Gibson Consulting Newsletter

No.30 : Spring 2018

Our Spring 2018, newsletter, contains two articles. The first is an article titled **'The Use of A Programme to Analyse Project Delay'.**

Our second article is titled, **'Cumulative Impact Claims'.** This article discusses the merits of this type of claim which is becoming more prevalent as part of a disruption or loss and expense claim.

If you wish to discuss any of the matters or points we raise in these articles, please do not hesitate to make contact.

The latest News on Roger Gibson's Books.

Roger's first book, 'Construction Delays, Extensions of Time and Prolongation Claims' is selling very well in the Western World. However, as reported in an earlier Newsletter, the book has been translated into Mandarin Chinese and this version is selling very well in the Far East and Middle East.

Roger's second book, 'Construction Delays, Disruption and Productivity' is also selling very well

The manuscript of Roger's third book is progressing well, and should be with the publishers May/June this year.

The seeds have been sown for Roger's fourth book; which will be based on the new NEC4 protocol. Further details will be given in future Newsletters.

The Use of a Programme To Analyse Project Delay

Construction and engineering project specifications typically include programming requirements. Due, in part, to the availability of increasingly more powerful planning software, programming requirements are becoming increasingly complex.

A well thought out plan and programme is a valuable tool for organizing and coordinating the project work. The programme also is used in determining when the project resources, such as manpower and materials, will be required. Finally, if a project encounters delays, a well thought out and properly linked programme will be the basis for analysing what events impacted the completion of the project.

This article will first review basic programming concepts and then review the content of typical programming requirements. Finally, the article will briefly discuss the use of programmes in analysing a delay claim. Since CPM (critical path method) based programmes are becoming the standard of the industry, this article will focus on that type of programme.

Basic Programming Concepts

The nature of the project programme will normally depend on the cost of the project. A bar chart is usually used on smaller projects. As the cost of the project increases employers start to demand a programme that is based on a critical path method network.

A bar chart simply indicates when specific activities will start date, their duration and finish date. The activities are plotted on a time scale. Since each specific activity on a bar chart is depicted as a straight line on the programme, a bar chart is easy to understand. A bar chart does not indicate the interrelationship between different activities nor does it indicate that the commencement of one activity is dependent on the completion of a predecessor activity.

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The Use of a Programme To Analyse Project Delay (Cont'd)

It is important to understand the relationship between the commencement and completion of the various activities which comprise a construction project. A network, or CPM, is a programming technique which indicates the dependencies and interrelationships between different activities. Those interrelationships between activities are indicated as a network.

Over the years, the CPM has become the common construction network programme. A CPM shows the sequence of each activity, the start of each activity, the dependence of that activity on the completion of a preceding activity, and how the completion of that activity will restrict the commencement of subsequent activities. The CPM is a graphical model of a project.

The basic steps in creating a CPM programme include: (1) identification of the basic tasks or activities that must be performed to complete the project; (2) estimation of the duration of the specific activities; (3) making a determination of the logical flow of the work, which includes a determination of which activities must be completed before the subsequent ones can commence; and (4) inputting the information into the computer so that it can make the numeric calculations that lead to the formulation of the programme.

The critical path is computed in two steps. The first step involves a forward pass calculation of the activities; starting with the first activity on day one of the project. During the forward pass calculation the early start and early finish for that activity is calculated. The early start is the earliest time an activity can start and is based on the completion of predecessor activities. The early finish is the earliest time an activity can finish, assuming it starts on time and takes no longer than was planned. The second step is the backward pass calculation. It involves calculating the late start dates and late finish dates for each activity. While the late start date is the latest date an activity can start without delaying the project completion, the late finish date is the latest date an activity can finish without delaying the project. Project planning software automatically completes these two calculation passes then prepares a report with the dates and a graphic portrayal of the programme.

The Critical Path is the longest continuous chain or series of activities through the CPM network. In essence, the critical path is the shortest period of time it will take to complete all the activities that comprise the project. The completion of project is delayed when one of the critical path activities is not started on time, not finished within the allotted time, or not finished on time. If a non-critical activity exceeds its float time, that activity will become critical.

Project Programme Specifications

In almost every construction and engineering project time is of the essence. Since timely completion of the project is important, almost every project specification includes some form of a programming requirement. The more sophisticated the project is the more likely the project specifications will include a programming section.

Typically, an initial programme must be submitted for approval by the project manager. Once the initial programme is accepted it is commonly referred to as the 'as-planned' or 'baseline' programme. In addition, the specifications may require the contractor to submit the programme data in an electronic form.

On larger projects, the specifications may require that the programme be resource loaded. In other words, the programme must also indicate the costs and resources necessary to perform each activity. The contractor is required to breakout within each activity the separate values assigned to specific resources such as labour, equipment, and materials.

When a contractor prepares the initial programme they should request activity durations from the subcontractors and the long lead time suppliers. That information is not only necessary to accurately prepare the programme, but can be the basis of binding the subcontractor to the activity durations set forth in the programme. Thus, subcontracts should include provisions that obligate subcontractors to provide such information.

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Once the programme is approved, copies should be sent to the subcontractors. Most specifications require monthly updated reports that indicate the status of each activity. The status of each activity is usually found by reviewing a status, or 'time-now' line that runs from the top to the bottom of the programme. By reviewing each item that line passes through and those which preceded the status line, the completion status of each activity on that date can be determined.

The project general conditions may require the use of the updated CPM to prove that an employer responsible delay impacted one or a series of critical activities. Until such evidence is submitted the employer may deny an extension of time to complete the project or obtain additional time-related compensation.
Some specifications require the preparation of a recovery programme when the critical activities are not being completed on the dates set forth in the 'as-planned' programme. Such a programme must indicate how the contractor intends to complete the project within the allotted time and what resources will be used to accelerate the work so that it can be completed on time.

A Brief Overview of the Use of CPM Programmes to Prove Delay Claims

Over the years, the Court has given a number of decisions which indicate that CPM based scheduling delay analysis is the preferred method to analyse delay claims and assign each parties responsibility for the delay.
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Over the years, the Court has given a number of decisions which indicate that CPM based scheduling delay analysis is the preferred method to analyse delay claims and assign each parties responsibility for the delay.
In Royal Brompton Hospital NHS Trust v. Frederick Alexander Hammond and Others (2000), the important matters that are gleaned from this case and judgment are,

i) In determining a fair and reasonable extension of time as a consequence of a delay event, an examination of the actual critical path of the contractor's works should be carried out to establish that the delay event affected, or was likely to affect, the completion of the works. Furthermore the work activities that were critical to the forward progress of the works at the time the delay event occurred should be taken into account.

ii) The matter of concurrency should be looked at closely to determine those events are sequential and those that are truly concurrent.

In Motherwell Bridge Construction Ltd v. Micafil Vakuumtechnik (2002), the judgment emphasised that a 'delay, must be on the critical path'; confirming again what was stated in the Henry Boot and Royal Brompton judgments.

The judgment in Balfour Beatty Construction Limited v. The Mayor and Burgesses of the London Borough of Lambeth (2002), contains the following important issues,

i) A proper programme should be maintained during the execution of the works.
ii) In determining an extension of time, the 'foundation' should be the original programme; subject to justification and substantiation of its validity and reliability.
iii) A valid critical path, or paths, should be established as it, or they, will almost certainly change.
iv) Concurrent, or parallel, delays should be demonstrated where necessary.

There are four primary methods of analysing a delay claim using a CPM programme. All four methods rely on some comparison of the as-planned programme to the actual as-built programme or events. Two methods are primarily used after the project is completed, i.e. retrospective, and two methods are used during the course of construction, i.e. prospective.

The Use of a Programme To Analyse Project Delay (Cont'd)

The first approach requires a determination of which events the other party is responsible for and then removing them from the as-built programme by manipulating the programming software. In essence, employer-responsible delays are removed from the programme then a comparison is made to the as-planned programmes completion date. This method is used after the project is completed. If the collapsed as-built completion indicates that the collapsed project completion date is equal or less than the as-planned programme the owner is responsible for the delays. This method is referred to as the "collapsed" as-built programme method.

The second method involves a selection of specific time periods when major delays occurred for an "as-planned" versus "as-built" comparison. Rather simply collapsing out the owner caused delays, this approach involves a more in depth analysis of how each delay period impacted the critical path activities. Once an analysis of the first major delay is made, then those conclusions become the baseline for determining how the subsequent delays impacted the project. This approach is also used after the project is completed.

The third method involves modifying the "as-planned" programme. The method involves either modifying the as planned programme by modifying the programme to reflect the critical delays for which the owner is responsible or alternatively by modifying the programme to reflect the critical delays for which the contractor is responsible. A comparison of the original "as-planned" programme to the modified programme should indicate the number of additional days that are attributable to the owner. This method is typically used before a project is completed. It should be noted that the courts have questioned the validity of such an approach since it fails to accurately measure the impact of the delays on the critical path.

The fourth method involves the use of fragnets, which are fragments of a CPM network. In essence, new partial CPM networks are created for the periods or events that are being evaluated. Once the fragmented portion of the programme is completed, it is then added into the current "as-built" programme. At which point, an evaluation of the delay can be made in relationship to the ongoing activities. The fragnet approach is typically used during the course of construction.

Delay analysis is not limited to the four methods. There are a number of variations on the four methods. Before the court, arbitrator or adjudicator will accept whatever method is chosen, the proponent of the analysis method must be able to establish that the approach identifies how the delay impacted the actual completion of the project. By definition, only those delays which delay the actual completion of the project are on the critical path.

Conclusion

A properly thought out programme allows a contractor and the employer's team to properly coordinate the work and resources that are needed to timely complete the project.

The cost of project planning software is decreasing and at the same time the level of intricacy of the finished programme is increasing. However, the proper use of such software requires a basic understanding of construction planning.

Finally, a properly prepared and updated CPM based programme can be a key document for proving the other party's responsibility for delays.

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Cumulative Impact Claims

When changes in a project become numerous and act concurrently, it creates a compounding effect in the life cycle of the project, and to this date there is no definitive standard to calculate such loss of productivity claims. Cumulative impact claims are becoming more prevalent on projects which have multiple changes over the course of the project.

Almost every change to a construction project has some effect on the project's cost and time. There are generally two categories of this effect:

- The direct cost and time of performing the change, and
- The impact the change may have on other unchanged or contractual work because of delay, disruption, change of sequence, lack of resources, etc.

Contractors generally do not have much difficulty estimating the direct costs or time required to perform a single change, but it is very difficult to accurately asses the impact of that change on the unchanged or contractual part of the work. To execute a change it may have been necessary to delay or disrupt the unchanged work, or perform it in a manner or sequence different to that originally planned, all of which may lead to a loss of productivity and increased costs.

Difficulty in assessing the impacts, coupled with the resistance on the part of the contract administrator to recognize such impacts, often leads to a decision to leave such impacts out of the individual changes. Neglecting such impacts may not be a big problem if the number and value of the changes on a project are minimal, but the situation becomes more complex in the case of an extensive number of changes on medium-sized and large projects.

This compounding and negative effect often goes unnoticed until it is too late. It generally becomes apparent only in the latter stages of a project when work cannot be completed on time and when labour productivity does not measure up to the anticipated levels.

What is a Cumulative Impact Claim?

Two things are certain about almost any construction project: (1) there will be changes made during the course of construction, and (2) the employer and the contractor will seldom agree on the total effect of those changes on the time impact and cost of the project. Changes to the work can and should be addressed on a case by case basis, but when the project is overwhelmed with changes a certain phenomenon is often experienced. This phenomenon is referred to by industry experts as cumulative impact. This is the result of multiple changes to a project that when taken individually may not have significant impact to the project. Many times, contractors, employers and their representatives do not recognize this impact until it has already occurred.

An analogy to describe a 'cumulative impact claim'.

Compare the notion of cumulative impact to a still pond of water which represents a smoothly running construction project. When one change is introduced to a project, it is similar to throwing a rock into the water and watching the ripples that emanate. Those ripples are the effect that one change has on the project. When multiple changes occur, at different times, multiple rocks of varying sizes are thrown into the pond at various locations. Each rock that is thrown into the pond has its own impact in the form of the ripple pattern it creates. Eventually, if enough rocks are thrown into the pond at different times, there is no simple ripple pattern. Instead, turbulence is created with each stone's ripple

patterns impacting the others. Soon, there is no pattern and turbulence becomes the order of the day. Such is the effect on a construction project when multiple impacts are experienced over a period of time. While each change or impact, on its own, may be manageable, when they are introduced together over a relatively short period of time, an impact to the overall progress of the project can be felt.

Cumulative Impact Claims (Cont'd)

Demonstrating Cause and Effect.

Construction contracts do not typically include adequate language to enable fair and equitable compensation for the unforeseen impact of cumulative changes. Furthermore, cumulative impact claims are one of the most difficult forms of claim to present and prove. It is generally agreed that the theory of cumulative impact is reasonable, and that multiple

changes and other types of delays and disruption can negatively impact the performance of the changed work such that a contractor expends additional time, man-hours and costs, in completing its original scope of work.

When a project is impacted with a large amount of changes, the site supervisors spend their time coordinating the changed work and finding the most productive work for their crews in an attempt to be on budget and on programme. They have less time to document the impacts to their work and fill out the daily timesheet of their resource allocation. Without these records, the contractor will find it difficult to recover his additional costs.

It is recommended that the contractor should track the changes, individually or in like groups, in separate cost accounts kept apart from the cost accounts for the original scope of work. In essence, the use of effective cost-accounting methods and the maintenance of appropriate cost records can minimize many of the proof problems inherently associated with construction claims.

Furthermore, when a contractor becomes aware that a multitude of changes are impacting its productivity it is essential that the contractor notify the contract administrator of this and reserves its rights to claim.

Future articles on 'Cumulative Impact Claims' will present and discuss methods of evaluating these types of claims, such as 'modified total cost', 'measured mile', and recognised industry studies.

Finally, cumulative impact claims are not just a theoretical concept but a real occurrence on construction projects suffering numerous changes.