



Delay analysis in unconventional contracts (EN)

Typical contracts include milestones, which rely upon a sequence of works and prescribe the completion of a certain aspect of a project within a specified period.

The SCL¹ defines the critical path as “[...] the longest sequence of activities [...], the sum of whose durations determines the overall project duration.”² Traditional delay analysis methodologies set out in the SCL and AACE³ focus on the assessment of the contractual milestone’s critical path.⁴ It evaluates the delay event’s impact on the sequence of the critical activities, which would adversely affect the contractual milestone dates.

“However, in some less conventional contracts, milestones are prescribed as the achievement of payment for completed works, represented by a percentage of the contract price in a fixed duration.”

The achievement of milestones is measured through the IPCs,⁵ completed within a period stipulated in the contract. Therefore, the sequence of activities to achieve the milestones, in such contracts, is not a fixed logic link in the programme. Consequently, the application of traditional delay analysis methodologies would be extremely difficult.

In the absence of a resource loaded programme and fixed sequence of activities linked to milestones, this article will provide a potential solution on how to analyse and determine the delays on cost-based milestones.⁶

Critical delay in unconventional contracts

Assuming in what follows that a contractor entered into a contract for the construction of a USD 10 million project within 50 months. The table below summarises the contractual milestones, which represent a percentage of the contract price to be achieved within a fixed duration.⁷

¹ Society of Construction Law, 2nd Edition, 2017.

² SCL Delay and Disruption Protocol, 2nd Edition, 2017, page 62.

³ Association for the Advancement of Cost Engineering International Recommended Practice No. 29R-03.

⁴ A critical path is generated for each milestone, to which a delay penalty is applied should the contractor default from its contractual obligation.

⁵ Interim Payment Certificates.

⁶ The sole purpose of the article is to demonstrate a new methodology to assess the delays, should the contract be silent in this regard.

⁷ This example is extracted from the Article “Variation Order Time Impact in Unconventional Contracts”, HKA, 2022.



Milestone no.	Percentage complete	Duration (in months)
I	5%	10
II	50%	25
III	80%	40
IV	100%	50

Table 1: Contract-price-based Milestones

The contractor's first instinct is generally to generate a critical path for the achievement of the milestones as per the table above, and the completion of the overall project within 50 months, as illustrated in the figure below.

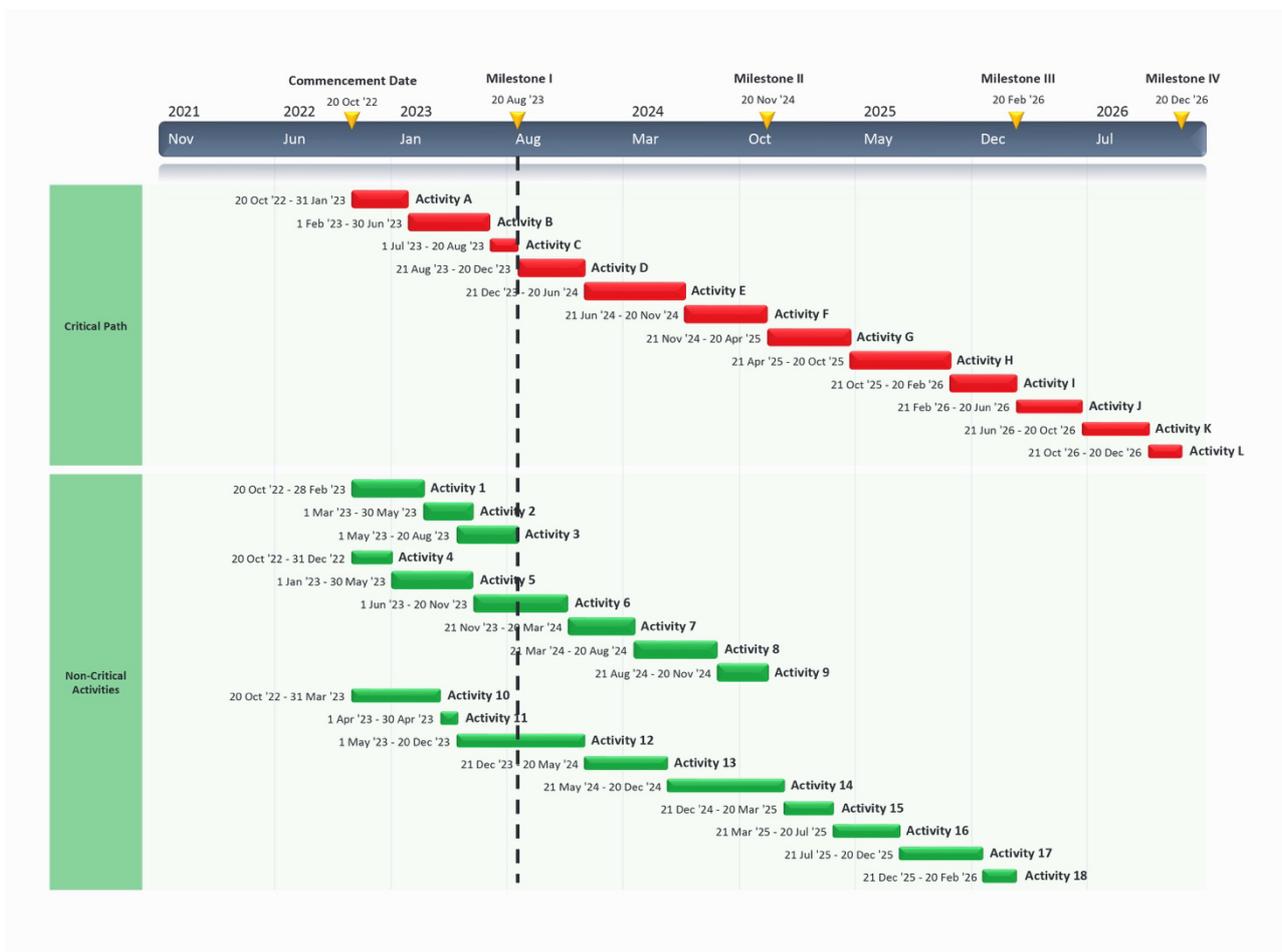


Figure 1: Baseline programme

For example, Figure 1 indicates that in addition to Activities A, B, and C, activities 1 to 5, 10, 11, and parts of activities 6 and 12 contributed to the achievement of Milestone I. Thus, it stands for reason that in a less conventional contracts, there is no critical path as all activities contribute to the achievement of the contractual milestones. In this case, activities would be more critical than other depending on how much



more they weigh in the contribution. Critical activities are, thus, determined based on those with highest cost rate in accordance with the contract BOQ.⁸

Determining the critical delay and entitlement

Further, assuming the works progressed and based on the issued IPCs, the contractor identified that 20.2% of the contract price was achieved on 20 November 2023,⁹ three months later than planned. In this case, the contractor would wish to claim for an EOT with a cut-off date 20 November 2023.

If an activity was planned to complete on a certain date before the planned milestone date, its delay would not be critical, as long as it was completed prior the planned milestone date and without causing a critical delay on the subsequent activities.

Accordingly, the contractor should first identify the activities that were supposed to be (or partly) completed by the planned milestone date. As mentioned above, the most critical activities would be those with the highest cost to complete, in accordance with their unit rate in the contract BOQ.

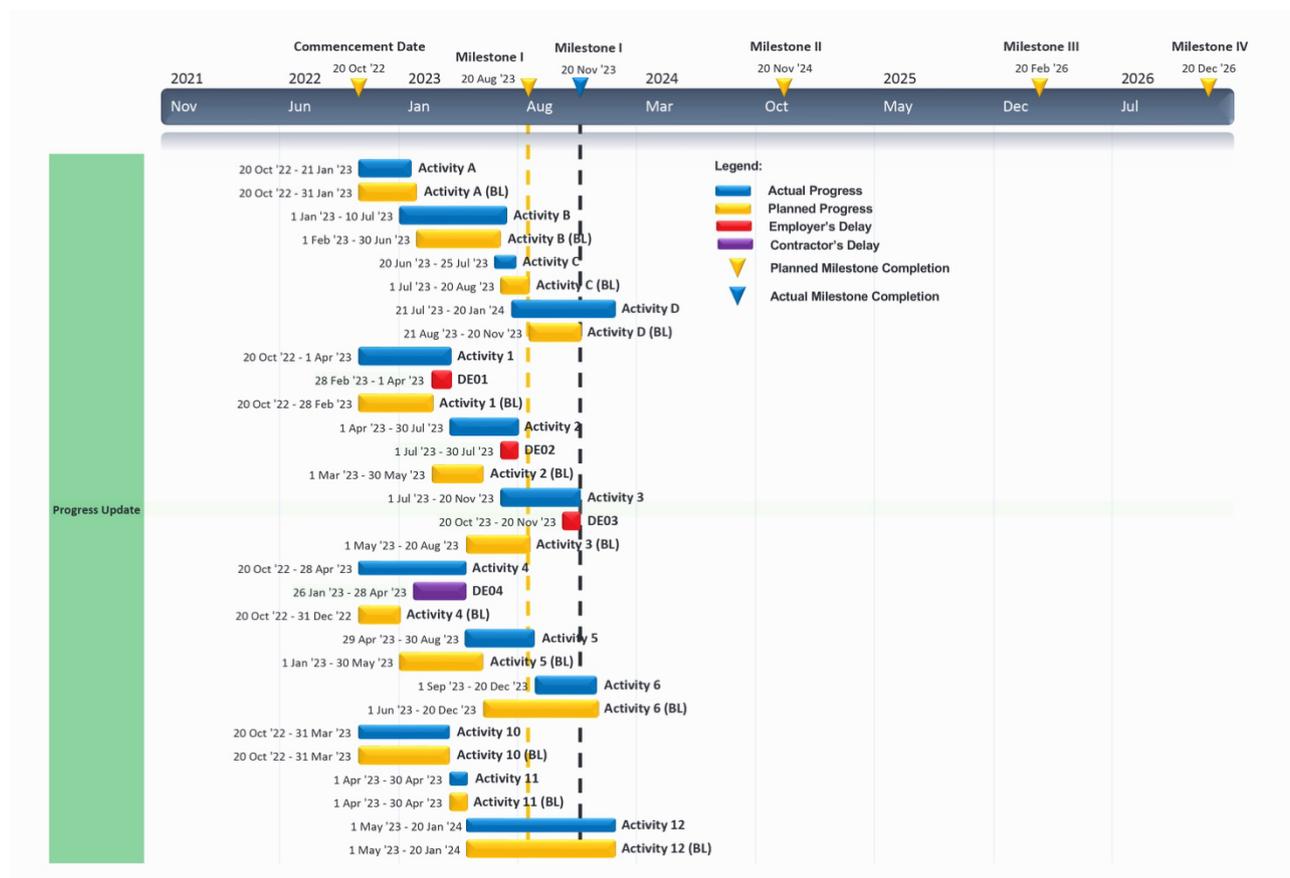


Figure 2: Progress update

⁸ Although all activities are technically critical as they all contributed to the achievement of the milestone, however the completion of one activity would be more influential and has more of a contributing factor than others.

⁹ It is extremely rare for the sum of IPCs to equate the contract-price milestone. Therefore, the contractor would seek the IPC that is equal or close (but larger) than the contract milestone to determine when the latter was achieved.



Figure 2 illustrates the example mentioned above, which is an updated version of the baseline set out in Figure 1. According to the baseline programme in Figure 1, Activities A, B, and C were scheduled to be completed by 20 August 2023 and Activity D will start right afterwards. The figure shows that Activities A to C were completed before the planned milestone date, and therefore, no critical delay was incurred between Activities A and D.

However, the cause of the delays incurred on Activities 3, 5, and parts of 6 and 12 were identified and summarised in the table below.

Delay Event	From	To	Duration (days)	Caused by
01	28-Feb-2023	1-Apr-2023	32	Employer
02	1-Jul-2023	30-Jul-2023	29	Employer
03	20-Oct-2023	20-Nov-2023	31	Employer
04	26-Jan-2023	28-Apr-2023	92	Contractor

Table 2: Summary of the identified delay events

The overall delay between 20 August 2023 and 20 November 2023 is 92 days. The next step would be identifying the critical delay, so that the sum of the critical delay should equate to the overall delay incurred on Milestone I.

Assuming the unit rate of the activities, as per contract BOQ, is considered as follows: Activity 3 < Activity 4 < Activity 2 < Activity 1. Milestone I would have incurred a total delay of 92 days due to:

- DE02 of 31 days, between 20 October 2023 and 20 November 2023; and
- contractor's delay of 61 days, between 26 February and 28 April 2023.

Therefore, the contractor would be entitled to an EOT of 31 days with the associated costs.

Impact of the remaining milestones

It goes without saying that the delays on Milestone I would have a cascading effect on the remaining milestones. However, the impact on the milestones would differ based on the nature of the delay events. For instance, should it a delay related to additional work imposed on the contractor through a variation/change order, the article "*Variation order time impact in unconventional contracts*" illustrates how to address the impact on the milestones.¹⁰ On the other hand, should a delay event be in another form (i.e., late access, late approvals, etc.),¹¹ it's another story.

In this case, the contract durations between the milestones set out in Table 1 must be maintained. The 3-month delay on Milestone I impacts the rest of the milestone dates, i.e., Milestones II, III, and IV, thereby delaying the overall project by 3 months.

¹⁰ Michel El Achkar, "*Variation Order Time Impact in Unconventional Contracts*", HKA, 2022.

¹¹ Any form of delay deemed as a delay event in accordance with the contract conditions.



Assuming Milestone II was completed within 14 months from Milestone I, as opposed to the original duration of 15 months as per Table 1. This demonstrates that the contractor mitigated the identified employer's delay by a month and the project would then be in delay by 2 months.

In the event the employer wishes to maintain the original milestone dates for all, or any of, the remaining milestones, it would require the contractor to mobilise additional resources to complete the same amount of work in shorter duration. For instance, completing Milestone II would require 12 months as opposed to the original duration of 15 months, as per Table 1, which is the definition of an acceleration. Therefore, the contractor should follow the contractual mechanism and notify the employer how its wishes affect the contract.

Conclusion

Contract-price-based milestones are not logically linked with a specific sequence of activities. As works progress, the relationship between the activities and milestones changes, depending on the amount of work paid within the period being analysed. As each activity plays a role in achieving the milestones, one could conclude that there is no critical path in such types of contracts. Thus, applying traditional delay analysis methodologies would be extremely difficult.

An alternate solution would be by adopting a common-sense retrospective approach by undertaking the following steps:

1. Determine when the milestone in question was achieved based on the IPCs and the overall delay;
2. Identify the activities that were delayed and completed later than the planned milestone dates;
3. Determine the cause of the delays;
4. Identify which activity is more critical than the other based on their unit rate as per contract BOQ; and
5. Allocate the delay to the culpable party.

Generating a resource-loaded programme may ease the process and allow a contractor to forecast the achievement of a milestone at any point of time. However, it would have the same problem in terms of adopting a traditional delay analysis methodology, as the milestones would still be reliant on the logic links in the programme.

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