1

Outline

1. Outline & Learning Objectives
2. Case Study Project – Heritage Precinct for Nelson Mandela
3. Delays – The Basics
   - What is a construction delay?
   - What is a construction disruption?
   - Types of delay
4. Predominant Causes of Delay
   - Results of 17 international research studies on delays
5. Delay Analysis
6. Management of Delays
   - Delay prevention & mitigation
7. Conclusion

2

Learning Objectives

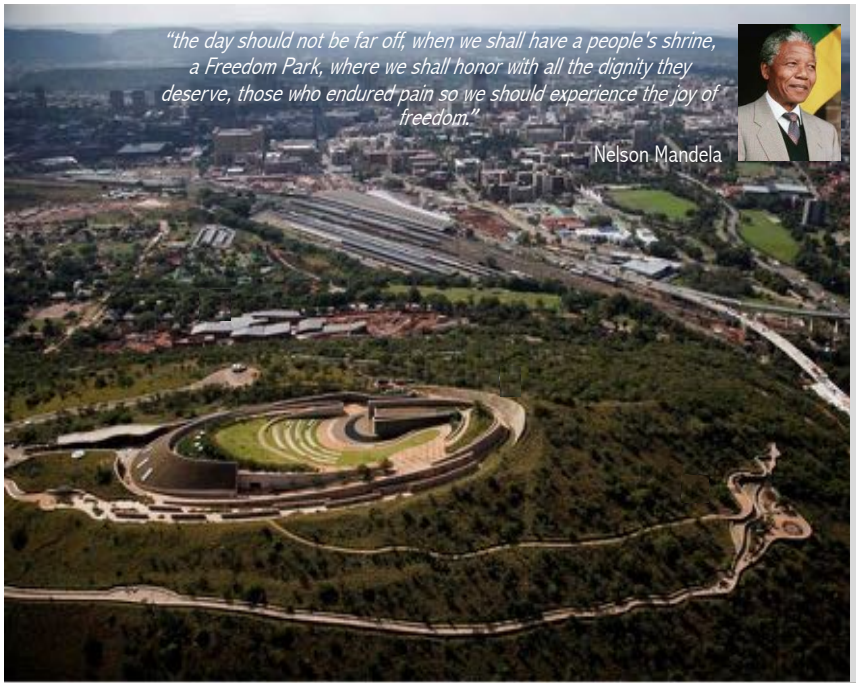
LEARNING OBJECTIVES

1. A better understanding of the basic terminology utilized in the analysis of construction delays
2. Increased knowledge of the predominant causes of delay
3. A basic understanding of Delay Analysis
4. Understanding of methods to prevent & mitigate delays

3

Case Study Project

4



5

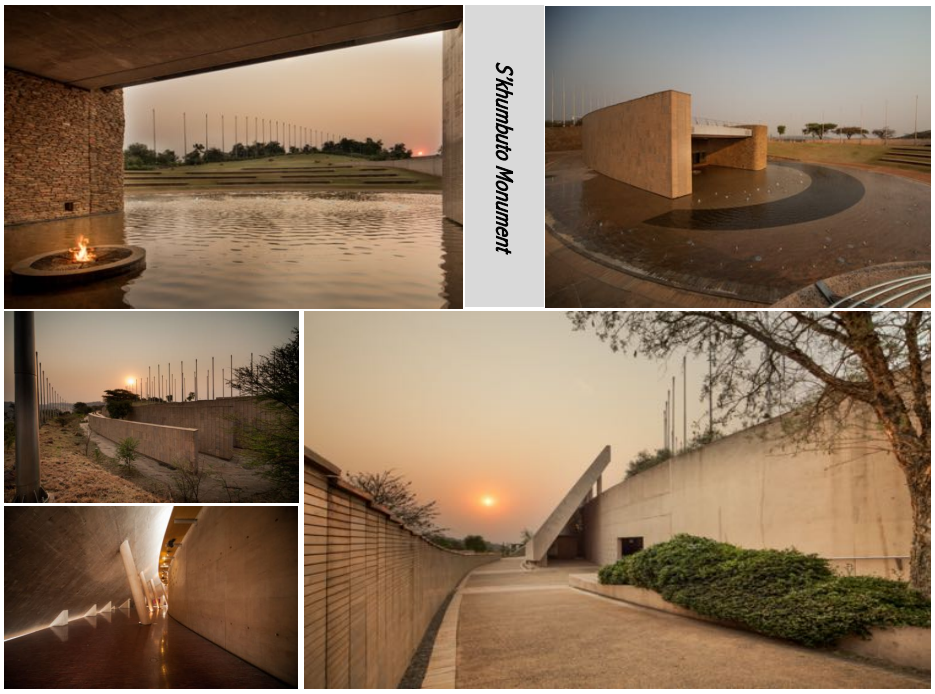
S'khumbuto Monument

Main elements:

- The 2 300 feet Wall of Names
- The Gallery of Leaders
- The 2 000-seat Amphitheatre
- The Sanctuary & Eternal Flame
- The 200 Reed sculptures, some reaching 105 feet

Cost:
$236 million

6


S'khumbuto Monument

7


Outdoor Museum:
The garden space was designed in such a manner to function as an extension of the museum with outdoor exhibitions area integrated in the landscape.

8

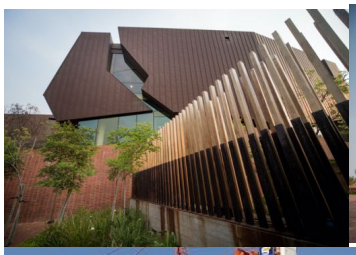
"Freedom Park will for all time be a tribute to and symbol of the constant quest for the total liberation of body, mind and soul with a freedom as infinite as time and space"

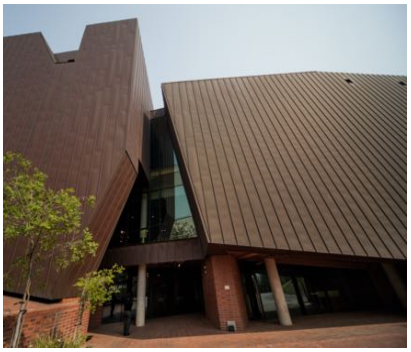
Thabo Mbeki, president of South Africa

Cost: $230 million

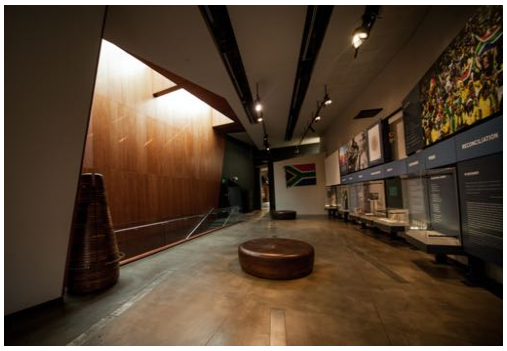
I Hapo Museum & Pan African Archive

9





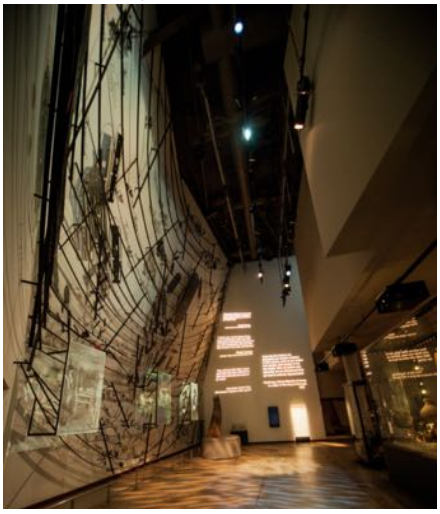
10



Exhibition:

7 epochs

3.6 billion years



11

Delays – The Basics

12

Construction Delay

WHAT IS A CONSTRUCTION DELAY?

- To cause something to be carried out or provided later than planned.
- In the context of building contracts, the term ' delay ' is typically used to indicate that the work is not progressing as intended, or according to the schedule.
- Generally, it means that completion of the work may not be achieved by the date specified in the contract documents (Chappell, Dunn & Cowlin, 2009).

13

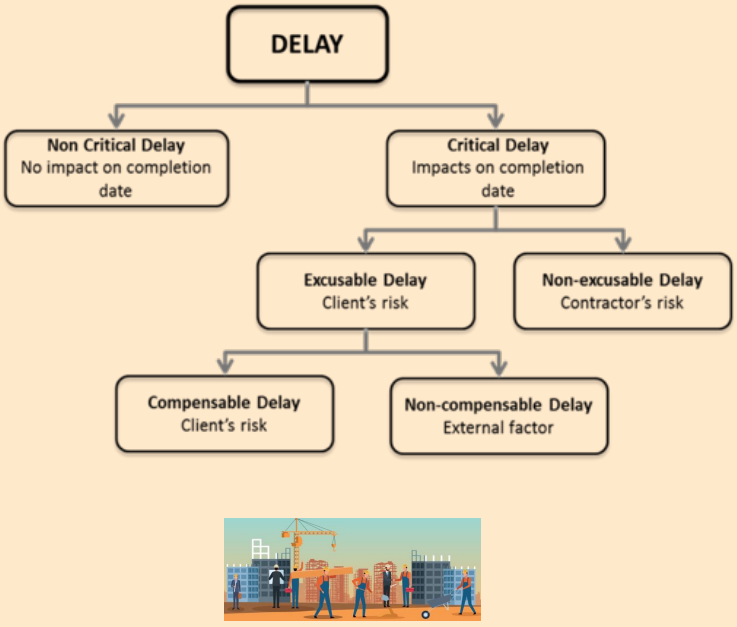
Construction Disruption

WHAT IS A CONSTRUCTION DISRUPTION?

- The ordinary meaning of disruption is 'violent destruction or dissolution '.
- Despite having completed on time, the contractor may have incurred additional costs, for which he is entitled to be reimbursed over and above any value of the instruction. In all such cases, it is necessary for the contractor to prove the loss and/or expense incurred as the consequence of a unavoidable disruption (Chappell *et al.*, 2009).
- A claim for disruption costs can be distinguished from a claim for prolongation costs; in that a disruption claim can be legitimately made – even though the works were completed in time

14

Types of Delays



15

Excusable Delays

EXCUSABLE DELAYS

WHAT IS A NON-EXCUSABLE DELAY?

- A non-excusable delay is defined as a delay caused by the contractor, or any aspect that is within the sphere of control of the contractor.
- The contractor would not be entitled to any additional time or compensation for this type of delay (Tumi, Omran & Pakir, 2009).

WHAT IS AN EXCUSABLE DELAY?

- An excusable delay is a delay caused by either of the following two factors:
  - Third parties or incidents beyond the control of the client and the contractor; and
  - The client or the client's agents.

16

EXCUSABLE DELAYS?

1. New construction regulations necessitate the re-design of a building component delaying the completion of the project by 2 weeks.
2. The presence of significant levels of ground water delay the basement excavation with 10 days. The geotechnical report made available at bidding stage opined that little to no ground water would be present.
3. The owner instructs the general contractor to appoint a specific plumber as sub-contractor. The plumber has limited resources available and his slow progress cause a 3 week delay.
4. The breakdown of a critical peace of equipment of the earthworks sub-contractor cause a 5 delay.

Excusable Delays

17

EXCUSABLE DELAYS – AIA: A201 (2017)

Clause 8.3.1

If the Contractor is delayed at any time in the commencement or progress of the Work by:

1) *An act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor;*
2) *By changes ordered in the Work;*
3) *By labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with section 15.1.6.2, or other* ***causes beyond the Contractor's control****;*
4) *By delay authorized by the owner pending mediation and dispute resolution;*

Excusable Delays

18

EXCUSABLE DELAYS – FIDIC (red book)

Excusable Delays

Clause 8.4.

The Contractor shall be entitled, subject to Clause 20.1 [Contractor's Claims], to an extension of the time for completion if and to the extent that the completion for the purposes of clause 10.1 [Taking-Over of the Works and Sections] is or would be delayed by any of the following causes:

a) *A variation (unless an adjustment to the Time for Completion has been agreed under clause 13.3 [Variation Procedure]), or other substantial change in the quantity of an item of work included in the contract;*
b) *A cause of delay, giving an entitlement to extension of time under a clause of these conditions;*
c) *Exceptionally adverse climatic conditions;*
d) *Unforeseeable shortages in the availability of personnel or goods caused by an epidemic or governmental actions; or*
e) ***Any delay, impediment or prevention, caused by or attributable to the employer, the employer's personnel, or the employer's other contractors.***

19

CRITICAL DELAYS

Critical Delays

The criticality of a delay can be defined as follows in terms of the ultimate impact on completion:

- *Critical delay* – a delay on the critical path of the project, and as a result the final completion date of the project would be delayed; and
- *Non-critical delay* – a delay that is not on the critical path, and would therefore, not impact the overall completion date. (Ndekugri *et al.*, 2008)

20

Critical Delays

CRITICAL DELAYS – AIA: A201 (2017)?

Clause 8.3.1

If the Contractor is delayed at any time in the commencement or progress of the Work by….

CRITICAL DELAYS – FIDIC (red book)

Clause 8.4.

*The contractor shall be entitled subject to clause 20.1 [contractor's claims] to an extension of the time for completion if and to the extent that **completion** for the purposes of clause 10.1 [taking-over of the works and sections] is or **will be delayed** by any of the following causes….*

21

Compensable Delays

COMPENSABLE DELAYS

Compensation will have to be considered if a delay is found to be excusable; and it should be established whether the delay can be defined as follows:

- Non-compensable delay:
  - An excusable delay caused by factors beyond the control of the client and the contractor.
  - Although most forms of contract make provision for the extension of the contract-completion date, the contractor will not receive compensation from the client; and
- Compensable delay:
  - An excusable delay caused by the client or the client's agents. The contractual completion date will be extended; and the contractor will receive compensation from the client (Tumi et al., 2009).

22

COMPENSABLE DELAYS?

1. New construction regulations necessitate the re-design of a building component delaying the completion of the project by 2 weeks
2. The presence of significant levels of ground water delay the basement excavation with 10 days. The geotechnical report made available at bidding stage opined that little to no ground water would be present.
3. The owner instructs the general contractor to appoint a specific plumber as sub-contractor. The plumber has limited resources available and his slow progress cause a 3 week delay.
4. The breakdown of a critical peace of equipment of the earthworks sub-contractor cause a 5 delay.

Compensable Delays

23

DELAY CLAIMS – CONTRACTUAL COMPLIANCE

- Two main categories:
  1. Clauses dealing with the notification of a possible delay; and
  2. Clauses dealing with the claim itself.

AIA: A201 (2017)

15.1.3. Notice of Claims
§ 15.1.3.1 Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

15.1.6 Claims for Additional Time
§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

Contractual Compliance

24

DELAY CLAIMS – CONTRACTUAL COMPLIANCE

The construction of the new multi-story office building was on programme until the contractor lost time on the main 3rd floor slab of the building, a critical activity.

- The information delivery schedule approved by all (with the construction schedule) provided for the slab design to be issued on September 12, 2016.
- The programme provided for the concrete work on the slab to commence on September 19, 2016.
- The structural engineer only issued the slab design to the contractor on September 16, 2016.
- The casting of the slab commenced on October 4, 2016 and the slab was completed on 10 October 2016.
- The notification of delay was submitted on October 4, 2016.
- Notes:
  - Sep 12 to Oct 4 (22 days)
  - Sep 16 to Oct 4 (18 days)
  - Sep 19 to Oct 4 (15 days)

Did the contractor comply to the contractual provisions in terms of clause **15.1.3.1**?

Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

Contractual Compliance

25

Predominant Causes of Delay

26

Causes of Delay

EXCUSABLE DELAYS

What is the predominant causes of delay in construction projects?

Is there a level of commonality in the main causes of construction delays internationally?

INTERNATIONAL RESEARCH

Findings of 17 independent studies on delays conducted in 16 different countries to answer these questions.

27

Causes of Delay

CAUSES OF DELAYS

Assessment of research studies done in:

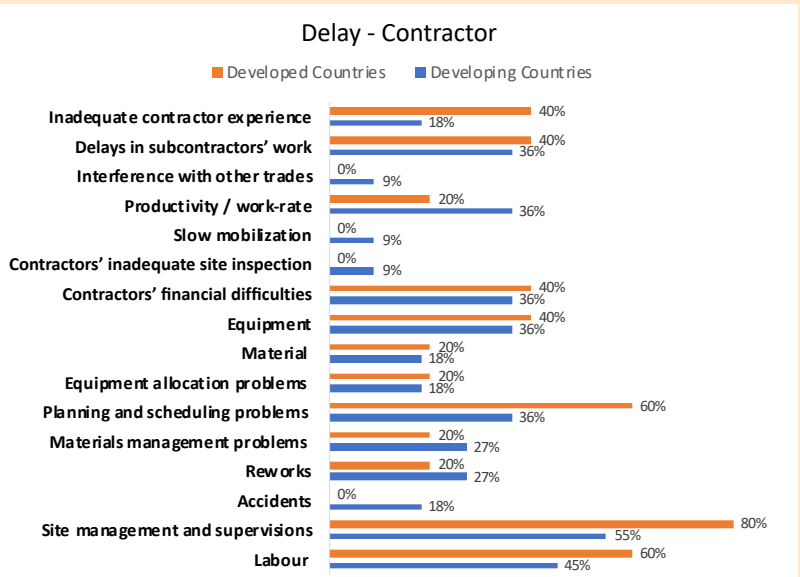
- United States
- Norway
- New Zealand
- Cambodia
- Saudi Arabia
- Hong Kong
- Egypt
- Malaysia
- Turkey
- Indonesia
- Thailand
- India
- Jordan
- Nigeria
- South Africa
- Botswana

Three main categories:

- Contractor delays,
- Client delays and
- External factors – where neither the contractor, nor the client are directly responsible for the delay.

28

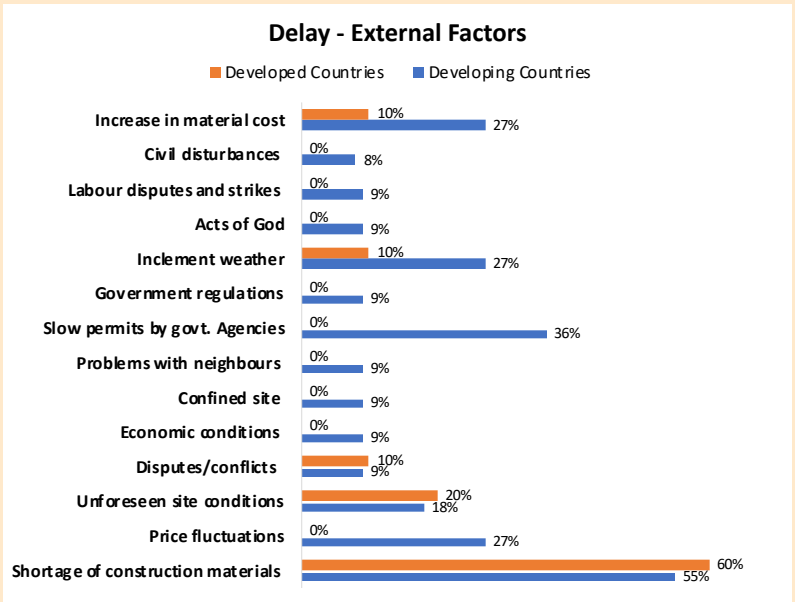
CAUSES OF DELAYS - CONTRACTOR



Causes of Delay

29

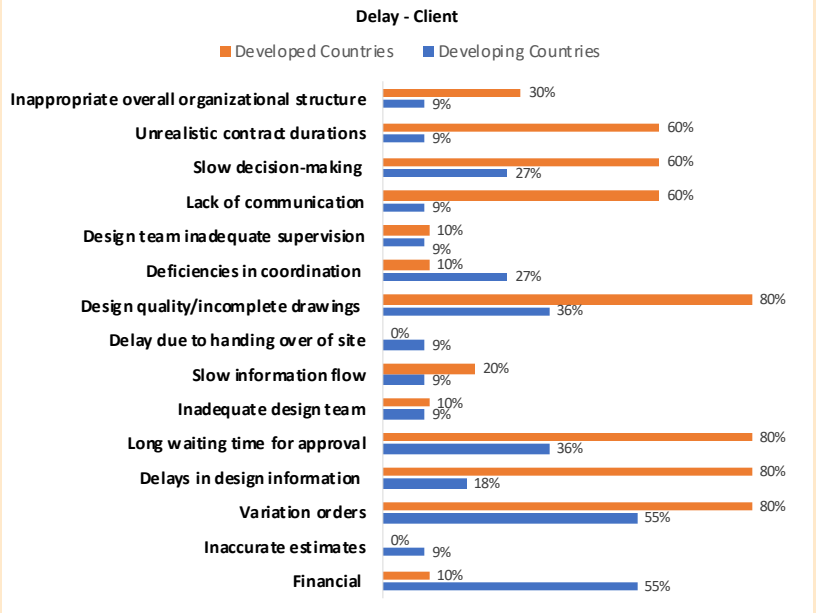
CAUSES OF DELAYS – EXTERNAL FACTORS



Causes of Delay

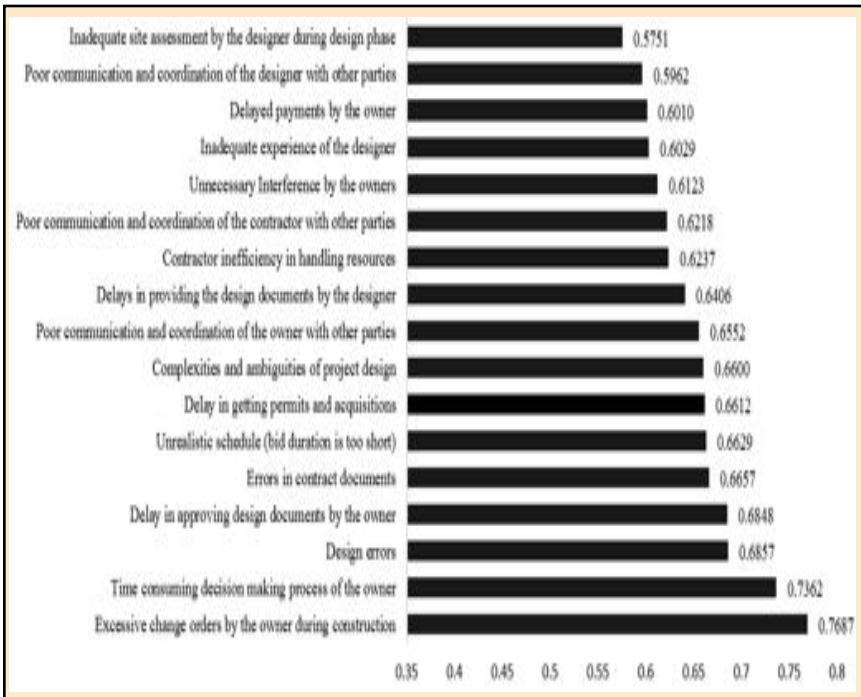
30

CAUSES OF DELAYS - CLIENT



Causes of Delay

31



Mohammadsoroush Tafazzoli Ph.D. Candidate, LEED AP , and Pramen P. Shrestha Ph.D, PE

Causes of Delay - USA

32

Delay Analysis

33

Cost: $390 million

176 Notifications of delay

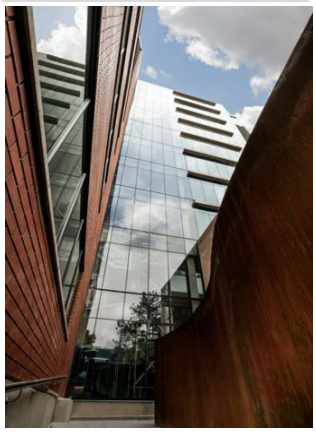
40 Extension of Time Claims

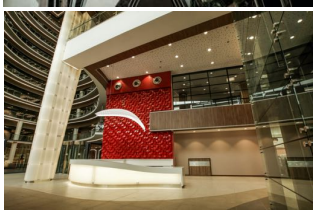
229 Days EOT awarded
($15 million)

New Head Office for the National Department of Public Services

"This prestigious building will be a towering feature of Pretoria's Inner City Regeneration programme and hopes to serve as a catalyst for further sustainable urban development in the area."

Pretoria News





34

Common Delay Analysis Method

	Common name	Alternative names
Non-CPM based techniques	S-Curve	Dollar-to-Time Relationship
	Global Impact technique	
	Net Impact	Bar chart analysis As-built bar chart
CPM Based technique	As-planned vs As-built	Adjusted as-built CPM Total time Impacted as-built CPM
	As-Planned but for	
	Impacted As-planned	What if Baseline adding impacts As-planned-plus delay analysis As-planned CPM
	Collapsed As-built	But-for As-built but-for As-built subtracting impacts As-built-minus analysis
	Window Analysis	Contemporaneous Period Analysis Snapshot Periodic update analysis Watershed
	Time Impact Analysis	End of every delay analysis Chronological and cumulative approach

35

Delay Analysis

PROSPECTIVE AND RETROSPECTIVE DELAY ANALYSIS

- Both prospective and retrospective delay analysis techniques are used during the construction process.
- Prospective analysis regards the analysis of the future impact of delays, which means that the analysis is done based on the likely impact the delay might have on the progress and completion of the project.
- Retrospective analysis can be linked to analysis of delays that occurred in the past and therefore analysis is done based on the actual impact the delay had on the progress and completion of the project (Barry, 2009).
- The Society of Construction Law Delay and Disruption Protocol propose that parties should address delays prospectively where possible.

36

PROSPECTIVE AND RETROSPECTIVE DELAY ANALYSIS

	Prospective delay analysis	Retrospective delay analysis
Impacted as-planned	✓	
Time impact analysis	✓	
Collapsed as-built		✓
Window analysis		✓
As-planned vs as-built		✓

Delay Analysis

37

DELAY ANALYSIS METHODS – THE CHALLENGE

- The Challenge - How to analyse the claims that it is transparent and fair to both the general contractor and the owner.
- I turned to construction related research for answers:
  - Delay research is fragmentary in nature and it would typically investigate one of the aspects in isolation of the others.
  - Many problems are encountered in practice in the application, preparation and assessment of EOT (Extension of Time) claims.
  - The lack of clear guidance on how to assess EOT claims can be seen as a major contributing factor to disputes
  - The bulk of the research focus on critical path analysis.
  - Limited information on an all inclusive procedure to guide practitioners in the assessment or formulation of delay claims.

Delay Analysis

38

DELAY ANALYSIS METHODS – THE CHALLENGE

Delay Claim Analysis Guidance:

1. The American Association for the Advancement of Cost Engineering (AACE) - Forensic Analysis: the AACE Forensic Schedule Analysis Practice note No 29R-03.
   - The practice guide is a very comprehensive technical resource for forensic schedule analysis but
   - does not attempt to take a holistic view at the delay analysis process or to provide a step by step guide to assist with analysis of delays.

2. The UK's Society of Construction Law - Delay-and-Disruption Protocol during 2017.
   - The purpose of the protocol is to provide good practice guidance for construction delays and disruptions.
   - Section 3 of the protocol offers high level guidelines on dealing with EOT during the course of the project

Delay Analysis

39

DELAY ANALYSIS SIMPLIFIED

- The process of assessing delay claims consists of a series of decisions taken in regard to a number of different matters –
  - ranging from compliance to contractual clauses to
  - risk allocation between contractor and client.
- In essence, the evaluation of EOT claims is a sequential decision-making process, in which each decision would impact on the outcome of the claim.
- A guidance tool should therefore support this sequential process of decision-making.

> *"A decision tree is a flowchart-like structure that shows the various outcomes from a series of decisions. It can be used as a decision-making tool. A primary advantage of using a decision tree is that it is easy to follow and understand."*

Delay Analysis

40

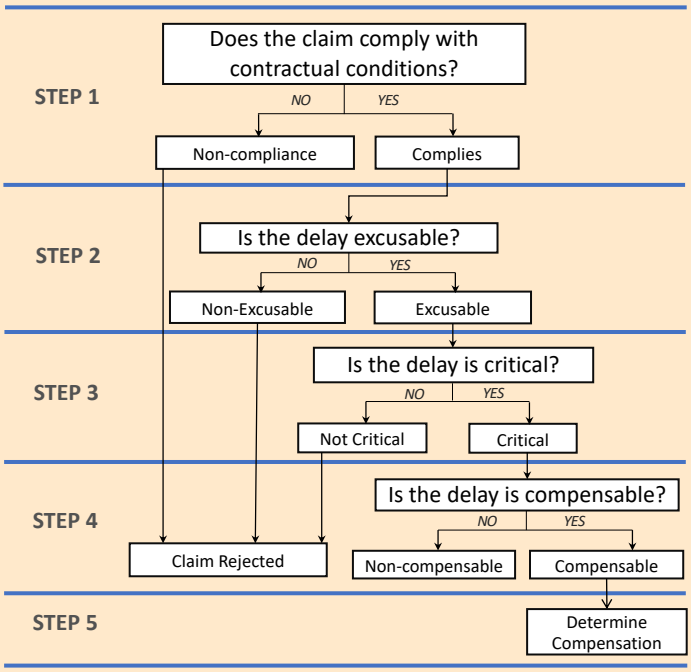
DELAY ANALYSIS SIMPLIFIED

- To be able to apply decision tree principles to EOT analysis it is necessary to identify the decisions taken as part of the evaluation process.
- The literature, focus groups and interviews identified the following essential decisions required when an EOT claim is to be analysed:

1. Was the delay critical?
2. Was the delay excusable?
3. Were the contractual provisions complied with?
4. Was the delay compensable?

Delay Analysis

41



Delay Analysis

42

DELAY PREVENTION & MITIGATION

- Independent CM
- Clear and Concise Project Scope Statement (Brief)
- Design
- Project approach
- Clear Risk allocation
- Type of Contract
- Know the contract
- Notify, Notify, Notify
- Deal with delays when they occur
- Communication
- Two-schedule approach

Delay Mitigation

43

CONCLUSION

- Delays are a common occurrence in construction projects
- It is unlikely that the occurrence of delays will drastically reduce in the near future
- Plan for delays

Conclusion

44

Continuing Education Credit

A credit value is assigned to CMAA courses and seminars in units of Professional Development Hours (PDH), Learning Units (LU), and CCM Recertification Points. CMAA guarantees that course material meets the minimum requirements for a PDH, which is 60 minutes of instruction, or increments thereof.

CCM
RECERTIFICATION POINTS PROVIDER

All courses approved by CMAA count toward CCM recertification points. For more information on recertification points, please visit

https://recerttrack.com/home.php?portal=24

CONTINUING EDUCATION AIA

CMAA is registered with the American Institute of Architects (AIA) as an approved CES provider of LUs. One educational contact hour equals one (1) LU. To receive LUs through CMAA, you must provide your AIA member number on all registration materials and attendance forms.

www.aia.com

ENGINEERING RCEP
REGISTERED CONTINUING EDUCATION PROGRAM

CMAA has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by RCEP.

www.rcep.net

Not all sessions and activities offered may be acceptable for continuing education credit in your state. Please check your state licensing board's requirements before submitting your credits.