



DR05: Guidance from the Court on Delay Analysis.

In the recent *Mirant Asia-Pacific (Construction) (Hong Kong Ltd v Ove Arup & Partners* case in the Technology & Construction Court, Judge Toulmin made some key observations in his Judgment that are important in respect of 'Delay Analysis'.

The project was the construction of a coal fired power plant at Sual on Luzon Island in the Philippines. The construction of the plant was carried out by a consortium of several companies and the client was the Philippines government power company. One of the consortium companies changed its name to Mirant Asia-Pacific Construction, and this company awarded a contract to Ove Arup for the design of the foundation slab for the power station's boilers. In the event, in April 1997, two of the main foundations of the boiler house, designed by Arup, dropped. Remedial works had to be carried out which impacted on the erection of the steelwork support for the boilers which had already commenced.

The action was commenced by Mirant against Arup in 2002, After a second hearing in 2004, Judge Toulmin decided that Ove Arup had been negligent in the design and was liable for the consequential damages of that negligence. The matter was taken to the Court of Appeal where the judgment was upheld.

The Critical Path

In his latest judgment, issued in April 2007, Judge Toulmin indicated that it was necessary to investigate and establish as to whether the remedial work to the boiler foundations were on the critical path for completion of the project..

Judge Toulmin made the following observations and statements on 'the critical path'.

"As computers have become more sophisticated, the critical path analysis has been enabled to become more sophisticated. This has become an invaluable tool which enables a complex construction Project to be managed with better available information. The analysis will identify at a given date which important aspects of the Project are falling behind the programme, particularly if they are on or close to the critical path, what if any is the impact on other aspects of the programme and where additional resources need to be placed. It will also demonstrate where activities are ahead of what is planned and enable a decision to be taken on whether planned activities need to be rescheduled.

It is also used as a tool for analysing, as at the given date, what has caused any delay that has occurred and what is the extent of that delay."

Delay Analysis

Judge Toulmin made the following observations on 'Delay Analysis'.

"There may be more than one critical path.

It is important to look at activities at or near the critical path to understand their potential impact on the Project.

Windows analysis, reviewing the course of a Project month by month, provides an excellent form of analysis to inform those controlling the Project what action they need to take to prevent delay to the Project.

Without such analysis those controlling the Project may think they know what activities are on the critical path but it may well appear after a critical path analysis that they were mistaken.

A less reliable form of critical path analysis is the watershed analysis. This analyses the Project in terms of a few key events. It may be a sufficient check in the course of a Project to analyse what changes, if any, may need to be made in the Project at the time of a benchmark event.

Both windows analysis and watershed analysis are used frequently to analyse delays at the end of a Project. A watershed analysis will be less reliable particularly if the gaps between the watersheds are lengthy. It does not show the pattern of events between the watersheds. This may be very important where a number of activities are at or near the critical path. What the watershed analysis provides is a snapshot at the particular time when it is carried out.



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Float in a programming sense means the length of time between when an activity is due to start and when it must start if it is to avoid being on the critical path. Float can also be used to refer to the additional time needed/allowed to complete an activity over and above the shortest time that is reasonably required.

It is, of course, obvious that the analysis is only valid if it is comprehensive and takes account of all activities.

I add the proposition that if a retrospective delay analysis is being conducted on a Project, the analysis must include the time to the end of the Project, otherwise activities may occur which will take them on to the (or a) critical path after the date of the final window or watershed."

'Windows'

HHJ Toulmin had some observations on the 'Windows' method of Delay Analysis; by stating,

"Windows analysis is the most accepted method of critical path analysis. As Pickavance (referring to the book 'Delay and Disruption in Construction Contracts', by Keith Pickavance), makes clear at page 572 of his book, "Windows" (and "Watersheds") are not methods of analysis in themselves: they are merely aspects of conducting the critical path analysis. In essence they represent the division of the overall construction period into smaller periods into which each new set of corresponding progress can be entered into the programme and analysed.

The term "Windows analysis" refers to the regular reviews and updates undertaken by the contractor, normally monthly. These periods of time would be described as monthly windows. Unlike previous monthly reviews, the planner would use sophisticated software programmes to plot which activity or activities were on and which were near to the critical path each month. The programmes would take into account those activities which had started early or had been delayed. Also built into the programmes would be the progress of those activities which had started since the previous monthly window. This would enable the employer and the contractor to analyse over the relatively short periods of time what changes had occurred, and identify what problems needed to be investigated and put right.

The analysis would also identify delay, enabling those concerned to investigate and, if appropriate, agree the cause at an early stage. A monthly review would, in a complex Project like Sual, have enabled the consortium to see what activities were at or close to the critical path and to take urgent action where necessary. It would also have enabled a much more sophisticated retrospective analysis of the delay to be undertaken than that which was able to be carried out.

So, what lessons in respect of 'Delay Analysis' do we learn from the *Mirant v Arup* judgment? Judge Toulmin gave some good advice and useful guidance which can be summarised into the following five items.

1. *"The analysis will identify at a given date which important aspects of the Project are falling behind the programme, particularly if they are on or close to the critical path, what if any is the impact on other aspects of the programme. It is also used as a tool for analysing, as at the given date, what has caused any delay that has occurred and what is the extent of that delay."*

This is the nub of a good and reliable 'Delay Analysis'.

2. *"There may be more than one critical path."*

An important observation that is often not appreciated by those reviewing a 'Delay Analysis'.



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1. *"It is important to look at activities at or near the critical path to understand their potential impact on the Project."*

This is a good point which should be followed by anyone carrying out a 'Delay Analysis'.

2. *"If a retrospective delay analysis is being conducted on a Project, the analysis must include the time to the end of the Project, otherwise activities may occur which will take them on to the (or a) critical path after the date of the final window".*

Again, sensible advice that is sometimes overlooked in a 'Delay Analysis'.