIA)
- Collapsed As-constructed
- Impacted As-deliberate
- As-planned v/s As-constructed

the choice of a selected schedule analysis method relies upon on the undertaking's facts, the character of the activities being analysed, the nature and extent of available as-constructed facts, and the to be had development statistics, and may range from task to assignment. Each of the above – referenced time table analysis methodologies has inherent blessings and downsides.

### 2.9.1 Windows/Contemporaneous Period Analysis

windows analysis, additionally referred to as contemporaneous duration analysis, is a retrospective time table impact analysis approach that commonly makes use of contemporaneous agenda updates, along side as built information associated with a put off or change, to quantify affects to the as built important direction related to the alternate or put off. This evaluation takes under consideration the alternate's or delays courting to beyond and/or concurrent occasion sand instances. The home windows strategies rely upon the forwards looking agenda calculations at the time that updated were organized which displays the simple repute of the mission and the contractor's plan for project crowning glory at numerous point in time. This the method permit for exam of the dynamic nature of the essential path from period to length because the undertaking unfolds.

The windows method of evaluation generally begins with this baseline production agenda, after which proceeds

chronologically from up to date to updated, monitoring development alongside the crucial and near important paths. For each evaluation duration, the earlier up to date will become the baseline for the analysis of delays or accelerations. The windows method compares begin dated, end dates, and periods of the activities and identifies adjustments to schedule common sense between evaluation periods. As such, implementation of the windows evaluation relies upon on dependable baseline schedule statistics, contemporaneous schedule up to date, and as built schedule data.

### 2.9.2 Time Impact Analysis:

The time impact technique of delay evaluation, also known as TIA, is a method just like the impacted as deliberate analysis, which forecasts or predicts a delays impact on a mission's of completion date. This agenda analysis approach involves the insertion or addition of activities indicating delays or modifications into an updated schedule representing progress as much as the factor whilst a put off occasion took place to decide the effect of these delay activities.

### 2.9.3 Collapsed as-built

The collapsed as constructed delays evaluation technique is a retrospective approach that starts with the as constructed agenda and that subtracts activities representing delays or modifications to illustrate the impact at the of entirety dated of a project but for the postpone or alternate. Usually, this technique is applied in cases where reliable as constructed time table information exists, however baseline time table and/or contemporaneous agenda updates both do no longer exist or are wrong to the volume that they may be now not dependable to guide a put off analysis. Implementation of the collapsed as constructed postpone evaluation entails identifying project delays or changes, after which subtracting sports representing those delays or adjustments, and the subtracting activities representing those delays or change from the as constructed creation time table. The ensuing "collapsed as constructed" agenda demonstrates when a challenge would had been finished however for the delays or modifications, demonstrating the impact of the delays or adjustments on a challenge's finishing touch date.

### 2.9.4 Impacted as planned

The impacted as deliberate approach of put off analysis is a technique which forecasts or predicts a postpone's impact on a venture's finishing touch date. The postpone analysis method entails the insertion or addition of activities representing delays or exchange into the baseline schedule to decide the impact of these delay activities. Use of the effect as deliberate time table evaluation a technique is generally confined to the quantification of delays for contemporaneous requests for time extensions.

Implementation of the impacted as planned put off analysis entails identifying undertaking or adjustments after which placing or adding sports, which constitute these delays or changes, into the baseline production agenda. The resulting agenda demonstrates the consequences of the put off or alternate on a tasks' finishing touch date.

### 2.9.5 As- planned v/s. As-built

The as deliberate v/s. As constructed agenda postpone analysis is a retrospective technique which entails evaluating the baseline, or as deliberate, production agenda against the as constructed time table or a time table that displays progress thru a particular point in time. This analysis method is typically applied when reliable baseline and as built agenda statistics exists, but the contemporaneous schedule updated both do not exist or are flawed to the quantity that they are now not reliable to assist a delay evaluation.

Implementation of the as deliberate v/s. As constructed time table delay evaluation can range from a easy graphical contrast to a extra sophisticated implementation which considers the start and end date and relative sequences of the various schedule activities. As an instance, linear creation tasks, together with road or pipeline creation tasks with discrete postpone troubles, may make use of a easier implementation of the as deliberate v/s. As constructed agenda analysis. A more sophisticated implementation of the as deliberate v/s. As constructed time table analysis methodology compares the start and finish dates, periods, and relative sequences of the sports and seeks to determine the basis reasons of each variance. The complexity of the implementation generally depends on the nature and complexity of each the projects and the issued being evaluated.

### 2.10 Identification of construction delays:

Identity of put off events is one of the greater hard and time consuming, yet crucial thing of put off analysis. Delays to planned work scope can occur in handiest three forms. It is vital to set up a foundation for dimension of delays and identifying discrete occasion's which can be analysed by means of reference to undertaking's essential route. Put off to deliberate work scope can arise in most effective three bureaucracy:

- put off to graduation
- prolonged derations
- Suspension during performance

each of those may have impact at the of completion of delayed venture. Many activities can be entered into the evaluation primarily based in simple terms on identity of ability postpone occasions. Best the ones events which can be shown to have contributed to delays in progress or

critical delays to final touch are relevant to establishing delays damages or extension of time entitlement and reimbursement for put off damages. The system of figuring out can be undertaken by using the postpone analyst in two primary methods:

- One starts offevolved with an as constructed application and works backward, identifying deviations from the as deliberate time table. Those are the outcomes of delay events. It's far consequently known as "impact primarily based" method. It is closely dependent on a reliable as built packages and a strong factual matrix.
- 2nd method develops a set of problems, activities and potential put off events and attempts to measures the effect of those causes it is known as "cause primarily based technique". This is closely depending on a reliable as deliberate application or CPM updates

- Delays are due to:
1. Deferment in granting possession of the website online.
  2. Unforeseeable ground conditions.
  - Three. Doubtful instructions.
  - Four. Variations or adjustments in scope of work.
  5. Increase in characteristics.
  6. Faulty quantities in settlement payments.
  7. Late layout records.
  - Eight. Suspensions of works.
  - Nine. Delays caused by statutory undertakers.
  10. Exceptionary unfavourable weather situations.
  11. Delays due to company or his representatives.
  12. Moves or character moves like lockouts.

Before price of implication as well as ability legal responsibility outcome, the technique to delays cause identity ought to each systematic programmatic. 2.11 reasons of production delay there's no consensus within the literature obtained at the identity of factors which stipulated, deliberate or carried out creation instances of constructing. One purpose for this is that researches have in large part viewed the concern from numerous angle. Such viewpoints include identity of discrete factors which have an effect on productivity on website and taking a gadget view of the construction method and quit product.

The subsequent elements were traces to be the construction time influencing elements by using each character planner. Factors pertinent to customers

- monetary ability / economic arrangement for the venture.
- preceding operating courting
- class (Public, private)
- priority on construction time
- detailed sequence of completion
- viable adjustments to initial design

elements pertinent to experts

- Completeness and timeliness of projection information
- construct - ability of layout.

- Provisions for ease of communication
  - preceding working relationships
  - priority on creation time
- elements pertinent to Contractors
- Availability of suitable management crew given company's simple work load.
  - Programming construction work.
  - preceding overall performance of website online control teams
  - No. Of Sub-contractors
- factors pertinent to contract shape
- Suitability to task time.
  - Use of requirements form of agreement elements pertinent to tasks situations
  - characteristic or quit use (workplace, residential, commercial)
  - Complexity
  - location elements
  - external weather
  - guidelines and statutory undertakes (water, gas, and so forth.)

### 2.12 Effect of Delays:

Delay in construction projects is considered one of the most common problems causing a multitude of negative effects on the projects and its participating parties. The Principal reasons for construction delays are comparable across developing countries, several factors pertaining to local industry, socio-economic and cultural issues and projects characteristic also contribute delays. Delays are almost always parties. The Principle reasons for construction delays are comparable across developing countries, several factors pertaining to local industry, socio-economic and cultural issues and projects characteristic also contribute delays. Delays are almost always accompanied by cost and time overruns. Construction project delays have a b=debilitating, cash-flow problems, and a general feeling of apprehension towards each other. Projects can be displayed for a large number of reasons and usually impact on cost and time. The effect of delays is listed as follows:

1. The owner's failure to coordinate multiple prime contractors.
2. The owner's failure to provide adequate access to the project.
3. The owner's failure to provide the right of way.
4. Suspension of the Contractor's performance.
5. Change orders issued by the owner.
6. Any interference by the owners with the contractor's performance.
7. Delays caused by a third party under the control of the owner, such as the architect or the Engineer. If quality



time is really spent on project it has to be converted in savings or minimizing the cost.

8. Delay in use of project.
9. Locked in use of project.
10. Locked up capital.
11. Escalation in subsequent investment.
12. Delay in getting profit.
13. Idling of resources – men, money, machines.
14. Productivity loss due to un-contracted work period.

Relationship between, time, cost, and quality as in following terms:

- Time is a function of cost and quality.
- Cost is a function of time and quality.
- Quality is a function of time and cost.

### 2.13 Analysis of Delays:

When the completion of a project is delayed, how to accurately analyse the impact of a delayed activity on the project is a main problem for construction projects managers. Available professional scheduling tools have been not designated for delayed analysis that requires numerous computation scenarios by different view. There are several delays analysis. The as planned schedule represents the contractor’s original plan for completing the work required by the contract documents and approved by the owners the as – built schedule depicts the actual starts and finish dates and sequence of activities as they have occurred during the project.

The as planned and as built schedules are usually represented by different formats, i.e. bar chart or presentences diagram or arrow diagram, and prepared by different software. Although few commercial delay analysis software systems are available now, they cannot fit the requirements of different users, different platforms, and different professional scheduling tools employed by users. There is a need to analyse the system requirements of a construction delay analysis systems that is beneficial to develop a transparent system.

### What is a delay analysis?

Delay analysis is a forensic investigating into the events or issues that caused a project to run late. Delay analysts refer to critical and non-critical delays, the first are event causing delay to the project’s completion date and the second type affect progress on the project but do not directly impact the project completion date.

### 2.14 Delay analysis methodology:

There are many delay analysis methods found in the literature. The famous methods include: Global Impact Technique, Net Impact Technique, adjusted as-built CPM Technique, As-planned Technique (What-if they Technique,

As planned Plus Delay Technique, But-for Analysis using As-planned CPM), Snapshot Technique, Time Impact Technique (Modified as-built Method), Windows Technique (Contemporaneous Period Analysis), Modified Windows Approach and isolated Delay Type Technique. All these methods can be grouped into four categories: concept method, forward, backward path method and dynamic method. Simulated Delay Analysis Method

The bug – for technique (also termed as the collapsed as built method) is used to present delays and time extension requests after a project is built. This technique attempts to remove one party’s delay from the as built schedule (to collapse the schedule) and leaves those delays caused solely by the other Party.

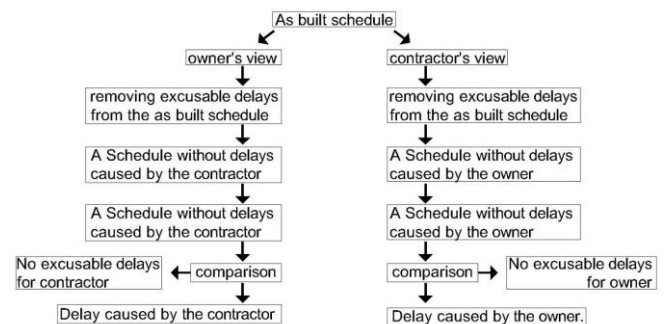


Fig. 2.3 But – for Analysis Method

Delay analysis methodologies are as follows:

- Concept Method:
  1. Method: Global Impact Technique, Net Impact Technique.
  2. Description: Simply calculating delay value by examining final schedule evidences.
- Forward Path Method
  1. Method: Adjusted as – built CPM Technique, as-planned Expanded Technique.
  2. Description: Systematically calculating delay value from as-built schedule backward to as-planned schedule.
- Backward Path Method:
  1. Method: But-for technique, Time impact Technique.
  2. Description: Systematically calculating delay value from as built schedule backward to as-planned schedule.
- Dynamic Method:
  1. Method: Snapshot Technique, Windows Technique, modified Windows Approach, Isolated Delay Type Technique.
  2. Description: Systematically calculating delay value in determined time frames forward or backward.

Construction schedule management and delay prevention and claim preventions have received much attention from practice and researchers.

There are several professional scheduling tools widely employed to plan and control construction schedules. These tools are not designated for delay analysis that requires numerous computation scenarios by different views. Therefore, a comprehensive management information system (MIS) for schedule delay analysis is required for schedule delay management.

### 2.14.1 Time Impact Analysis – Tool for Delay analysis

This recommended exercise specializes in the fundamental elements vital to carry out a Time impact analysis (TIA) to evaluate and quantify the effect of an unplanned occasion on uncomplicatedting-edgestraight forward task finishing touch.

The TIA is a forward-looking, potential time table contract agenda to determine the viable impact of that delay to undertaking finishing touch. This education isn't always encouraged for a retrospective (hindsight or forensic) view taken after a sizeable passage of time since the put off event.

This TIA practice worries itself with time factors, now not cost aspects of projects. The time impact should be quantified previous to figuring out any price implications.

A TIA may be accomplished to evaluate the capability or most in all likelihood outcomes of an unplanned event. TIA is a simplified analytical process commonly precise on production tasks to facilitate the award of excusable days to challenge final touch, due to delays that had been no longer the responsibility of the contractor. The Tia method may also be utilized by the Contractor as an inner technique to evaluate alternatives to regain or enhance challenge final touch for delays resulting from the contractor.

The TIA process is achieved even as a assignment is on-going, and accordingly has a 'ahead-looking' or a 'prospective evaluation' angle in close to-actual time. The TIA is generally with the modelling of the impact of a single change or delay event. It calls for a vital route strategies (CPM) agenda this is able to show the natural CPM calculation differences among a schedule that doesn't consist of a postpone and one which does encompass an pastime modelling the postpone event. The differences for mission of entirety, among the non-impacted schedule and that of the time table with the effect, are considered to be the effect of the postpone for time duration issues.

TIA assumes that the most lately time-honored schedule update, simply prior to the real postpone, efficaciously shows the tasks reput and logical sequence of work concerned at the challenge at the time of the delay. It also assumes that the Contractor's and owner's responses to the

put off are independent of the rest of the undertaking and that the actual delay will not result in a change within the task work plan.

TIA is greater effective as a forward-looking tool than as a backward-looking device. This is in part due to the ability of the proprietor to reply to the outcomes of the analysis and reduce the value affects of a delay. However, TIA is a suitable and useable tool for the determination of the effect of a beyond delay whilst hired in an analytical device, together with a Window analysis. Different delay evaluation strategies inclusive of windows evaluation and As-constructed analysis are normally more correct and reliable, but these are typically some distance more high priced to prepare, more time-ingesting, and require more expertise, research and instruction time to finish.

TIA is greater or less appropriate and useable for the determination of postpone influences underneath the following circumstances:

greater useable:  
 • Frozen paintings Plan  
 • ahead searching Delays predicted to arise or happening at the present time.  
 • brief period of postpone

less Useable:  
 • The less linear (or serial in nature) of the paintings plan  
 If more mitigation become done at some point of the postpone

### 2.15 Investigating of delays in construction of government office building in Gulf:

This undertaking has been studied in step with records available at the internet. For global projects typically, and projects inside the Arabian Gulf location mainly, the maximum not unusual motive of production disputes and claims in creation postpone.

The authorities office constructing is a 7-story shape with built up vicinity of round five,7000 Sq. Ft. The task were given not on time by way of 9 months because of diverse motives mentioned beneath. The causes of postpone had been then classified into 5 wide categories depending on their nature and mode of occurrence.

- |    |              |   |                |
|----|--------------|---|----------------|
| A. | Layout       | - | associated     |
| B. | Construction | - | associated     |
| C. | Monetary     | / | economic       |
| D. | Management   | / | Administrative |
| E. | Code-        |   | related        |

The sort of delay are categorized as:  
 1. Non-excusable: construction organisation goes no time or money and will pay liquidated damages.

2. Excusable Non-Compensable: production corporation receives time, but no money

3. Excusable Compensable: construction agency receives both time and money

4. Concurrent: construction employer will no longer get either time or money and no liquidated damages might be applied.

A. Layout – related Delays that is one of the most critical classes among the five put off classes because all the causes were identified as key delays, i.e. A put off is maximum likely to appear due to design related problem. In line with the survey completed for locating out the reasons in Gulf, layout related delays are considered to be excusable compensation delays.

B. Creation associated Delays in the creation stage, the contractor constantly has the responsibility and the development company gets no time if a postpone happens. Delay because of loss of inspections are the most commonplace on this degree.

C. Economic / monetary – associated Delays behind schedule bills are the most effective key delay. Consistent with outcomes, postpone not often happens because of economic/monetary motives. The owner of the challenge continually has the duty, this means that that the postpone is excusable compensable.

D. Management / Administrative – associated Delays similar to the previous class, this additionally has simply on key delay: contract changes. But, the 2 events concerned (proprietors and contractor) must deliver the duty depending on the cause of the put off. The form of delay is likewise depending on what brought about the put off.

E. Guidelines and Code related Key Delays This category has the most influence on postpone, in particular on tasks constructed in coastal regions. Very often, the government is accountable and, in this example, the delays are taken into consideration excusable compensable.

F. Damage assessment inside the absence of evidence to show real damages, the courts in the Arabian Gulf area use the subsequent formulae to check the anticipated expenses that want to be compensated to the Contractor because of project delays because of the proprietor: estimated costs due to put off=

$$(TPC - CM) * DD + INT PO$$

in which, TPC = total project cost  
CM = value of substances

## Conclusions

- There is a vast put off trouble in creation initiatives in Kuwait, particularly in governmental projects, most of which exceed their of completion time by a hundred%, further to exceeding their finances. This observe focuses on the essential problem of put off inside the buildings of governmental constructing tasks.

- The consequences result in the development that settlement documents have been a ways from whole at formation of the lump sum contracts normally, consequently tasks were tendered in advance without the necessary production documents being sufficiently distinct to mirror the overall scope of labor.

In maximum instances it is discovered that, when the contractor has the duty, the kind of postpone in Non-Excusable; whilst the proprietor or authorities or experts has the duty, it is an Excusable Compensable put off.

- consultants play a totally crucial position in layout-related postpone due to the fact they're in prices at the design manner in conjunction with the proprietor of the undertaking. However, the government performs the most vital position in code-related put off, whilst the contractor has the essential duty in production-related postpone.

- put off due to monetary / economic reasons, as well as management / administrative causes percentage an intermediate role of significance, just imparting one key put off:

behind schedule bills- those categories do no longer have the equal bad on undertaking final touch time as different elements taken into consideration on this look at, together with code-design and construction-associated troubles.

- based totally in this take a look at, it's miles recommended that the constructing permit Approval technique be streamlined as a lot as viable, and adjustments in legal guidelines and policies be made keeping in mind the bad effect they cause in time period of creation task fee and time.
- design-associated, which include modifications in drawing and incomplete and defective specifications and exchange orders have a very adverse effect on challenge completion instances and forever result in cost escalation as well.

- these issues can be managed with right design technique management and timely decision-making. Choices made early within the life of a undertaking have the most profound effect at the task's goal of delivering a secure, nice assignment inside the time and budget allocated.

### 2.16 Investigation of delay in construction of Commercial Office Project DLF Tower in Okhla, South Delhi,

This task will be studied thru statistics available in public area at national level. DLF Ltd., biggest realtor in India, is again in the go wires of its customers. Customers who had accomplished investment inside the commercial office undertaking of the company in South Delhi are demanding a reimbursement from the developer. They are alleging that the employer has now not popularity of the assignment and it is delayed as well.

The DLF Tower tasks, Okhla, South Delhi, was released within the month of March, 2008, while costs of actual property have been really excessive and it became the time previous to the global slowdown healthy the actual property region of India. Although, the company has now not declared any go out coverage for its consumer of the Okhla task.

The undertaking will spread over five acres of land, with a purpose to have 3 towers. It is expected to be finished with the aid of March 2011. Approximately 300 customers had booked area in DLF Towers.



Early this 12 months, a set of 80 consumers formed DLF Towers Okhla Allotters affiliation to call for a refund at the floor that the venture is running not on time and on DLF's own assurances inside a yr of booking. Customers also need a reduction in price in music with correction in business realty expenses. In line with the association, its members have been allocated areas on the venture at Rs. Five,000 /- to 18,000/- per Sq. Fts. The contributors declare that because there was a 40-50% decline in industrial assets values, DLF have to give them a reduction.

The company, but, has not but introduced an exit coverage of its buyers. Customers allege that DLF has now not acquired a "alternate in Land Use", that's required when you consider that a industrial project is being advanced on land intended for commercial use. According to the "utility for Provisional Allotment", a copy of that is "Mint", the company has said that if it is not capable of allot space to customers inside a yr

of signing the booking form due to non-sanction of building plan, DLF will refund the price made via shoppers along side an annual hobby of nine%. "After 20 months of launching the mission, there is simplest a deep hole dug inside the floor on the website online and consistent with the booking form if approval is not taken inside twelve months, customers can take refund, but DLF isn't always geared up to provide money back.

According to a proper to information query filed through the affiliation with the Municipal employer of Delhi and Delhi improvement Authority in September, a copy of which is with "Mint" the company, permission has been granted to the challenge for creation as an "industrial challenge". Constructing plan and layout plans have found out that excavation proves is going on at the web page. "we're devoted to deliver the mission on schedule as promised," the spokesperson stated. He however, declined comment on whether or not the firm has paid the considered necessary conversion for purchasing the cease-use classification changed from industrial to commercial.

Following the slowdown which compelled many builders to halt or put off production of several initiatives due to liquidity crunch, shoppers have more and more turned the heat on developers failing to stick to project production schedules.

### 2.17 Summary:

This chapter may be summarized as the delays have implication on value. In case on commercial constructing tasks, delays are most high-priced due to its high importance. The causes of delays must be identified format to minimize its effect on the mission.

## INVESTIGATION OF DELAYS

### 3.1 Introduction:

The element research of delays, its reasons 7 outcomes, the accountable stakeholder is performed via reading the projects at one of a kind degrees of production at neighborhood stage as follows:

#### 1.2 (A) Commercial Office Building Project, Andheri, Mumbai:

(Construction Stage)

- Project Name: 42 Avenues
- Client Name: Mr. Rajesh Mehta
- Location: CTS-660 Off. Link Road, Andheri (W), Mumbai.



- It is basement + G + 6 story structure. Total B/u area is 48,000 Sq. Fts. Includes parking area at basement and offices above.
- The site is accessible through 13.4m wide road on its north side. It is rectangular plot measuring 56M in length & 23.7M in width.
- There is change in scope of work at preliminary stage of the project work. Initially, it was planned as G + 3 Storey building and now it is modifies to G + 6 Storey structure as per the demand of client.
- Total Project cost as per Changes scope of work, is Rs. 5,76,00,000/- Loan has been taken from the bank at the interest rate of 11% of Rs. 3,76,00,000/-
- Parties involved in Project and their roles:
  1. Contractor: Complete execution of the project on site.
  2. Architect: Prepares an architectural design proposal and inspects the work execution.
  3. Structural Engineer: Prepares structural design and drawing as per architectural design and inspect the work execution.
- a. Scheduled Project Start date (Execution): Feb,2018
- b. Scheduled Project end date: Jan, 2019
- c. Actual Project Execution Date: Feb,2018
- d. Actual Project Completion Date: July,2019
- e. Status of work till last week of June: 90% of Work Completed.

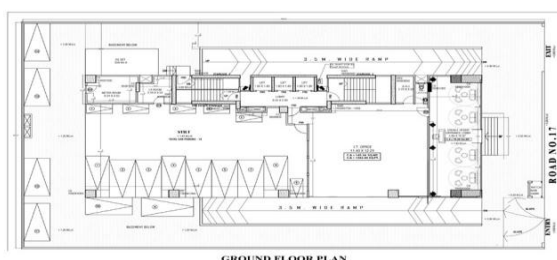


Figure 3.2 Site Plan of 42 Avenues

The delays in project are identified by comparing actual time required to complete the activity v/s. estimated time required for completion of same activity. Similarly, the actual cost and estimated costs of various activities is compared to find out cost overrun for the project. In this project, the delays are identified in survey and levelling of site, in appointing architect and structural engineer, in finalising the design, in preparation of BOQ and specification, in excavation, RCC work and plastering and in the process of approval. The details explanation is given in the table presented below.

In this table,

ET= Estimated Time, AT= Actual Time QA=Qualitative Analysis

EC= Estimated Cost AC= Actual Cost

Indirect Cost for the Project includes Overheads, Rate of Interest on Loan etc.

For 4 Months of Delay Indirect Cost is Rs. 1,66,48,000/-

Total Cost overruns is inclusive of Direct Cost & Indirect Cost is Rs. 1,68,27,450/-

### Learning from Case Study:

From the case study carried out, the conclusion can be stated as the delays can be eliminated completely by taking required precautions or can be minimized by taking preventive actions in the response. The impact of the delays in terms of costs escalation is considerable. There it is important to find out ways to avoid or minimize the delays in construction of commercial building projects.

### 1.3 (B) Commercial Office Building Project, Sardar Nagar:

(Preliminary Stage)

- Project Name: Leela Heights
- Client Name: M/s. Rishiraj Enterprises Pvt. Ltd.
- Location: Assa House, Sardar Nagar.
- It is basement + G + 5 story structure. Total B/u area is 57,620 Sq. Fts. Includes parking area at basement and offices above.
- The site is accessible through 20m wide road on its south side. It is rectangular plot measuring 57.0 Mts. In length & 41.23 Mts. in width.
- Total Project cost is Rs. 15,44,00,564/-

- Parties involved in Project and their roles:
  - Architect: Prepares an architectural design proposal and working drawing as well as approval drawings.
  - Developer: Co-ordinating various activities of different parties involved in the project and inspect the work.
  - Contractor: Execute the Construction work on site as per the drawings and instruction given by architect or engineer.
  - Structural Engineer: Prepare a set of structural drawing as per the Architectural drawings.
  - Sustainability Consultants: Application of green building features in planning & development of project.

Scheduled Project Start date (Execution): Jan, 2018  
 Scheduled Project end date: Jun, 2019  
 Actual Project Execution Date: Jan, 2018  
 Actual Project Completion Date: Aug, 2019  
 Status of work: 90% of Work Completed.

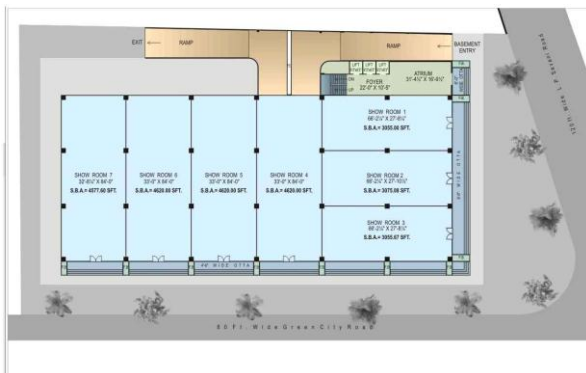


Figure 3.2 Site Plan of Leela Heights

Similar to previous case study, the delays in project are identified by comparing actual time required to complete the activity v/s. estimated time required for completion of same activity. Similarly, the actual cost and estimated costs of various activities is compared to find out cost overrun for the project, the delays are identified in carrying out pre-design study, in finalizing conceptual design and architectural design, in surveying and in the process of design approval. The detail explanation is given in the table presented below:

In this table,

ET= Estimated Time, AT= Actual Time QA=Qualitative Analysis

EC= Estimated Cost AC= Actual Cost

Sr. No.	Activity/ Sources of Delays	Causes of Delays	Reason behind the Causes	Responsibility	Action Taken	Effects of Delay			QA		
						Estimated Time	Actual Time	Estimated Cost			
1	Pre-design Study	Incomplete Data provision from Client	Lack of Co-ordination between Client & Architect	Co-ordinating properly to get all the relevant information	Owner	7	12	5	-	TOR	
2	Finalizing Conceptual Design	Several Design Changes from Time to Time	Slow Design making Process	Finalizing the Conceptual plan as per finalized requirements	Owner	15	22	7	-	TOR	
3	Application of Green Building features for Sustainable LEED Certification	Poor Co-ordination between Architect & Development Consultant	Clashing of Opinions in Designing and Planning	As per Clients need middle path is achieved	Consultants	7	17	10	-	TOR	
4	Preparation of Architectural Design Proposal	Lack of Internal Team work	Absence of Senior Project Team Members	Interacting with all the team members to finalize the architectural design	Consultants	7	12	5	-	TOR	
5	Survey of Plot	Changes in Plot Shape & Size	Errors in plotting down the actual shape of the plot	Replotting the entire plot & cross checking with development plan sheet	Contractor	7	14	7	-	TOR	
6	Preparation of approval drawings	Revisions in the Approval drawings set	Change in FSI from 1.25 to 2.5	Correction in the Drawings as per modified FSI	Licensing Architect	5	9	4	-	TOR	
7	Design Approval from Government Body	Slow Approval process			Govt.	30	45	15	-	TOR	
									83		
											Total Effect on Cost

Indirect Cost for the project includes Overheads, Rate of Interest on Loan etc. for 2 Months of Delay Indirect Cost is Rs. 83,42,000/-

Total Cost overrun is Inclusive of Direct Cost & N Indirect Cost is Rs. 83,42,000/-

**Learning from Case Study:**

Since the project is at preliminary stage, the delays can be controlled by accelerating the activities in that state to avoid further delays in execution stage. The cost escalation is not as high as in case of the previous case study since this project is at its preliminary stage. Hence the impact on the cost a=can be controlled by taking preventive actions.

**DELAY ANALYSIS OF INVESTIGATED PROJECTS**

**1.1 Introduction:**

The investigation of the delay in construction of commercial building projects is analysed as a result the reasons or sources of delay are identified. The reasons can be

categorized into six groups. The brief list of delays is formulated starting the responsible stakeholder and type of delay.

### 1.2 Causes of Delays in Construction of Commercial Building Projects:

The delays affecting commercial building projects can be categorized on the basis of their sources as follows:

#### 1. Design related Delays:

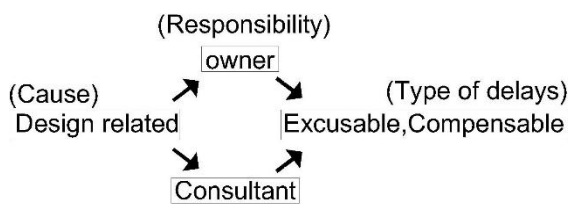


Fig. 4.1 Design related delays

Design related delays are common in all construction building projects where major responsibility is shared by owners and consultants.

#### 2. Construction Related Delays:



Fig. 4.2 construction related delays

Construction or execution of work on site contributes major factors leading to delayed construction. In this case contractors as well as owner are held responsible for the delays.

#### 3. Acts of God:

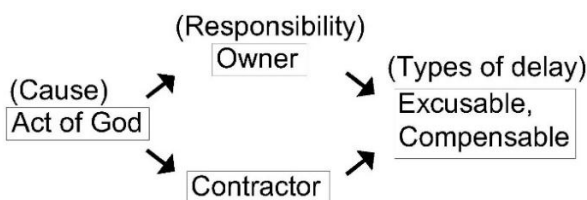


Fig. 4.3 Acts of God

In the event, a delay due to Acts of God, the responsibility is borne by the owner and the type of delay is an excusable compensable.

#### 4. Management and Administrative Delays:

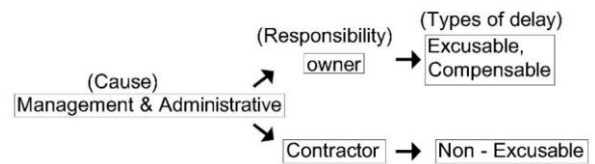


Fig. 4.4 Management & Administrative Delays

There are two parties involved (Owner and contractor) that have to carry the responsibility depending on the cause of the delay and the type of delay is also depending on what caused the delay.

#### 5. Authorized design Approval Delays:



Fig. 4.5 Authorized Design Approval Delays

The approval for the building considerable time for which Government can be held responsible.

#### 6. Financial/Economical Factors:

7.

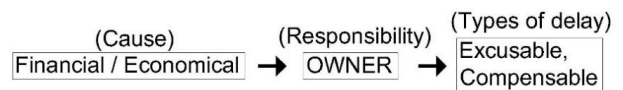


Fig. 4.6 Financial / Economic Factors

The owner of the project will always have the responsibility, which means that the delay will be excusable compensable.

These are various stakeholders involved in the project. Their roles are as follows:

- Design Consultants (Architect): Prepares an architectural design proposal based on pre-design study and inspect the work execution.
- Structural Engineer: Prepares structural design and drawing as per architectural design and inspect the work execution.
- Contractor: Execute the Construction work on site as per the drawings and instruction given by architect or engineer.
- Client/Owner: Provide basic required data regarding soil, site conditions weather conditions etc. as per mutual agreement.

- Project Management Consultants: Co-ordinating various activities of different parties involved in the project and inspect the work as per predefined schedule and estimated cost.
- Government: Approval of plans by Architect for executing the work on site.

The types of delays can be identified as follows:

- Non – excusable: Construction gets no time or money and pays liquidated damages.
- Excusable Non – Compensable: Construction Company has time, but no money.
- Excusable Compensable: Construction Company gets both time and money.
- Concurrent: Construction Company will not get either time or money and no liquidated damages will be applied.

The types of delays are considered from contractor’s point of view whereas the responsibility of stakeholder is considered from project manager’s point of view.

Table No. 4.1 List of Reasons of Delays

The Causes of Delays affecting commercial building projects are listed below:

Sr. No.	Factors Causing Delays	Responsibility from Projects Manager's Point of view	Type of Delays
R 01	Lack of Pre-design Study	Design Consultant	Excusable, Compensable
R 02	Inaccurate Documents like Soil Testing Report, Weather Conditions, Survey of Plot etc.)	Client	Non-Excusable, Non-Compensable
R 03	Design Development	Design Consultant	Excusable, Compensable
R 04	Decision making during Development Stage	Client, Design Consultant	Excusable, Compensable
R 05	Changes in Scope of Work	Client	Excusable, Compensable
R 06	Changes in Drawings	Design Consultant	Excusable, Compensable
R 07	Changes in Specifications	Client	Excusable, Compensable
R 08	Poor Estimation & budgeting of Projects Cost	PM Consultants / Design Consultants	Excusable, Compensable
R 09	Contract Modifications	Client, Contractor	Excusable, Compensable
R 10	Incompetence of Parties to cope up with the Changes	PM Consultants	Excusable, Compensable
R 11	Changes in Development Control Regulations	Government	Excusable, Compensable
R 12	Poor Planning in Scope of Work	Contractor	Excusable, Compensable
R 13	Approval from Local Authorized body i.e. Government	Government	Excusable, Compensable
R 14	Unforeseen Site Conditions	Client, PM Consultants	Excusable, Compensable
R 15	Slow Mobilization	Contractor	Non-Excusable, Non-Compensable
R 16	Delays in Procurement of Materials	Contractor / PM Consultant	Non-Excusable, Non-Compensable
R 17	Delay in Material Supply	Contractor	Non-Excusable, Non-Compensable
R 18	Poor Equipment Performance	Contractor	Non-Excusable, Compensable
R 19	Poor availability of Construction Equipment	Contractor	Non-Excusable, Compensable
R 20	Ineffective Communication System	PM Consultant	Excusable, Compensable
R 21	Poor Storage of Materials	Contractor	Non-Excusable, Non-Compensable
R 22	Poor Material Handling	Contractor	Non-Excusable, Non-Compensable
R 23	Increased Quantity of Materials	Contractor	Non-Excusable, Compensable
R 24	Deviation of Quantity Materials Purchased & Ordered	Contractor, PM Consultants	Non-Excusable, Non-Compensable
R 25	Inappropriate Construction Method	Contractor	Non-Excusable, Non-Compensable
R 26	Slow Drawing Revisions & N Distribution	PM Consultants, Design Consultant	Non-Excusable, Compensable
R 27	Too Much overtime for Labours	Contractor	Non-Excusable, Non-Compensable
R 28	Labour Injuries	Contractor, PM Consultants	Non-Excusable, Non-Compensable
R 29	Late Site Inspection	PM Consultants	Non-Excusable, Compensable
R 30	Defective Work	Contractor	Non-Excusable, Compensable

R 31	Deviation from Scheduled Activities	Contractor, PM Consultants	Non-Excusable, Compensable
R 32	Lack of Co-ordination	PM Consultants	Non-Excusable, Compensable
R 33	Poor resource assigning & leveling	PM Consultants	Non-Excusable, Non-Compensable
R 34	Lack of Advanced Techniques	Contractor	Non-Excusable, Compensable
R 35	Lack of Trades Skills	PM Consultants	Non-Excusable, Compensable
R 36	Transportation Delay	Contractor	Non-Excusable, Compensable
R 37	Lack of Funds	Client	Excusable, Compensable
R 38	Failure to make Timely - Payment	Client	Excusable, Compensable
R 39	Poor Reporting System	PM Consultants	Non-Excusable, Non-Compensable
R 40	Poor Risk Management	PM Consultants	Excusable, Compensable
R 41	High Frequent of Unpredictable situations (natural disaster, force majeure)	Client	Excusable, Compensable
R 42	Poor Weather Conditions	Client	Excusable, Compensable
POST - CONSTRUCTION STAGE			
R 43	Inadequate review of Work executed	PM Consultants	Non-Excusable, Compensable
R 44	Late Handling over of site to Client	Contractor	Non-Excusable, Non-Compensable

### 1.3 Summary:

This chapter can be summarized as there are approx. 44 reasons among all the phases of construction project, due to which projects get delay. The delay can be excusable, compensable, non-excusable, non-compensable depending upon the contract. Contractors are considered as most responsible for the delay since they are carrying out major work in construction.

### GUIDELINES TO MINIMIZE THE DELAYS

#### 1.1 Introduction:

The analysed facts is inferred to formulate the suggestions to limit the delays in creation of business constructing projects. The overall control at the project can be completed by using making use of the hints.

#### 1.2 Project Control:

The method of controlling involves, verifying whether the sports accomplished are in conformity with the plans made, guidance given and the outcomes expected. The system of controlling starts off evolved with making plans and terminates at controlling. Distinct degrees of the venture viz. Pre-production, execution and publish creation may be controlled by means of technique referred to beneath.

##### 1.2.1 Pre-construction stage:

lack of proper homework and inputs put off the assignment thereby making loss to the society. As a result it's miles necessary earlier than enforcing the project. While purchaser/owner makes modifications in design, specification, and problems past due education or are gradual in approving designs, they need to comprehend that there may be a knock effect. Make certain that the patron knows whilst they are the reason of put off. After all time is cash, typically the contractor’s cash, commonly the contractor’s cash unless it is identified through the client, what the effect in their movements is on the finishing touch of the challenge tiers and the critical direction.



A suitable form of settlement may be made as in keeping with the necessities and suitability of purchaser and contractor. Regardless of all precautions, investigation, changes and extras can be avoidable. In such case, an exchange order signed by experts/owner issued after the execution of contract authorizing the change in drawings or an adjustment within the agreement kind.

As commercial office buildings are vital priority on countrywide improvement plan, layout feasibility should be checked at right time in challenge lifestyles cycle to get an concept of the undertaking benefits to the society in addition to customer. If the task is not going to be viable in destiny then there may be no factor in investing cash. This can cause wastage of time, money in addition to efforts.

Because the process of layout approval from governmental frame is very sluggish in nature, different sports should be scheduled in any such manner that overall assignment period must now not get prolonged.

Freeze design changes at a certain factor to permit for procurement lead time, approvals and many others. While there is a hard and fast deadline, for example, the industrial workplace building has to be opened on date 25th July 2010, there is a "point of no greater charge." Too regularly contractors are held accountable as "the last guy standing" doesn't be caught in the function.

### 1.2.2 Execution / Construction Stage:

Mission control consists of two components: one accurate information approximately the schedule repute of the challenge and others, moves taken in reaction to the status record. The driving pressure for maintaining the challenge "On schedule" is cash. Commonly, on time or bonus/penalty clauses that offer an incentive to the Contractors to finish the project as soon as viable.

The concept liquidated damages and accelerations are frequently contrary tactics in fixing the put off issues. It's far the sum stated and agreed to be paid as damages among the events to a contract inside the late completion of labor. Typically the charge is constant per day or in keeping with week for a duration past the agreed date completion.

Occasions can also delay the activity and shorten the contractor's time to accomplish his paintings. Or proprietor might also require the contractor to complete his paintings sooner than first of all scheduled. Either of these cases may call for as acceleration of contractor's work i.e. He may want to make up time to avoid damages payable to the owner for the late finishing touch of the venture. It is regularly carried by operating time beyond regulation and on weekends by adding manpower or van setting extra shifts and device.

Ordinary web site inspection is the important thing for walking the project as in keeping with agenda. Preserve an eye on what your crew participants are doing that would motive delays e.g. Beginning past due, past due submission of drawings. Mistakes in drawing and so forth. In which we are at fault, we ought to receive the value and try to recover the charges we incur. We should receive the cost and attempt to recover the charges we incur. Mitigate the effect of delays via accelerating the paintings, using up "go with the flow" and redefining the vital path.

Reveal the paintings achieved by means of earlier contractors cautiously and ensure delays outdoor your manipulate are identified and documented. Delays which might be out of doors the manipulate and effect the monetary want to be recorded and monetary impact handled with the aid of the best accountable person. The false impression and unrealistic expectancies are averted through the designated vital direction schedules that can specify the paintings and timetable to be used, however most important is the logical sequence of the events which must occur for a project to be finished on anticipated time.

### 1.2.3 Post Construction Stage:

Reviewing the construction section will assist to avoid errors which have been take location? It's going to bring improvement in challenge paintings to limit the time overrun and fee overrun. Compare the real success with deliberate on the way to recognize the regions for development. Analysis for time overrun is completed assignment may want to assist in higher time control in destiny.

Delays may be minimized through taking on the spot corrective and preventive motion of time overrun and price overrun. For instance, postpone in deliver of material to the web site due to negative transportation facility may be minimized by means of the usage of opportunity mode of transportation for imparting the materials. There are some delays which can not be minimised seeing that those are past one's manipulate. By way of taking same instance of deliver of material, it's miles because of damaging weather situations or flood then it can't be minimized. In such case, a remedial motion needs to be taken for recovering the losses or damages in phrases of time and value.

The precautionary movements may be relevant to the delays that are under one's manage, however delays because of natural calamities and disasters can not be managed hence their results can not be minimized.

### 1.3 Formulation of guidelines to minimize the delays:

From the case studies performed under this project various reasons for delays of the project are identified. The effect of delays in terms of time overrun and cost overrun are studied. The action taken by various stakeholders are analysed. On the basis of these actions, to be taken for

minimizing the delays re formulated as guidelines as follows. These guidelines will help to achieve the goals within the estimated time and budget as well as this will bring discipline in the work pattern. The guidelines will also facilitate effective and efficient use of resources.

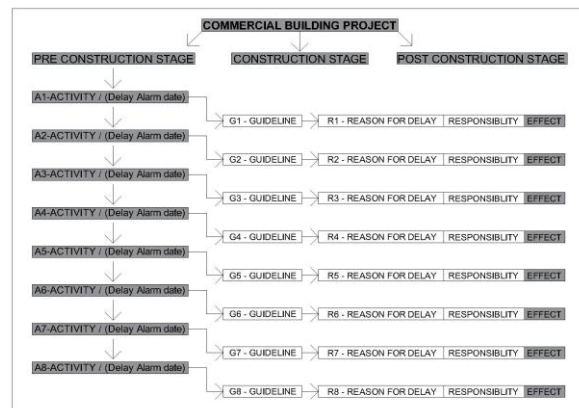
These guidelines from a part of the model indicating interdependency of reason or causes of the delays and their effect in the form of flowchart which is generated as the output of the project research. According to the model prefix (as G1, G2, G3, G4.....) are given to the guidelines refers to the guidelines. The pre-fix G1 given to the guideline refers to the reason of delay R1 for which is it to be followed. Similarly, it is applicable for all the other reasons for delay. (G2---R2, G3---R3, G4---R4,.....)

Sr.No	Guidelines for Minimizing Delays in Construction of Commercial Building Projects
<b>PRE - CONSTRUCTION STAGE</b>	
G 01	Conduct Date acquisition to get correct information should be received from correct (Authorized) source regarding the Project.
G 02	Prepare documents with accurate data filled therein which can form basis for the decision making.
G 03	Develop the Conceptual Design as per the project Requirement within the Scope of work.
G 04	Define the Objectives of the Project as well as freeze the Requirement at early stage.
G 05	Give fair idea to the owner regarding the revisions as per change in scope of work to avoid delay.
G 06	Revise the Drawings and per the requirements & check the drawings for the relative errors.
G 07	Define the list of Specification and get it approved from the client before procuring.
G 08	Prepare an accurate & detailed budgeting based on direct market survey.
G 09	Draft the contract through skillful hands which is simple & comprehensive in nature.
G 10	Develop the flexibility in the system of working to accommodate the possible changes within the framework of scope of work.
G 11	Implement the Changes in design as per latest Development Control Regulations.
G 12	Accurately study the job items, their interdependency & sequence as well as methods.
G 13	Sufficient time must be allotted for approval from the locally authorized body.
G 14	Conduct detailed & accurate survey of the site conditions & provision climatic conditions.
G 15	Plan the site Layout in realistic manner to achieve barrier free movement and accessibility.
G 16	Compare the landed cost of different materials given by selected suppliers & choose the most suitable one as per project requirement.
G 17	Monitor the Material procurement Schedule including terms & conditions of delivery.
G 18	Handle the equipment's with care as well as cleans and maintains the equipment's regularly.
G 19	Make a provision for the alternate equipment or place an order in advance for hiring it.
G 20	Planning & applying Miss-management information System.
G 21	Must have proper temporary storage facility to protect materials from bad weather.
G 22	Provide an effective work method with available facilities for handling materials.
G 23	Utilize materials optimization. Use materials efficiently to reduce wastage.
G 24	All clauses regarding procurement of materials must clearly defined.
G 25	Execute the Construction according to predefined work methodology & monitor the performance as per site conditions, climatic conditions, locally available materials etc.

G 26	Revise the drawing as per the latest modifications & send the drawing to all related people involved as quick as possible.
G 27	Fix up a Time table on everyday working including the minimum required time for refreshment of labors to achieve maximum productivity.
G 28	Implement safety regulations for on site working & monitor regularly.
G 29	Prepare a schedule to carry out the site inspection on regular basis (Daily/Weekly) followed by reporting system.
G 30	Keep a check on the construction method while executing on site to avoid rework.
G 31	Develop detailed and accurate schedule to facilitate easy and controlled scheduled.
G 32	Develop a single & easy method to understand system to regulate co-ordination procedures & responsibility of each personnel.
G 33	Conduct proper personnel selection for the position needed based on comprehensive work experience and training check & relevant skill tests.
G 34	Application of high technology can be carried out as per the object requirements and level of complexity in the construction activities.
G 35	Conduct comprehensive & careful selection of Suppliers which considers supplier's, daily capacity & material quality.
G 36	Provide accurate material delivery schedule as per agreed terms & conditions as well as penalties for delay, material damage etc.
G 37	Optimize the cash flow as per the requirements of the Projects at different stages.
G 38	Prepare a payment schedule along with the terms & conditions agreed by the parties.
G 39	Develop procedure & execute the procedure with discipline.
G 40	Formulate preventive action plan as well as risk mitigation plan in advance to cope up with unfavorable situations.
G 41	Add force majeure clause in contract to predict & anticipate unexpected conditions.
G 42	Apply accurate work methodology suitable as per climatic conditions & site locations.
G 43	Compare the actual achievement with the planned so as to understand the area for discrepancies.
G 44	All the activities including on-site construction & administrative must be carried out as per pre-defined critical path for handling over the completed site to the client.

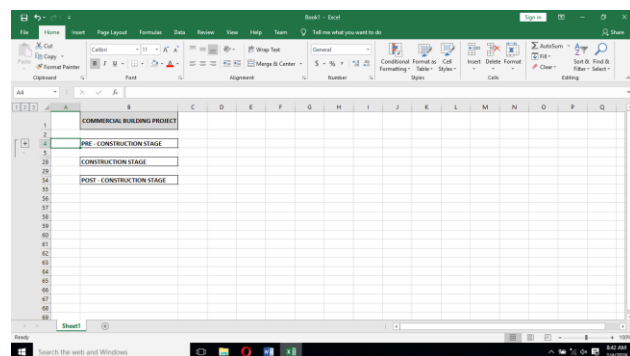
**1.4 Model formulation:**

The model below represents activities in pre-construction stage with the flowchart of reason of delay and its effect along with the responsible stakeholder. The same can be carried out for execution stage and post construction stage. Here – “A” refers to Activity, “G” refers to Guideline” “R” refers to reason for delay. “Delay Alarm Date” refers to the date on which pre activity work must be ready before actual performance of activity to minimize the delays.



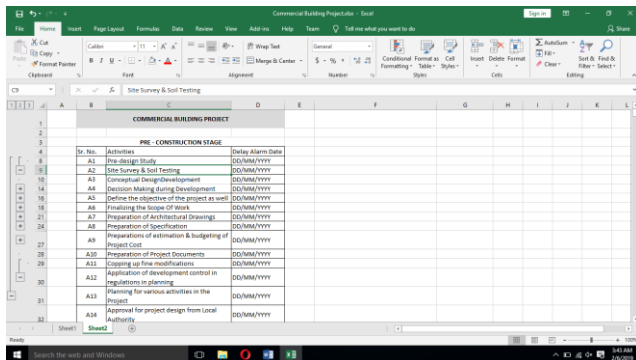
The model is worked put in excel format as follows. The work plan of the project activities can be inserted in the model along with the respective dates. The responsibility can be assigned to different stakeholders involved in the project. The model can be operated by steps mentioned below.

Step 1: It shows all the three stages of commercial building projects viz. Pre-construction, execution, and post construction. By clicking the +6 sign on left hand side all these phases get open.

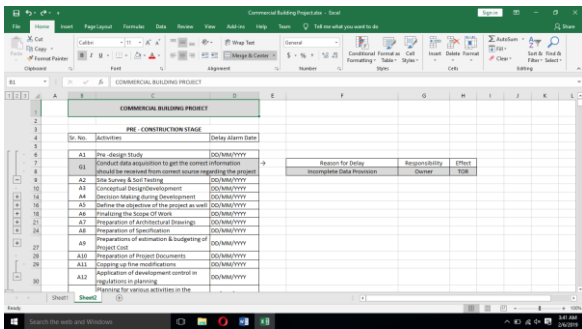


Step 2: it shows all the activities to be carried out in pre-construction stage by clicking '+' sign pointed below. The pre activity work must be ready before actual performance of activity to minimize the delays; the date can be termed as 'Delay Alarm Date'. It is to be inserted in the model these can be termed as "Delay Alarm Date" on which these activities

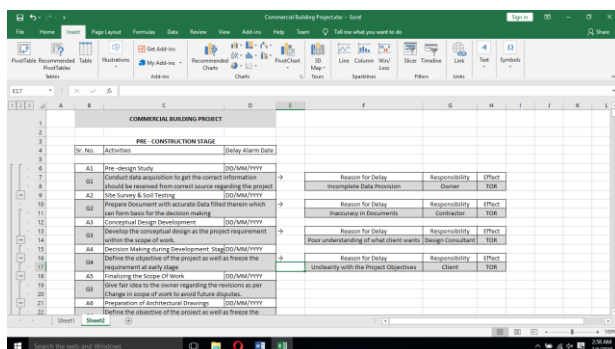
are to be started can be filled up by project manager which needs to be modifies project to project.



Step 3: It shows the guideline to be followed to avoid the delay as well as the flowchart of reason for the delay, responsible stakeholder and its effect on the project for each of the activity in the particular construction stage.



Step 4: it is similar to Step 3. In this respective date for all the activities (A1, A2, A3, A4,.....) up to last activity in the particular construction stage) can be inserted in the model. The flowchart of respective guideline (G1, G2 G3, G4,.....) and reason for delay, responsible stakeholder and the effect of delay on project can be obtained through this model. Similarly flowchart for all the activities of all the three phases can be obtained.



**1.5 Summary:**

To summarize the chapter, guideline helps the project manager to perform various activities in all three phases of project life cycles, within the budget and pre-estimated time

required to finish the project. The delays that can be minimized can be controlled by following the guidelines and the delays which cannot be controlled needs to take corrective actions.

**APPLICATION OF GUIDELINES AND ITS EFFECTS**

**6.1 Introduction:**

The detail investigation of delays, its reasons 7 effects, the responsible stakeholder is carried out by studying the projects at different stages of construction at local level as follows:

**6.2 (A) Commercial Office Building Project, Khar(w), Mumbai:**

(Construction Stage)

- Project Name: Everest Heights
- Client Name: Mr. Pushkar Mehta
- Location: CTS-660 Off. Link Road, Khar (W), Mumbai.
- It is basement + G + 6 story structure. Total B/u area is 48,000 Sq. Fts. Includes parking area at basement and offices above.
- The site is accessible through 13.4m wide road on its north side. It is rectangular plot measuring 56M in length & 23.7M in width.
- There is change in scope of work at preliminary stage of the project work. Initially, it was planned as G + 3 Storey building and now it is modifies to G + 6 Storey structure as per the demand of client.
- Total Project cost as per Changes scope of work, is Rs. 5,76,00,000/- Loan has been taken from the bank at the interest rate of 11% of Rs. 3,76,00,000/-
- Parties involved in Project and their roles:

1. Contractor: Complete execution of the project on site.
2. Architect: Prepares an architectural design proposal and inspects the work execution.
3. Structural Engineer: Prepares structural design and drawing as per architectural design and inspect the work execution.
  - a. Scheduled Project Start date (Execution): Feb,2018
  - b. Scheduled Project end date: Jan,2019
  - c. Actual Project Execution Date: Feb, 2018



- d. Actual Project Completion Date: July, 2019
- e. Status of work till last week of June: 90% of Work Completed.

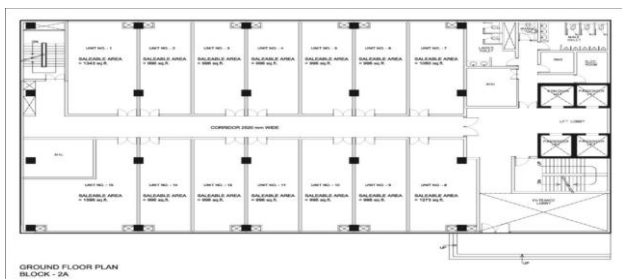


Figure 6.1 Site Plan of Everest Heights

The delays in project are identified by comparing actual time required to complete the activity v/s. estimated time required for completion of same activity. Similarly, the actual cost and estimated costs of various activities is compared to find out cost overrun for the project. In this project, the delays are identified in survey and levelling of site, in appointing architect and structural engineer, in finalising the design, in preparation of BOQ and specification, in excavation, RCC work and plastering and in the process of approval. The details explanation is given in the table presented below.

Further it is in this table,

ET= Estimated Time, AT= Actual Time QA=Qualitative Analysis

EC= Estimated Cost AC= Actual Cost

Sl. No.	Activity/Source of Delay	Causes of Delay	Reason Behind the Cause	Action Taken	Responsibility	Estimated Time	Actual Time	Effects of Delay			QA	Guidelines no.	Result of Guidelines	
								Time (Day)	Estimated Cost	Actual Cost				Direct Cost (%)
1	Survey & Levelling of Site	Non-availability of Equipments	Equipment Failure	Equipment Hiring	Contractor	7	12	5	35,000/-	60,000/-	25,000/-	TOR, COR	G19, G18	
2	Appointment of Architect & Structural Engineer	Internal Disputes	Rate Fixing Issues	Search for Right Architect & Civil Engineer & Awarding the Contract	Owner	7	10	3	-	-	-	TOR	G3, G4, G5	
3	Finalising Conceptual Design	Slow Decision Making Process	Unclear Objectives	Finalizing the Requirement & Conceptual Design	Owner	15	22	7	-	-	-	TOR	G3, G7	
4	Preparation of Specification & Bill of Quantity	Revisions in Quantities	Change in Scope of Work	Bill of Quantity worked out as per new scope	Owner	7	10	3	-	-	-	TOR	G6, G7, G44	
EXECUTION / CONSTRUCTION STAGE														
5	Clearance from Govt. Authority	Slow Approval from Municipal Corporation	-	-	Owner	45	75	30	-	-	-	TOR	G1, G2, G3, G4, G5, G6, G7, G8, G9, G10, G11	IF THE GUIDELINES WOULD HAVE BEEN FOLLOWED TO MINIMIZE THE DELAY TO ALL STAKEHOLDERS INVOLVED IN THE PROJECT IN ADVANCE, SO THAT PRECAUTIONARY ACTIONS TO MINIMIZE THE LOSS CAN BE TAKEN IN ADVANCE.
6	Excavation for Basement 1 Floor	Excavation Movement of Equipment	Congested Plot Areas	Excavation Carried out in Smaller Parts	Contractor	5	8	3	63,750/-	64,500/-	900/-	TOR, COR	G18, G19, G20, G21, G25	
7	RCC Slab Completion till 7th Slab	Interrupted Supply of RMC	Non-availability of cement since no enough space for material storage on site	Purchasing of cement from local supplier at higher rate.	Contractor	120	150	30	51,20,000/-	51,24,950/-	4,950/-	TOR, COR	G18, G19, G20, G21, G22, G23, G24, G25, G33	
8	Fixing of Door Frames	Changes in Size of Windows	Frequent Changes in Elevations of Building	Finalizing the Window Schedule	Contractor	15	20	5	2,88,000/-	3,45,800/-	57,800/-	TOR	G7, G5, G10, G26, G41	
9	External & Internal Plastering	Non-availability of skilled labour	Vacation of labours for festival which was not considered	Appointing local labours	Contractor	90	97	7	22,40,000/-	22,95,000/-	55,000/-	TOR, COR	G4, G25, G29, G44	
10	Fire Fighting	Slow Design Approval process of Fire fighting	-	-	Owner	30	45	15	-	-	-	TOR	G11, G13	
11	Economic Factors	Lack of Funds	Fluctuation in Market Value of Materials, Recession	Loan taken from Bank	Owner	30	40	10	-	-	-	TOR, COR	G4, G5, G8, G17	
						Total Effects on Time		123 Days	Total Effect on Cost		1,30,450/-			

Indirect Cost for the Project includes Overheads, Rate of Interest on Loan etc.

For 4 Months of Delay Indirect Cost is Rs. 1,66,48,000/- Total Cost overruns is inclusive of Direct Cost & Indirect Cost is Rs. 1,68,27,450/-

Application of guidelines to reduce delay:

- 1) Activity – Survey & levelling of site

Cause of delay – no availability of equipment’s

Reason behind delay – equipment failure

Guideline to be followed – G19,G18

G18 – Handle the equipment with care as well as clean & maintain the equipment regularly.

G19 – Make a provision for the alternate equipment or place an order in advance for hiring materials.

- 2) Activity – Appointment of architect & structural engineer.

Cause of delay – Internal disputes



Reason behind delay – Rate fixing issue.

Guideline to be followed – G3, G4, G5

G3 – Develop the Conceptual Design as per the project Requirement within the Scope of work.

G4 - Define the Objectives of the Project as well as freeze the Requirement at early stage.

G5 - Give fair idea to the owner regarding the revisions as per change in scope of work to avoid delay.

3) Activity – Finalizing Conceptual Design

Cause of delay – Slow Decision Making Process

Reason behind delay – Unclear Objectives

Guideline to be followed – G3, G7

G3 - Give fair idea to the owner regarding the revisions as per change in scope of work to avoid delay.

G7- Define the list of Specification and get it approved from the client before procuring.

4) Activity – Preparation of Specification & Bill of Quantity

Cause of delay – Revisions in Quantities

Reason behind delay – Change in Scope of Work

Guideline to be followed – G6, G7, G44

G6- Revise the Drawings and per the requirements & check the drawings for the relative errors.

G7- Define the list of Specification and get it approved from the client before procuring.

G44- All the activities including on-site construction & administrative must be carried out as per pre-defined critical path for handling over the completed site to the client

5) Activity – Clearance from Govt. Authority

Cause of delay – Slow Approval from Municipal Corporation

Reason behind delay – UN-KNOWN

Guideline to be followed – G1, G2, G3, G4, G5, G6, G7, G8, G9, G10, G11, G13

G1- Conduct Data acquisition to get correct information should be received from correct (Authorized) source regarding the Project.

G2-Prepare documents with accurate data filled therein which can form basis for the decision making.

G3-Develop the Conceptual Design as per the project Requirement within the Scope of work.

G4-Define the Objectives of the Project as well as freeze the Requirement at early stage.

G5-Give fair idea to the owner regarding the revisions as per change in scope of work to avoid delay.

G6-Revise the Drawings and per the requirements & check the drawings for the relative errors.

G7-Define the list of Specification and get it approved from the client before procuring.

G8-Prepare an accurate & detailed budgeting based on direct market survey.

G9-Draft the contract through skilful hands which is simple & comprehensive in nature.

G10-Develop the flexibility in the system of working to accommodate the possible changes within the framework of scope of work.

G11-Implement the Changes in design as per latest Development Control Regulations.

G13-Sufficient time must be allotted for approval from the locally authorized body.

6) Activity – Excavation for Basement Floor

Cause of delay – Critical Movement of Equipment

Reason behind delay – Congested Plot Areas

Guideline to be followed – G18, G19, G20, G21, G25

G18-Handle the equipment's with care as well as cleans and maintains the equipment's regularly.

G19-Make a provision for the alternate equipment or place an order in advance for hiring it.

G20-Planning & applying Miss-management information System.

G21-Must have proper temporary storage facility to protect materials from bad weather.

G25-Execute the Construction according to predefined work methodology & monitor the performance as per site conditions, climatic conditions, locally available materials etc.

7) Activity – RCC Slab Completion till 7th Slab

Cause of delay – Interrupted Supply of RMC

Reason behind delay – Non-availability of cement since not enough space for material storage on site

Guideline to be followed – G18, G19, G20, G21, G22, G23, G24, G25, G35

G18-Handle the equipment's with care as well as cleans and maintains the equipment's regularly.

G19-Make a provision for the alternate equipment or place an order in advance for hiring it.

G20-Planning & applying Miss-management information System.

G21-Must have proper temporary storage facility to protect materials from bad weather.

G22- Provide an effective work method with available facilities for handling materials.

G23-Utilize materials optimization. Use materials efficiently to reduce wastage.

G24-All clauses regarding procurement of materials must clearly defined.

G25-Execute the Construction according to predefined work methodology & monitor the performance as per site conditions, climatic conditions, locally available materials etc.

G35-Conduct comprehensive & careful selection of Suppliers which considers supplier's, daily capacity & material quality.

#### 8) Activity – Fixing of Door Frames

Cause of delay – Changes in Sizes of Window

Reason behind delay – Frequent Changes in Elevations of Building

Guideline to be followed – G5, G7, G10, G26, G41

G5-Give fair idea to the owner regarding the revisions as per change in scope of work to avoid delay.

G7-Define the list of Specification and get it approved from the client before procuring.

G10-Develop the flexibility in the system of working to accommodate the possible changes within the framework of scope of work.

G26- Revise the drawing as per the latest modifications & send the drawing to all related people involved as quick as possible.

G41-Add force majeure clause in contract to predict & anticipate unexpected conditions.

#### 9) Activity – External & Internal Plastering

Cause of delay – Non-availability of skilled labour

Reason behind delay – Vacation of labours for festival which was not considered while planning

Guideline to be followed – G4, G20, G29, G44

G4- Define the Objectives of the Project as well as freeze the Requirement at early stage.

G20-Planning & applying Miss-management information System.

G29- Prepare a schedule to carry out the site inspection on regular basis (Daily/Weekly) followed by reporting system.

G44-All the activities including on-site construction & administrative must be carried out as per pre-defined critical path for handling over the completed site to the client

#### 10) Activity – Fire Fighting

Cause of delay – Slow Design Approval process of fire fighting

Reason behind delay – UN-KNOWN

Guideline to be followed – G11, G13

G11-Implement the Changes in design as per latest Development Control Regulations.

G13-Sufficient time must be allotted for approval from the locally authorized body.

#### 11) Activity – Economic Factors

Cause of delay – Lack of Funds

Reason behind delay – Fluctuation in Market Value of Materials, Recession

Guideline to be followed – G4, G5, G8, G17

G4-Define the Objectives of the Project as well as freeze the Requirement at early stage.

G5-Give fair idea to the owner regarding the revisions as per change in scope of work to avoid delay.

G8-Prepare an accurate & detailed budgeting based on direct market survey.

G17-Monitor the Material procurement Schedule including terms & conditions of delivery.

### Conclusion after implementation in live project-

From the case study completed, the realization may be stated as the delays may be removed absolutely via taking required precautions or can be minimized by means of taking preventive moves inside the response. The effect of the delays in terms of fees escalation is large. There it's far important to discover methods to keep away from or minimize the delays in production of commercial constructing tasks.

## CONCLUSION

### 7.1 Introduction:

This bankruptcy talks approximately the output of the tasks research. Its gives the model displaying interdependency of reasons of delays and its impact with detail motives.

A assignment put off is subject matter of challenge in the construction industry. Delays can be minimized best when their causes are identifies. Knowing the motive of any particular put off in a production project is carried out inside the industrial constructing production quarter in India, the outcomes will also be applicable for comparable initiatives and its consequences on the projects from this studies can consciousness construction supervisor's attention to plot preventive actions to maintain the building construction venture on schedule.

Through the project research, interdependency of the motives of causes of postpone and their impact is formulated within the form of flowchart. The mission version gives information approximately motives of postpone, its impact and the associated pointers to be accompanied to decrease the feasible put off to all stakeholders involved within the mission earlier, so that precautionary movements to reduce the loss can be taken in advance. This model will be beneficial while planning the task sports for the undertaking managers.

### 7.2 Scope for further research:

The version can be formulated as a program in softcopy and launched on the website as a similarly development of this project studies. It can be used for the similar projects by means of tasks managers to limit the delay in construction of commercial building projects. As according to the venture

requirement, the date as of numerous sports and accountable stakeholder can be edited. The version offers the set of tenet for performing different sports, so that each one the stakeholders come to recognise their duty and appropriate motion could be taken by way of them to govern the undertaking.

Presently the model translates time overrun and cost overrun because the impact of postpone on business constructing projects. There may be a scope for growing inter-courting among reasons of put off and its impact in phrases of time overrun, price overruns in addition to great overrun.

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