Construction Delays



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4th Semester in Bachelor of
Architectural Technology and Construction Management

How can delays in construction be avoided, or – if they are not avoidable, what systems or procedures can be used to make sure that the actual responsibly for any delay is not in doubt.

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NOTE: This dissertation was completed as a compulsory student assignment in the 4th semester part of a Bachelor of Architectural Technology and Construction Management degree course–**no responsibility is taken for any advice, instruction or conclusion given within!**

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Abstract

This report has been written as a compulsory assignment in the 4th semester part of a Bachelor of Architectural Technology and Construction Management degree course.

This report discusses the phenomenon of Delays in construction, the main focus is on the project manager, and how he can handle them and the responsibility for them. To be a top project manager you have to be able to continuously analyse the project you are dealing with there are several ways to do so and in this report are given ways to accomplish better performance dealing with delays, recognize them in time and take action preventing them to happen.

Problem background

As a 4th sem. Constructing Architect student, I have to define research and document a specific aspect of the building and construction sector. I am specifically interested in the problem of delays in construction and feel that this could be a very relevant part of my future career as Constructing Architect.

In times of ever-intensifying competition in the construction business, communication and schedules' are becoming a bigger part of construction projects. Construction delays can sometimes be expensive and inconvenient for all parties involved. Previous experience has shown me that there are often problems and arguments between the contractor and the client about such delays with involved parties finding it difficult to agree about responsibility – especially who should be responsible for any increased work and cost of the delay.

Problem Statement

How can delays in construction be avoided, or – if they are not avoidable, what systems or procedures can be used to make sure that the actual responsibly for any delay is not in doubt.

Research questions

1. What specific management aids are available to help managing construction delays?
2. How are delays handled and managed in construction projects?
3. How is it possible to recover for construction delays?
4. Are ways to minimise the risk of delays to occur?
5. Who are responsible for delays?

Key Words

Construction, delays, planning, quality management, Construction management, Risk management, Critical path method, triple constraint, Gantt diagram,

Research methods

I am going to write this report by collecting information mainly from bocks; I am going to study some cases and use, district court web pages to do that.

Introduction

Construction is risky business. And while today's construction projects may be safer than they were in the past, the financial risks continue to be great. Today's constructions projects are bid under fierce competition with little margin and require the coordination of many trades under demanding conditions and challenging time frames. Often, everything does not go according to plan, and the parties to the construction Contract find themselves at odds. Many of the risks that Owners and Contractors face can affect construction time. And lost time in project may and can be staggering. While the management teams are able to analyse most factors related to change, the effect on construction time remains difficult to understand and measure in detail. This is true despite the fact that the construction process has employed "modern" scheduling techniques for nearly half a century. More surprisingly, even though the power and capabilities of scheduling software have increased considerably in recent years, identifying and accurately quantifying construction delays continues to challenge even the best Project Managers.

This report addresses the topic of construction delays, the result effects, and damages.

All construction industry professionals should know the basic types of delays and understand the situations that give rise to entitlement to additional compensation. Most important, they should understand how a Project schedule and Project documentation can be used to determine whether a delay occurred, quantify the delay, and assess the cause of the delay. Furthermore, construction professionals should be able to assess the delay's effects on the Project and quantify any costs or damages.



Figure 1 Triple constraint

The Triple Constraint involves making trade-offs between particular things such as time, cost and scope of a specific project. It is inevitable in a project life cycle. The variables are constantly changing, if you change one you must change the other.

Planning a project

Project schedule

Scheduling is an inexact process in that it tries to predict the upcoming project. While it is not possible to know with certainty how long a project will take, there are techniques that can increase likelihood of being close. If the schedule is close in planning and estimating, it is possible to manage the project to achieve the schedule by accelerating some efforts or modifying approaches to meet required deadlines.

One key ingredient in the scheduling process is experience in the project area; another is experience with scheduling in general. In the construction industry, there is a body of knowledge that associates the accomplishment of known work efforts with time duration. In some cases, there are books recording standards for use by cost and schedule estimators.

When preparing a schedule estimate, consider that transition between activities often takes time. Organizations or resources outside direct control may not share sense of schedule urgency, and their work may take longer to complete. All external dependency relationships should be handled as a risk in the project. Uncertain resources of talent, equipment, or data will likely result in extending the project schedule.

Failure to meet schedule goals is most often due to unrealistic deadlines, passive project execution, unforeseen problems, or things overlooked in the plan and lack of detail.

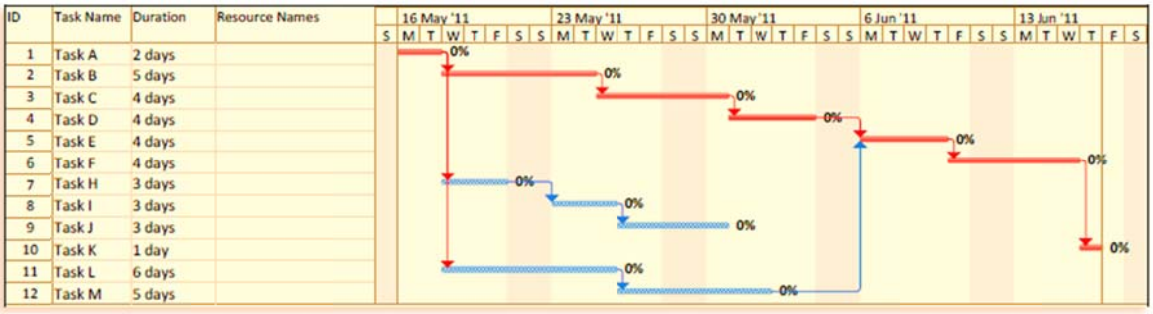


Figure 2 Gantt diagram

Most of the planning software available on the market defines the critical path in the project automatically, in this example the critical path are marked with red bars, the blue bars are the slack in the project.

Resource Levelling

Projects will often be confronted by time and organizational constraints that limit their ability to obtain human resources. Sometimes staff can be supplemented through temporary help from technical service agencies. When staffing requirements are identified and constraints are understood, work plans can sometimes be adjusted to fit requirements to available resources.

Resource scheduling is one of the greatest challenges for projects without access to large organizational or job-market resource pools. Project planning should address such issues as redundancy of critical resources, resource capacity, bench strength in vital areas, and contingency plans to handle departures of key personnel.

Most of the popular project management software packages enable the project resource planner to assign staff to project tasks, display resource requirements profiles, and adjust the schedule of slack tasks so resource requirements more closely fit those available in the organization. Some packages can display multiple project resource requirements to facilitate organization-wide resource management, optimization, and levelling. Individual project requirements may be adjusted by manipulating schedule slack in tasks not on the critical path. This can facilitate allocation and levelling of staff throughout the organization.

Unless one person is working on each task full time, the schedule duration on the Gantt chart will not be the same as the effort required. Effort requirements will drive project cost, but durations will drive the schedule. These distinctions are helpful when reconciling project and resource schedules.

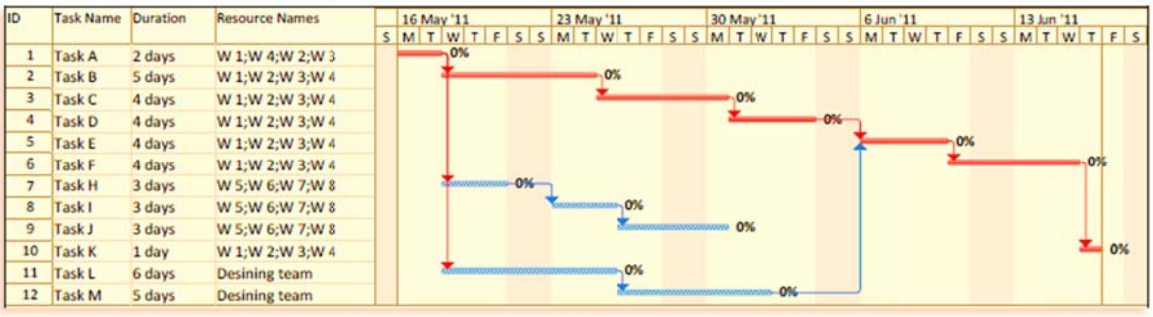


Figure 3 Gantt diagram with resources

"Crashing" the Schedule

Efforts to accelerate a project schedule are commonly grouped under the term "crashing" the schedule. Maybe this term was coined to suggest that there is always some price for driving a project to completion sooner than normal. There are a number of ways to improve the schedule when project are needed sooner or time for tasks in the project takes more time than expected, so that the upcoming tasks are needed to level out the schedule to meet the deadline for the project.

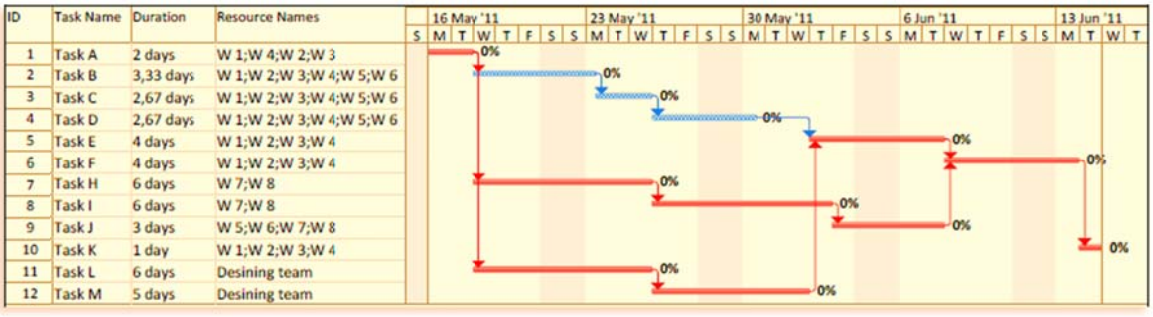
- Add people to the schedule. Additional staff must be added early in a project or they will slow it down while learning the ropes. If you add people, you may also need to add staff for supervision and coordination, so staffs is fully applied.

- Improve productivity and work longer hours. A good team atmosphere with management support can help make this happen. Without positive nourishment of this process, you could lose your team to attrition.

- Review schedule dependencies and look for opportunities to overlap tasks or make serial tasks concurrent or parallel activities. This requires greater coordination and sometimes involves increased risks which need to be managed carefully.

- Review the project scope and remove or delay features or functionality from the project critical path.

- Consider innovative approaches such as a different development methodology, alternative technologies, or out-sourcing options.



ID	Task Name	Duration	Resource Names
1	Task A	2 days	W 1;W 4;W 2;W 3
2	Task B	3,33 days	W 1;W 2;W 3;W 4;W 5;W 6
3	Task C	2,67 days	W 1;W 2;W 3;W 4;W 5;W 6
4	Task D	2,67 days	W 1;W 2;W 3;W 4;W 5;W 6
5	Task E	4 days	W 1;W 2;W 3;W 4
6	Task F	4 days	W 1;W 2;W 3;W 4
7	Task H	6 days	W 7;W 8
8	Task I	6 days	W 7;W 8
9	Task J	3 days	W 5;W 6;W 7;W 8
10	Task K	1 day	W 1;W 2;W 3;W 4
11	Task L	6 days	Desining team
12	Task M	5 days	Desining team

Figure 4 Crashing the Schedule

In figure 4 changes have been made on the resources the critical path have changed and the delivery date has moved forward by 2 days without adding extra labour to the project,

this is done by taking an advantage of the slack in the project. In this situation the number of critical task has increased, by doing that also risks in the project have increased.

Risk Management

Defining Risk Management

Beyond basic project planning, risk management also involves specific planning for risk. Risk planning begins by reviewing the initial project assumptions. Project charters, datasheets, or other documents used to initiate a project often include information concerning risk, as well as goals, staffing assumptions, and other information. Any risk information included in these early project descriptions is worth noting; sometimes projects believed to be risky are described as such, or there may be other evidence of project risk. Projects that are thought to be low risk may involve assumptions leading to unrealistically low staffing and funding. Risk planning builds on a foundation that is consistent with the overall assumptions and project objectives. In particular, work to understand the expectations of the project stakeholders, and adopt an approach to risk management that reflects your environment. (Kendrick, 2009)

Risk management plan

For small projects, risk planning may be informal, but for large, complex projects, you should develop and publish a written risk management plan. A risk management plan includes information on stakeholders, planning processes, project tools, and metrics, and it states the standards and objectives for risk management on your project. While much of the information in a risk plan can be developed generally for all projects in an organization, each specific project has at least some unique risk elements.

A risk plan usually starts by summarizing your risk management approach, listing the methodologies and processes that you will use, and defining the roles of the people involved. It may also include information such as definitions and standards for use with risk management tools, the frequency and agenda for periodic risk reviews, any formats to be used for required inputs and for risk management reports and requirements for status collection and other tracking. In addition, each project may determine specific trigger events and thresholds for metrics associated with project risks, and the budgets for risk analysis.

Managing risks in project is imperative for its success. We need to have a process (or processes) in place for risk management to be effective. Here are the five steps project manager can use for risk management:

- Identify Risks – Identify risks that affect the project (positively or negatively) and documenting their characteristics

- Assess & Analyse Risks - Assess the risk impact, Analyse the probability of risk occurrence and prioritize the risks, numerically analyse the effect of identified risks on project objectives (usually on cost, schedule and scope targets)

- Plan Actions – Explore all the possible ways to reduce the impact of threats. Plan actions to eliminate the risks. Action plans should be appropriate, cost effective and realistic.

- Monitor & Implement the Action – Track the risks throughout the project. If risks occur then implement the risk strategy based on action plan. If mitigation strategy is selected, execute the contingency plan based on risk triggers. In case contingency plan fails, execute fall-back plan.

- Measure the effectiveness & Control the risk impact - Measure the effectiveness of the planned action and controlling the risk impact by understanding risk triggers & timely implementation of planned actions. (Pritchard, 2005)

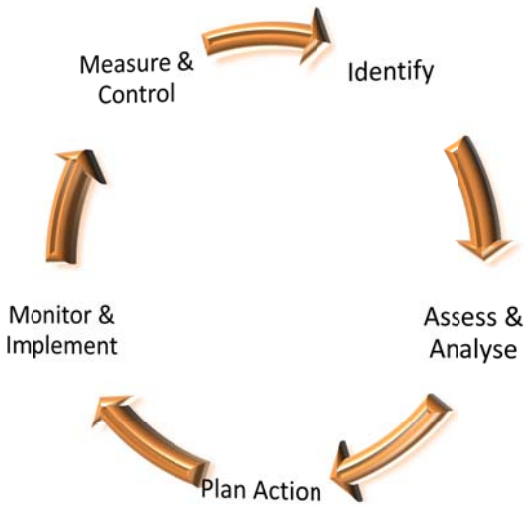


Figure 5 Risk management process

Risk management processes are cyclic which starts from identification of a risk and it may result in identification of another new risk.

In Time decisions

Tracking and measuring the Project's progress, a properly maintained Project schedule will enable the parties to identify and deal with unexpected issues as they arise. When a problem is encountered that may delay some element of the Project, the Project participants can use the Project schedule as a tool to predict the effect of the delay on the completion of the overall Project. In addition to predicting the effect of the problem, they can also decide on an appropriate course of action to deal with the problem, which may include accelerating the work, relaxing Contract restrictions to more quickly advance the Project, or deleting work items. This ability to predict and deal with a problem that may delay the Project before it actually does so is perhaps a Project schedule's most valuable attribute.

Project delays

Defining delays

On construction projects, as well as on other projects where a schedule is being used to plan work, it is not uncommon for delays to occur. It is what is being delayed that determines if a Project or some other deadline, such as a milestone, will be completed late. Before any discussion of delay analysis can begin, a clear understanding of the general types of delays is necessary.

There are four basic ways to categorize delays: (Trauner, 2009)

- Critical or noncritical
- Excusable or no excusable
- Compensable or no compensable
- Concurrent or no concurrent

In the process of determining the effect of a delay on the Project, the analyst must determine whether the delay is critical or noncritical.

All delays that are identified in the analysis will be either excusable or no excusable. Delays can be further categorized into compensable or no compensable delays. This chapter provides basic definitions of these types of delays.

In any analysis of delays to a Project, the primary focus is on delays that affect the progress of the entire Project or that are critical to the project completion. Many delays occur that do not delay the Project completion date or a milestone date. Delays that affect the Project completion, or in some cases a milestone date, are considered critical delays, and delays that do not affect the Project completion, or a milestone date, are noncritical delays.

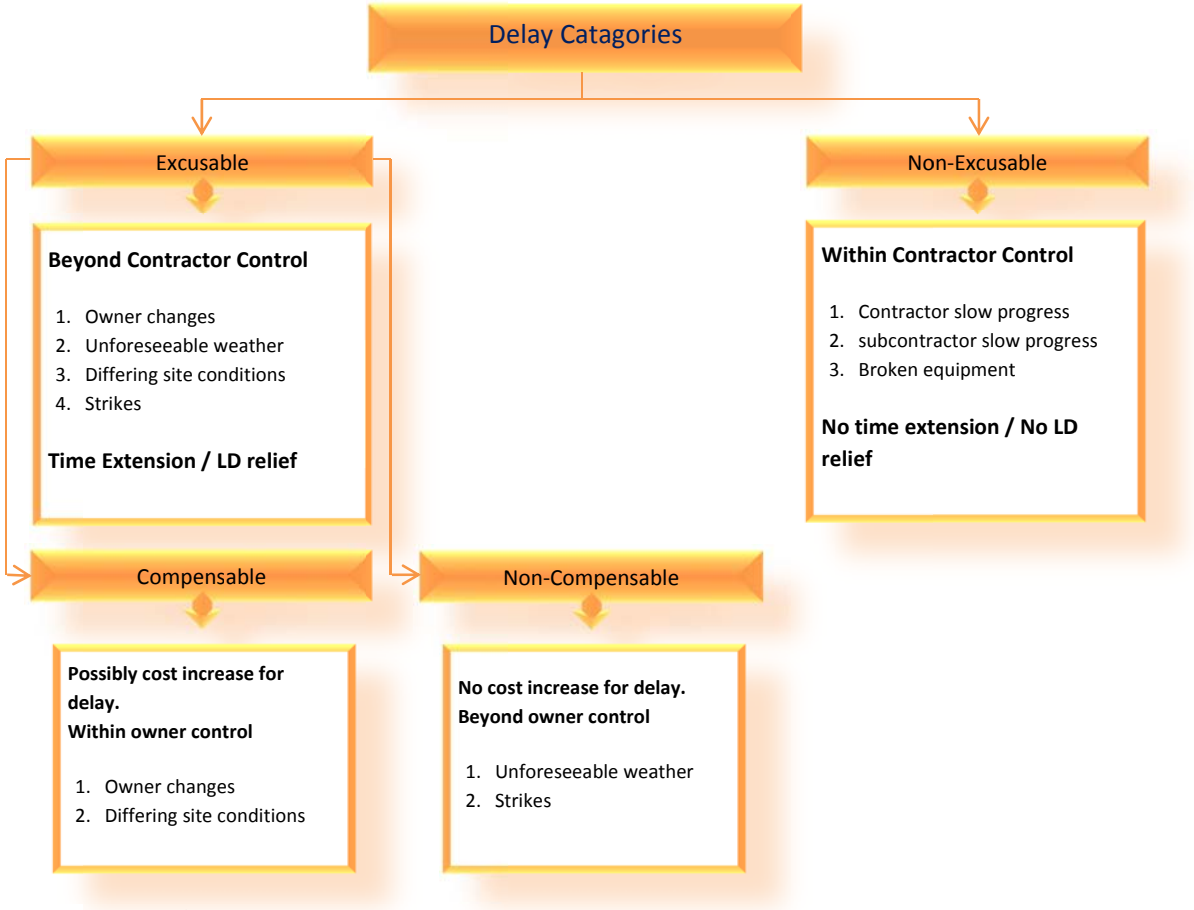


Figure 6 Types of construction delays

Determining which activities truly control the Project completion date depends on the following:

- The Project itself
- The Contractor's plan and schedule (particularly the critical path)
- The requirements of the Contract for sequence and phasing
- The physical constraints of the Project—how to build the job from a practical perspective (Trauner, 2009)

Extensions of time

Just when you thought you knew all there is to know about how to prepare or analyse extension of time (EOT) claims, identify critical paths in programmes, and support your conclusions with well-reasoned arguments supported by the facts, something new comes along. Over the past 20 years extension of time methodologies have grown more sophisticated. (Gibson, 2008)

Awarding extensions of time under a construction contract ought to be easy. Usually the contractor notifies of a delay and the reason for it. The contract administrator reviews the application and, if they believe it to be the result of a 'relevant event', they award a fair and reasonable extension of time and fix a later date for completion of the project.
Due to the dynamic and often complex nature of a construction project, the simple 'short-cut' method of delay analysis has proved to be inappropriate for anything other than providing a relatively informed feel for what happened. Previous experiences of various authors and observations by other investigators indicate the wide spectrum of EOT assessment and analysis approaches/techniques adopted or adapted by various contractors and consultants at different times; but also the lack of consensus on any suitable approach. (Gibson, 2008)

Liability

Liability depends of the construction contract and the facts of each particular case. The contract may exempt the owner from liability for certain kinds of delay. A close examination of the facts may reveal that a third party is responsible for the delay, or that the delay should not have prevented the contract from being completed on time. Given these variations one must examine the circumstances of each case closely. If one bears this in mind, and the principle that there are exceptions to any rule, it is possible to delineate some general guidelines about liability. In the absence of contractual terms to the contrary, an owner will generally be liable to a contractor for delay caused by:

- The owner's failure to give the contractor timely and exclusive possession of the site
- The owner's unauthorised interference with the contractor's work
- Changes arising during the course of construction (i.e. as a result of design changes, or poor contract documents)
- Unanticipated subsurface conditions
- Financing problems
- The actions of other contractors hired by the owner
- Failure to make progress payments when due

Similarly, in the absence of any contractual terms to the contrary, a contractor will usually be liable to an owner for delay arising out of:

- The repair of deficient work for which the contractor is responsible
- The contractor's failure to obtain permits in a timely fashion
- Labour disruptions
- Late performance by a subcontractor
- Late delivery and installation of materials

A general contractor may also be liable to a subcontractor for delay. Contractor could be in some cases liable if it fails to take all reasonable steps to make the site available to the subcontractor, and the subcontractor's work is delayed as a result. Contracts which provided that the subcontractor's work would be done "as directed", "as required" or "when notified" by the contractor have been held to protect a general contractor from such liability.

Case study

The case

On 16 March 2005 two parties made an agreement that the defendant built a 138.56 m^2 house for applicants. The Agreement between the parties notice what drawings should be used to build the house and there was also a noted who designed the structural part of the house. The first article stated that the contractor developed all drawings, unless the local plan and work of engineering support and the site plan. Then the agreement said. The Contractor shall build the house in his workshop, arrange transport and get it on the foundation that he will construct. The buyer pays a fee to the local authorities for telephone, cold and hot water and electricity as well as the building permit. Buyer pays for digging the ground and filling into the foundation, the contractor is responsible for measuring and setting out the house. Also the plaintiff shall make the site in order so it will be possible to arrange the prebuilt house on its foundation. In the third Article of the agreement it is noted that the house should be completed for delivery 15th October 2005. Daily fines should be calculated after 30 November 2005. 13,500 ISK, for each calendar day.

Plaintiff states that Defendant has not delivered the house on time, but that he delivered the 28th February 2006 or 134 calendar days by the agreed delivery date. In a statement the defendant stated that the house was delivered 27th February 2006.

Case reasons and legal grounds

Plaintiff claims that the defendant was, in accordance with Article 3 in the agreement, responsible for that the house should be completed on the 15th October 2005. If the delivery would not take place at the right time should the defendant pay the plaintiff 13,500 ISK in fines for each calendar day after 30 November 2007. Applicants claim that the contract has been done very carefully for dates. Defendant representative was made aware that the Plaintiff stated very strongly that the house should be delivered at the agreed time. Provisions for fines have been set in the agreement in order to ensure

delivery of the house on time. Applicants noted that the defendant representative was construction manager of the building and fully managed the building.

The defendant case is based on that the applicants are mostly to blame for the delivery of the building could not be 15th October, as had been agreed on. Impossible has been to bring the building into place until the 25th January 2006. Agreement has laid down mutual obligations. So has it been the responsibility of the plaintiff to obtain site plan, providing building permits and pay building permit fee, arrange and pay for excavation of the ground and filling, arrange of the plot so they could bring the house on the foundation, to choose with reasonable notice the fixtures, flooring, etc. None of these duties applicants have met and the defendant has not been able to deliver the house at the agreed time, because of this reasons. Defendant assumes that the omission of the plaintiff has been impossible to fulfil its obligations under the Agreement. Defendant argues that there has been a prerequisite for the provision of daily fines would be effective; the applicants fulfil its part of the agreement, in a reasonable manner and with reasonable notice. The defendant also raises the claim that the applicants had not proven that they have suffered damage; but that an individual has suffered damage is essential to be able to claim compensation.

Conclusion

It is undisputed that defendant had delivered plaintiff's house 28th February 2006 or 134 calendar days after the agreed delivery date. Plaintiff's claims for payment of fines, based on 3rd Article in the agreement and they do not prove that they have suffered damages due to delay which occurred in the delivery date of the building, but they may levy fines in accordance with the article regardless of the damage they may have suffered. Court agrees therefore not on the arguments presented by the defendant that the applicants have not proven their claims. Currently following, whether the plaintiff did not fulfil its part of the agreement, which could order that the defendant was able to properly deliver the house as agreed. For the Court the parties did controversies for this. On behalf of the plaintiff was alleged that they had done everything they required, had an obligation to immediately as there was reason to. It must take as a basis that the agreement is in principle prepared by representative of the defendant, but the provisions for fines will be from the plaintiff. Defendant representative told the court that he had built several houses similar to those applicants purchased, the defendant alleged to have been controlling the construction agreement. Was the Defendant but his representative was construction manager for the building responsible to make the plaintiff realized that if their omission led to the delivery of the building was delayed. He would also have to notice the plaintiff clearly if he felt that the plaintiff should be responsible for perform certain tasks that it is unclear from agreement which he was supposed to take care of, so

as to obtain building permits. Defendant has presented no data that he had made the plaintiff aware of the omission of which would delay the delivery but the Defendant must bear the deficit of not having secured the evidence for this. For this reason, must take into account the plaintiff's claim.

Judicial decision

The defendant pays the plaintiff, 1,201,500 ISK plus penalty interest under the first paragraph. 6. Article. Act. 38/2001 on Interest as indexation from 28 February 2006 to the payment date.

The defendant pay the plaintiff 350,000 ISK including VAT in legal costs. (Halldórsson)

Study

In this case the contractor claims that the client are more than less responsible for the delays of the project, that may be right, but however the contractors responsibility for documenting the project maintaining the schedule and inform the relevant party's about the work process has failed. If there has been schedule for the project and delays have been documented clearly in project files the contractor could have been able to avoid this case from the district court and claim that the delays have been on the client responsibility. This case is not the only one I have read regarding this report there are more cases in recent years that has riced regarding delays in construction, and in some of them the judicial decision has felled the other way. When I read this one it was obvious that the client was not a professional in construction and did not have a professional representative, maybe the judge has taken that into a consideration. If the cases I read felled the other way or not as clearly into the client way usually there was a professional in both parties. It is then regarding to this in both parties responsibilities ensure that the schedule for the project are maintained and followed.

Conclusion

For project managers in construction the planning is one of the most critical tasks to make. By planning them in detail they could use the method demonstrated in this report and are called "critical path method". By doing so they are able to recognise the delays as they occur in the project and they can analyse them, document and take action to recover from them. Besides the obvious way to recover delays, just to add more resources to the project, there are other ways to do so; how it is done I have tried to answer in the report. I have point out the liability and methods to point out responsibility for the fact that there are different factors that trigger the delays in project. There are also in this report demonstrated how to use aids and theory's to minimise the risk of delay.

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Figure 7 Time is money. Source: http://www.constructionlawtoday.com