

“Time” in “the Noughties”

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☞ Compensatory damages; Concurrent causes; Construction contracts; Delay; Extensions of time; Time limits

During the last decade, colloquially known as “the noughties”, the UK courts have handed down various judgments which give guidance on the way that “time” and, in particular, the assessment of delay by way of analysis, should be approached and handled.

In this article, the author reviews seven judgments which he considers greatly help those who are involved in time-related disputes.

Those cases are:

1. *Royal Brompton Hospital NHS Trust v Hammond* (2000)¹;
2. *Motherwell Bridge Construction Ltd v Micafil Vakuumtechnik* (2002)²;
3. *Balfour Beatty Construction Ltd v Lambeth LBC* (2002)³;
4. *Skanska Construction UK Ltd v Egger (Barony) Ltd* (2004)⁴;
5. *Great Eastern Hotel Co Ltd v John Laing Construction Ltd* (2005)⁵;
6. *Mirant Asia-Pacific Construction (Hong Kong) Ltd v Ove Arup & Partners International Ltd* (2007)⁶; and
7. *City Inn Ltd v Shepherd Construction Ltd* (2007).⁷

For each case, this article provides details of (i) the project concerned, (ii) the dispute itself, (iii) the judgment, and finally (iv) a commentary on the important comments and advice given by the court.

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¹ *Royal Brompton Hospital NHS Trust v Hammond* (2000).

² *Motherwell Bridge Construction Ltd (t/a Motherwell Storage Tanks) v Micafil Vakuumtechnik* (2002) 81 Con. L.R. 44 QBD (TCC).

³ *Balfour Beatty Construction Ltd v Lambeth LBC* [2002] EWHC 597 (TCC); [2002] B.L.R. 288.

⁴ *Skanska Construction UK Ltd v Egger (Barony) Ltd* [2004] EWHC 1748 (TCC).

⁵ *Great Eastern Hotel Co Ltd v John Laing Construction Ltd* [2005] EWHC 181 (TCC); 99 Con. L.R. 45.

⁶ *Mirant Asia-Pacific Construction (Hong Kong) Ltd v Ove Arup & Partners International Ltd* [2007] EWHC 918 (TCC); [2007] C.I.L.L. 2480.

⁷ *City Inn Ltd v Shepherd Construction Ltd* [2007] CSOH 190.

1. *Royal Brompton Hospital NHS Trust v Hammond* (2000)⁸

The factual background

The project was the construction of a six-storey hospital, known as “The National Heart and Chest Centre Phase 1”, in Chelsea, London, for the Royal Brompton Hospital NHS Trust. Taylor Woodrow was the main contractor, and practical completion was certified as being achieved on May 23, 1990, some 43 weeks and 2 days later than the original completion date for the project. In total, the architect awarded an extension of time of 43 weeks and 2 days, thereby revising the date for completion to May 23, 1990.

The contractor claimed loss and expense from the hospital for delays. Some money was paid by the hospital and, in 1992, the contractor commenced arbitration proceedings against the RBH Trust for the remainder of its claim. In 1995, prior to a hearing, the arbitration was settled, with the employer making a payment of £6 million to the contractor.

The dispute

In 1997, the RBH Trust served a statement of claim, pleading allegations of negligence against members of their professional team involved with the project, i.e. the architect, project manager, and so on, seeking to recover the settlement amount paid to the contractor, plus their own arbitration costs. The action resulted in a series of trials taking place in the Technology and Construction Court between 1999 and 2002.

The judgment

The hospital’s main case against the architect was that the contractor was responsible for the delays, but that the breaches and negligence of the architect had so weakened the hand of the Hospital in the arbitration that, instead of recovering from the contractor liquidated and ascertained damages and the loss and expense already paid to the contractor, it paid out further sums to the contractor, plus costs of £15 million.

One of the key points in the Trust’s case was that, in determining a fair and reasonable extension of time the architect failed to determine the actual critical path of the contractor’s works and that extension of time awards had been given for non-critical path works. Further, the Trust alleged that the architect had failed to determine the contractor’s actual progress against its programme and had not examined the reasons for delay against that programme and the actual progress of the works in assessing the applications for extensions of time.

A key issue in this case was “concurrency”. On this issue, H.H. Judge Seymour QC distinguished between sequential causes of delay and true concurrency, stating at [31]:

⁸ *Royal Brompton Hospital NHS Trust v Hammond* (No.9) [2002] EWHC 2037 (TCC); 88 Con. L.R. 1.

“However, it is, I think, necessary to be clear what one means by events operating concurrently. It does not mean, in my judgment, a situation in which, work already being delayed, let it be supposed, because the contractor has had difficulty in obtaining sufficient labour, an event occurs which is a Relevant Event and which, had the contractor not been delayed, would have caused him to be delayed, but which in fact, by reason of the existing delay, made no difference. In such a situation although there is a Relevant Event, ‘the completion of the Works is [not] likely to be delayed thereby beyond the Completion Date’. The Relevant Event simply has no effect on the completion date. This situation obviously needs to be distinguished from a situation in which, as it were, the works are proceeding in a regular fashion and on programme, when two things happen, either of which had it happened on its own would have caused delay, and one is a Relevant Event, while the other is not. In such circumstances there is real concurrency of causes of delay.”

Commentary

The important matters to be gleaned from this case and the judgment are that:

- 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 which 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 in order to determine those events which are sequential and those which are truly concurrent.

Judge Seymour also noted that, in order to make an assessment of whether a particular delay event affected the completion of the works and not just a work activity, he considered it correct to take into account what work activities were critical to the forward progress of the works, at the time that delay event occurred.

2. *Motherwell Bridge Construction Ltd v Micafil Vakuumtechnik (2002)*⁹

The factual background

Micafil were engaged by BICC as main contractor for the construction of an autoclave, which is a large steel vessel, with an internal volume of some 650 m³. The vessel was to be used in the manufacture of high quality power cables. Micafil undertook the responsibility for the design work and sub-contracted its construction to Motherwell Bridge. During construction, Motherwell Bridge raised many technical queries, and there were a number of significant design changes issued by Micafil. There were two formal amendments to the contract.

⁹ *Motherwell Bridge Construction Ltd* 81 Con. L.R. 44.

The dispute

Delays occurred and Micafil deducted liquidated damages. Motherwell Bridge, in turn, claimed extensions of time to extinguish the claim for liquidated damages.

The judgment

H.H. Judge Toulmin CMG QC first dealt with the matter of concurrent causes of delay. He was satisfied that his approach must be outlined from the judgment in the *Henry Boot*¹⁰ case. Judge Toulmin said in his judgment:

“Crucial questions are, (a) is the delay in the critical path? and, if so, (b) is it caused by Motherwell Bridge? If the answer to the first question is yes and the second question is no, then I must assess how many additional working days should be included.”

Judge Toulmin then departed slightly from the guidance in *Henry Boot*, by going on to say in his judgment, at [562]:

“other delays caused by Motherwell Bridge (if proved) are not relevant, since the overall time allowed for under the contract may well include the need to carry out remedial works or other contingencies. These are not relevant events, since the court is concerned with considering extensions of time within which the contract must be completed.”

Judge Toulmin went on to add that the approach must always be tested against an overall requirement that the result accords with common sense and fairness. With regard to the questions raised in the *Balfour Beatty* case, Judge Toulmin concluded that an extension of time for completion of the works may be granted in respect of a relevant event occurring during the period of culpable delay. However, he refused to follow precisely the guidance in *Balfour Beatty* to determine the “net” effect of delays occurring after the date for completion. By fixing the extended period of time available for completion of the work having regard to the incidences of the causes of delay and measured by the standard of what is fair and reasonable, Motherwell Bridge became entitled to an extension of time for the full period of delay.

Commentary

The judgment in this case emphasised that a delay must be on the critical path; confirming again what was stated in the *Henry Boot* and *Royal Brompton* judgments. Judge Toulmin also concluded that an extension of time for completion of the works may be granted in respect of a relevant event occurring during the period of culpable delay, an endorsement of the approach in *Balfour Beatty* below.

¹⁰ *Henry Boot Construction (UK) Ltd v Malmaison Hotel (Manchester) Ltd* [2001] Q.B. 388 CA; *Henry Boot Construction (UK) Ltd v Malmaison Hotel (Manchester) Ltd* (1999) 70 Con. L.R. 32 QBD (TCC).

3. *Balfour Beatty Construction Ltd v Lambeth LBC (2002)*¹¹

The factual background

The project involved the refurbishment of Falmouth House, Kennington Park Road, London. The project value was £3.8 million and the contract between the parties was JCT 1988 Local Authorities Edition without quantities. Commencement of the works was November 1, 1999.

As a consequence of delays to the project, the contractor was awarded extensions of time, which revised the date for completion to October 23, 2000. However, practical completion was not achieved until May 24, 2001, some 41 weeks and 3 days later than the revised date for completion. As a result, liquidated damages for this delay of £355,831 were deducted from the contractor.

The dispute

Balfour Beatty maintained that it was entitled to further extensions of time and referred the dispute to adjudication. The adjudicator's decision was that Balfour Beatty were entitled to an extension of time of 35 weeks and 1 day, thereby reducing the liquidated damages levied to some £80,600. The employer, Lambeth LBC, challenged the decision on the grounds that the adjudicator did not act impartially and that the decision was reached in breach of contract and without jurisdiction.

The judgment

The case was heard before H.H. Judge Lloyd QC, who found in favour of the defendant, Lambeth LBC, and Balfour Beatty's application for enforcement was dismissed. Judge Lloyd was persuaded that the adjudicator "had not acted impartially and that he failed to comply with the rules of natural justice in significant respects".

Judge Lloyd made the following comments, at [30], on the importance of establishing a critical path and on extension of time presentations:

"This is yet another case in which adjudication has been launched after completion of the works and in which the dispute attracts a simple description but comprises a highly complex set of facts and issues relating to the performance of a contract carried out over many months. It may well be doubted whether adjudication was intended for such a situation. If it is to be utilised effectively it is essential that the referring party gives the adjudicator all that is needed in a highly manageable form. From the material available to me it is clear that BB did little or nothing to present its case in a logical or methodical way. Despite the fact that the dispute concerned a multi-million pound refurbishment contract no attempt was made to provide any critical path. The work itself was no more complex than many other projects where a CPN is routinely established and maintained. It seems that BB had not prepared or maintained a proper programme during the execution of the works. By now one would have thought that it was well understood that, on a contract

¹¹ *Balfour Beatty Construction Ltd* [2002] EWHC 597 (TCC); [2002] B.L.R. 288.

of this kind, in order to attack, on the facts, a clause 24 certificate for non-completion (or an extension of time determined under clause 25), the foundation must be the original programme (if capable of justification and substantiation to show its validity and reliability as a contractual starting point) and its success will similarly depend on the soundness of its revisions on the occurrence of every event, so as to be able to provide a satisfactory and convincing demonstration of cause and effect. A valid critical path (or paths) has to be established both initially and at every later material point since it (or they) will almost certainly change. Some means has also to be established for demonstrating the effect of concurrent or parallel delays or other matters for which the employer will not be responsible under the contract. BB and its claims consultants, whilst recognising that the critical path would constantly fluctuate (see the referral notice), nevertheless decided that not only was it not practicable but that it was unnecessary to determine a constantly changing critical path.”

Judge LLOYD also made the following observations, at [49], regarding progress recording and the presentation of delay to areas of the works:

“BB programmed the works on a flat type basis (albeit without identifying the critical path for same) and at the very least BB should have measured progress against these same flat types. That way it would have been possible to compare the planned progress with the actual progress in a meaningful way. Instead all that BB have provided is an aggregate of all the planned time and compared with all the actual time on a trade by trade basis. No attempt has even been made by BB to demonstrate any link between the trades.”

Commentary

There are various important issues to be taken out of this judgment, such as the following:

- 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; and
- iv) concurrent, or parallel, delays should be demonstrated where necessary.

Another key aspect in which the court gave its opinion was that, in granting an extension of time, the purpose was to fix the period of time by which the period available for completion was to be extended. In other words, the date for completion, as adjusted, was not the revised or new date by which the contractor was to have achieved practical completion, but the end of the total number of days.

4. Skanska Construction UK Ltd v Egger (Barony) Ltd (2004)¹²

The factual background

The project was the design and construction by Skanska of a timber processing facility in Scotland for Egger, an Austrian company, on a former colliery site in Ayrshire. The contract price for Skanska's work was £12 million, under a guaranteed maximum price agreement. Overall, in a period of less than a year, a redundant colliery site in Ayrshire with varying levels was transformed into a state of the art fully automated factory, where virgin timber was fed in at one end and a sophisticated chipboard product emerged at the other. However, during the course of Skanska's works, there were delays and disruption, a major issue being the warehouse floor slab, which cracked and broke up.

The dispute

Skanska valued the final account at £24.5 million; whilst Egger's value was £13 million, from which there was a deduction of £4.1 million for defective work and liquidated damages. The matter was referred to the Technology and Construction Court and was heard before H.H. Judge Wilcox.

The judgment

The quantum issues of this case concerned the much greater part of the trial and the subsequent judgment. However, one of the issues was that of loss and expense and, in considering this, the court was presented with expert evidence relating to delays suffered by several of Skanska's sub-contractors.

This judgment considers a technique of delay analysis, which Judge Wilcox describes as an "impact analysis". In this case, the original planned construction programme in bar chart form was converted into a network form, i.e. a logically linked critical path analysis ("CPM"). The judge observed that, if an original programme was converted into a network, then it was essential that the reconstruction was accurate and supported by the evidence; otherwise, the court may decide that the critical path analysis is "not reliable as a base line".

During the project, there was agreement of the master programme; however, a further three sub-zone programmes were issued by Skanska. Their relevance was stated in the judgment, at [422], as follows:

"in order to carry out its impact analysis the master programme prepared by Skanska on 23rd May which for reasons extensively set out in the liability judgment became virtually redundant, almost from the outset because of the late provision of vital information relating to design and layout and changes made on the instructions of Egger. I am satisfied that the sub-zone programmes dealing with each zone separated in planning and programme terms provide a more accurate basis for detailed delay analysis rather than the flawed planned programme"

¹² *Skanska Construction UK Ltd* [2004] EWHC 1748 (TCC).

Judge Wilcox also commented, at [419], that: “The reliability of (a) sophisticated impact analysis is only as good as the data put in.”

Commentary

This case emphasises the reliability of a programme used as a base line for analysis. In establishing a reliable base line for analysis, the objective is to remove flaws in the original master programme. Furthermore, if more detailed sub-programmes are available, they should be considered in any reconstruction of the master programme, in order to provide a reliable base line programme for the assessment of delays.

Observations in this judgment were made with regard to the approach of the experts:

- i) It is not advisable to overpower the court with information and numerous delay charts which are difficult to understand. Whilst planning software nowadays is capable of producing a wide variety of reports and charts, careful consideration should be given in selecting the outputs to be incorporated in a report. In his judgment Judge Wilcox was not impressed with the complexity of a report running to “some hundreds of pages supported by 240 charts”. There is a lot to recommend the “keep it simple” philosophy. Accessibility of a report will always be a problem with delay analysis on large and complex projects as criticism could equally be levelled if the report is lacking the detailed supporting programmes, hammocks, sub-nets and analysis of alternative critical paths which may be required at some point.
- ii) Another observation in the judgment is that it is fundamental that the delay analyst is “objective, meticulous as to detail, and not hide bound by theory as when demonstrable fact[s] collide with computer programme logic”. This applies to all methods and techniques of delay analysis, time impact analysis, or other methods. For example, the conversion of the master programme from barchart to network format; if evidence contradicts or conflicts with the output of the computer programme, then adjustment of the input is required to ensure consistency with the facts, i.e. follow the facts, not the computer output. Further, if there are more detailed programmes available, then these should be considered in the development of the reconstructed base line programme. It will, however, be for the delay analyst to adopt “intellectual independence and objectivity” in applying his judgment to the weight he attaches to such programmes.

Finally, if a report is to be presented to court or a tribunal, the expert must be fully conversant with his or her report. Whilst this may seem self evident, it is common practice on large and complex projects for an expert to engage assistants to carry out aspects of the investigation. However, an expert’s opinion becomes less compelling if the impression is created that the expert is not entirely familiar with the details of his or her own report.

5. Great Eastern Hotel Co Ltd v John Laing Construction Ltd (2005)¹³

The factual background

The Great Eastern Hotel appointed John Laing as construction manager for the extension and refurbishment of the existing Great Eastern Hotel, next to Liverpool Street Station, London. The works included a complete refurbishment and extending the existing buildings to produce a first class hotel. This included major demolition work and then re-building, to create a large central atrium and two-and-a-half additional floors within a newly created mansard roof. GEH's budget for the project was £34.8 million, and Laing were appointed under a construction management agreement. The employer's indicative design and construction programme for the works was for a period of 113 weeks, but Laing proposed and issued a programme showing a 109-week overall period.

A letter of intent was issued to Laing on June 19, 1997, and the works commenced on June 30, 1997, which gave a planned completion date of August 2, 1999. Delays occurred, and practical completion was not achieved until July 13, 2000, some 346 days later than the planned completion date. The final cost of the project was £61 million, which is some £26 million more than the employer's original budget.

The dispute

The employer, Great Eastern Hotel Company, sought to recover losses of £17 million from the construction manager, Laing, by way of damages in respect of Laing's various breaches of contract. The matter came before Judge Wilcox in the Technology and Construction Court.

The judgment

The major issue which the court had to decide was responsibility for the delay. Both the claimant and defendants accepted that there was significant delay. The defendants denied liability, pointing the finger at both other parties and other concurrent causes of delay.

The procurement and erection of the temporary roof was one of the first items on Laing's programme. The judgment describes this situation as follows:

“60. Unhappily both the procurement of the Temporary Roof Trade Package and erection of the roof itself went badly wrong.

61. The procurement took three weeks longer than the time programmed by Laing. In consequence the scaffold and Temporary roof contractors TRAD commenced on site on 11th September 1997, three weeks later than programmed. There was thus an immediate three-week delay caused to the Project.

¹³ *Great Eastern Hotel Co Ltd* 99 Con. L.R. 45.

62. The erection of the roof itself took 35 weeks rather than the 10 weeks programmed by Laing. It was completed on 1st May 1998 instead of late October of 1997 as planned. That was a delay in excess of six months. The reasons for these delays had been canvassed a great deal in the evidence.

63. The parties are agreed that one of the fundamental causes of delay was the fact that TRAD did not devote adequate resources to the design of a roof. The fact that TRAD did not have or were not prepared to devote adequate design resources was not sufficiently appreciated or dealt with until long after the temporary roof should have been completed.

64. The parties accept that the temporary roof was critical to the whole Project and agree that the delays to the procurement and erection of the temporary roof caused a substantial delay to the project. GEH say that the critical delay caused was 19 weeks and Laing’s expert accepts that the critical delay was even more substantial, 26.9 weeks. In either case, the effect on the project was significant. It never recovered from this first fundamental setback, and the delays sadly became worse.”

Judge Wilcox’s conclusion on this issue, at [111], was:

“In my judgment, in relation to this phase of the project, the defendants are clearly in breach of clauses 2.8, 2.9, 3.1, 3.2 (D) and 3.4 of the CMA and in consequence by their acts and omissions are proved to have significantly caused the delay during these periods.”

The judge was looking for an objective evaluation from the experts. The two experts approached their analyses of project delay in two different ways:

“67. Both experts approached their analyses for the principal part of the project differently. Mr X for the main part proceeding retrospectively from an as built programme to determine the critical path and respective periods of delay and causes. Mr Y used an impacted as planned programme analysis by which the project is analysed on a monthly basis to measure the impact of events as the project proceeded.

68. The principal critical path determined by each expert was broadly similar. The total extent of delay periods found by each expert broadly coincided. Mr X’s assessment was several weeks longer than Mr Y, but I am satisfied that by applying an adjustment for public holidays and not taken account of by Mr X, there is no significant overall difference. It was 491/2 weeks.

69. The vital differences relate to some differences as to the route of the critical path and the causes of delay advanced by each expert.”

However, there was some agreement between the experts before the matter reached the trial stage:

“70. The experts in their joint statement that Court agreed as built dates for construction activities up to April of 1999. Thereafter, due to lack of information, Mr Y was unable to confirm the dates relied upon by Mr X in his as-built programme. They both agreed that MP/1 demonstrated Laing’s programme intentions at the time it was drawn in August of 1997 and at the

time the periods allocated to the activities were reasonable. Mr Y made certain improvement and refinements to MP/1. Not all of these were agreed by Mr X but none are particularly significant.

...

74. The experts dealt with the delay issues with reference to identified periods of time. In reviewing the evidence I would do so relating to each of these periods.”

And:

“183. I accept Mr Y’s careful evidence as to the impact of the flow of design information throughout the Project. It was based on thorough research and objective analysis.

184. Furthermore, Mr X in his report compares the timing of the actual design releases against an original programme which was superseded by later versions of the procurement programme on which Laing showed later dates for the provision of the information required.

185. Mr Y took account of the actual events in his researches and exhibited in his researches and conclusions the clear-sighted objectivity that informs the whole of his report.”

One of the issues which came up during the trial was progress monitoring and reporting. On this issue, Judge Wilcox said, at [223]:

“It is evident in my judgment that Laing consistently underplayed mention of the true causes of critical delay and assert[ed] other reasons for delay that would not reflect upon them. They consistently misreported the delays actually occurring and manipul[at]ed the data in the programme update to obscure the accurate position.”

Another issue which received comment in the judgment was that of alterations to the programme logic. An example of this issue in the judgment was:

“230. The deletion of the logic link between the demolition of the Mansard and demolition of the Infill Block obscured from GEH and the design team that the Infill Block was as critical as it was. Had Laing’s manipulation not taken place the criticality of the Infill Block from the delays it was causing would have become more readily apparent to everyone. In that event [it is] more likely than not that under inevitable pressure from the hotel and design team Laing would have taken steps to commence demolition of the Infill Block after protecting the Rail Track services at a much earlier stage. The misreporting of progress had further serious effects on the following Trade Contractors.

231. Because of the misreporting of progress, some of the following Trade Contractors commenced work on site before the works were ready for them, and this led to claims for extensive extensions of time together with prolongation and disruption costs. Had the true state of progress been declared, whilst it would have been necessary for Laing to have renegotiated with Trade Contractors in order to postpone their commencement on site, the cost

consequences of such renegotiation would have been relatively minor, and it would have avoided the subsequent claims for extensions of time and loss and expense.”

Commentary

The two party-appointed experts took different approaches to their task. One expert used a retrospective analysis approach from an as-built programme to determine both the critical path, the periods of critical delay and their causes. This was based on the “collapsed as-built” technique. The other expert analysed the project on a monthly basis in order to measure the impact of events as the project proceeded. This was based on the “windows” technique.

Despite the different approaches used by the experts, their results showed that the principal critical path and the extent of the critical delay periods were broadly the same.

The judge had some comments about the potential difficulties with the “collapsed as-built delay analysis”. The judge’s view was that, unless this takes account of the actual events which occurred on the project, it can only give rise to hypothetical answers. One of the key issues in this dispute involved the timing of design release. The judge commented that it was necessary to do more than compare actual release against the original construction programme, stating that, if you only do this, the analysis will not take account of the fact that the design team would have been aware of the significance of any delays which may have occurred to the original master programme. In other words, the design team may have been able to prioritise design and construction to fit actual progress.

The judge preferred the “as-planned impacted delay analysis”, which is a form of “windows” analysis in that the delays are determined and assessed by analysing the updated planned programme on a monthly basis to measure the impact of events as they occurred. In summation, the judge preferred the forward-looking “impacted as-planned” to the retrospective “collapsed as-built” approach. In particular, he considered it very important that it had been based on a careful analysis of what had actually happened. Furthermore, whilst ensuring that his own delay analysis could be supported, the expert had dealt with the question of concurrency by considering all other activities which might have caused delay to the completion date of the project, if the identified critical activities had been completed within the originally programmed period. The expert’s conclusion was that none were in fact critical, thereby demonstrating to the court that the case in relation to the alleged concurrent causes of the delay could not be established.

6. *Mirant Asia-Pacific Construction (Hong Kong) Ltd v Ove Arup & Partners International Ltd (2007)*¹⁴

The factual background

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.

The site for the power station was located on Banguyao Point, which is at the end of a hilly peninsula. In order to build the plant, a large section of the hill had to be removed by excavation and blasting. Arup's design for the boiler house foundations was based upon assumptions regarding the bearing capacity of the finished ground level. 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 dispute

The action was commenced by Mirant against Arup in 2002, and the first hearing took place in the Technology and Construction Court in the spring of 2003. A second hearing took place in late 2003, which concerned the remaining issues on liability. H.H. Judge Toulmin CMG QC issued his judgment in July 2004 and the matter was taken to the Court of Appeal where the judgment was upheld. Both the Technology and Construction Court and the Court of Appeal had decided that Ove Arup had been negligent in the design and was liable for the consequential damages of that negligence.

At the latest hearing, which took place in the TCC in December 2006, Mirant were claiming some £38 million. This sum consisted of liquidated damages, rectification costs, acceleration and other time-related costs.

The judgment

Although the remedial works to the boiler house foundations caused significant delay and cost to the boiler erection work, Judge Toulmin's conclusion was that Arup was not liable for the time-related cost incurred.

In examining Mirant's claims, Judge Toulmin indicated that it was necessary to investigate and establish as to whether the remedial work to the boiler foundations was on the critical path for completion of the project.

Judge Toulmin made the following observations and statements on "the critical path":

¹⁴ *Mirant Asia-Pacific Construction (Hong Kong) Ltd* [2007] C.I.L.L. 2480.

“129. 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.

130. 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.”

Judge Toulmin had some observations on the “windows” method of delay analysis, stating:

“131. 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.

132. 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.

133. 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.

134. As Pickavance makes clear, the essence of windows analysis is to provide a snapshot at the point at which the analysis takes place. It is a method of discovering the effect between a particular event or series of events within the time frame and the effect of one or more events on the total contract period.

135. Pickavance also notes that if the critical path analysis takes place using less frequent intervals, for example at watersheds, i.e. critical benchmarks in the Project some months apart, it will be necessary to retain and review detailed records in order to provide reliable data. Clearly the longer the interval between windows, the more likely it is that the review will be inaccurate (particularly if the records are poor). In such cases, where something has gone wrong which requires blame to be attributed, there is likely to be more room for discussion and dispute as to who is responsible for losses which occurred in the period between windows.

136. In this case forms of the windows or, perhaps more accurately described, watershed analysis are used by the experts to attempt to re-create the critical path using, in Mr X's analysis, three benchmarks and covering a period from April 1997 to October 1998 and in Mr Y's analysis, four benchmarks covering a period between April 1997 and October 1999. The fact that these benchmarks cover extended periods of time reduce the overall reliability of the analysis which was carried out. I will deal with these matters in detail later but I refer to them now primarily to give some background to terms which will be used in the course of my analysis of the facts."

Under the sub-heading, "The programming experts", Judge Toulmin gives his observations on "the critical path" and "delay analysis". The judgment states, at [565]–[575]:

1. The critical path can be defined as 'the sequence of activities through a Project network from start to finish, the sum of whose durations determine the overall Project duration'.
2. Duration is only the shortest time if activities on the critical path are carried out in the shortest time.
3. There may be more than one critical path.
4. It is important to look at activities at or near the critical path to understand their potential impact on the Project.
5. 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.
6. 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.
7. 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.
8. 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.

9. 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.
10. It is, of course, obvious that the analysis is only valid if it is comprehensive and takes account of all activities.
11. As the claimant readily acknowledges, it is merely a tool which must be considered with the other evidence. The question of whether or not the failure of the Boiler foundation caused delay to the commencement of the Reliability Trials and if so what delay is a question of fact. The evidence of Programming Experts may be of persuasive assistance.”

The next paragraph of the judgment is also important:

“576. To these propositions 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. In this respect Mr X’s analysis which ends in October 1998 is seriously flawed.”

Judge Toulmin’s conclusion was that the defective boiler house foundations did not cause critical delay to the project. There were other parts of the project works, which were the responsibility of Mirant and which were in more critical delay. Furthermore, the remedial works to the boiler house foundations were accommodated within the revised programme and did not, at the time, cause critical delay. Therefore, although the defendant, Arup, had breached its contract, this had not caused the claimant, Mirant, any loss. The Judge dismissed all of Mirant’s damages claims against Arup.

Commentary

First, it should be stressed that this hearing and the judgment concerned an assessment of damages, and was not directly about extensions of time. This judgment emphasises the importance of a reliable critical path analysis when assessing the extent of delay to a project. The latest hearing in this dispute was chiefly about how to assess the impacts of competing causes of delay. Judge Toulmin considered that it is important to look at the other work activities which were close to the actual critical path at the time of an event. In his judgment, he emphasised that “It is important to look at activities at or near the critical path to understand their potential impact on the Project”.

The judgment contains support for the “windows” method of delay analysis, and makes the following observations on this technique:

“132. 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.”

And:

“569. 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.

570. 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.”

Finally, this judgment reinforces the need for a reliable critical path delay analysis for the totality of the project to establish the real cause or causes of critical delay. As Judge Toulmin commented:

“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.”

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 as follows:

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.” (at [129])

This is the nub of a good and reliable “delay analysis”.

2. “There may be more than one critical path.” (at [567])

An important observation which is often not appreciated by those reviewing a delay analysis.

3. “It is important to look at activities at or near the critical path to understand their potential impact on the Project.” (at [568])

This is a good point, which should be followed by anyone carrying out a delay analysis.

4. “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.” (at [576])

Again, sensible advice, which is sometimes overlooked in a delay analysis.

5. “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. Windows analysis is the most accepted method of critical path analysis. In essence they (a ‘windows’ analysis) 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 essence of windows analysis is to provide a snapshot at the point at which the analysis takes place. It is a method of discovering the effect between a particular event or series of events within the time frame and the effect of one or more events on the total contract period.” (at [132])

This, in the author’s view, is a very good explanation of the “windows” method of delay analysis.

7. *City Inn Ltd v Shepherd Construction Ltd (2007)*¹⁵

The factual background

The contract was for the construction of a hotel in Temple Way, Bristol, under an amended JCT 80 form. The date of possession was January 26, 1998 and the completion date specified in the contract was January 25, 1999. However, some two months before the completion date, the employer, City Inn, dismissed the design team. The new architect certified practical completion as March 29, 1999 and the extended completion date was February 22, 1999. The result of the certificates was that the contractor, Shepherd, was awarded a four-week extension of time, entitling the employer to deduct liquidated damages for a five-week period from February 23, 1999, at a weekly rate of £30,000.

In adjudication, the adjudicator awarded an additional five weeks’ extension of time, bringing the overall extension of time to nine weeks. The adjudicator also directed the repayment of the total sum of £150,000 deducted as liquidated damages.

The dispute

In the court proceedings, Shepherd claimed an extension of time of 11 weeks and a declaration that the completion date was April 14, 1999. City Inn contended that Shepherd was not entitled to any extension of time at all beyond the original contract completion date. The basis for this was twofold:

- i) If the instructions issued by the architect had caused delays, then they were concurrent with delays arising from matters which were the contractor’s responsibility.
- ii) The contractor did not comply with cl.13.8 of the contract, which lays down the procedures to be followed by the contractor where an architect’s instruction was likely to delay completion.

¹⁵ *City Inn Ltd* [2007] CSOH 190.

The case involved complex arguments, including the principles of calculating extensions of time, critical path analysis and causation in law when there are concurrent events. The case was heard by Lord Drummond Young in the Outer House of the Court of Session in Scotland, and his opinion was handed down on November 30, 2007.

The judgment

Expert evidence on delay and the analysis/assessment of delay was central to the case. Generally, Lord Drummond Young preferred the approach of the Shepherd expert based upon a thorough examination of the construction process and the evidence of a key witness to the construction, instead of an as-built critical path analysis prepared by City Inn's expert.

Both City Inn and Shepherd each relied upon expert evidence of their programming experts, but only Shepherd led any witnesses of fact. Despite criticisms of the witnesses and experts by the parties, Lord Drummond Young found that all the witnesses were generally reliable and were doing their best to present their evidence in a fair and impartial manner. He found that both experts were well qualified to speak about the issues which arose, so that in choosing the evidence Lord Drummond Young was guided by the details of their evidence and the inherent likelihood of their respective views against the known facts.

Shepherd's expert's evidence was based on the evidence of its witnesses, the diaries and weekly reports disclosed by City Inn and his discussion with City Inn's expert of the as-built programme prepared by City Inn's expert. Shepherd's expert had changed his views as more information became available and this was criticised by City Inn.

Only City Inn's expert carried out a full as-built critical path analysis of the project and he produced a filtered as-built programme. His analysis was based upon inspection of Shepherd's construction programme and the records of the project. It was accepted by City Inn that this approach required an element of subjective judgment, which relied upon the knowledge and experience of its expert of programming in the construction industry. Lord Drummond Young concluded that the full as-built critical analysis by City Inn's expert was of doubtful value and crucially concluded that it was impossible to surmise what the programme might show if the correct logic links were inserted.

Lord Drummond Young held that it was not possible to base any reliable conclusions upon the as-built critical path analysis. He said, at [29]:

“The major difficulty, it seems to me, is that in the type of program used to carry out a critical path analysis any significant error in the information that is fed into the programme is liable to validate the entire analysis. Moreover, for reasons explained by [one of the experts], I conclude that it is easy to make such errors. That seems to me to invalidate the use of an as-built critical path analysis to discover after the event where the critical path lay, at least in a case where full electronic records are not available from the contractor.”

On the matter of concurrency, the judge said, at [18]:

“Where there is true concurrency between a relevant event and a contractor default, in the sense that both existed simultaneously, regardless of which started first, it may be appropriate to apportion responsibility for the delay between the two causes; obviously, however, the basis for such apportionment must be fair and reasonable.”

The Outer House’s judgment was appealed, and in July 2010, the Inner House of the Court of Session in Scotland issued its judgment. The Scottish Court decided that where two concurrent causes are operative, one being a relevant event and the other being an event for which the contractor is responsible, the certifier should approach the matter in a fair and reasonable manner and apportion the delay between the causes unless one of them is dominant.

The majority opinion was delivered by Lord Osborne, and he endorsed the approach taken by Lord Drummond Young in the previous judgment.

However, the judgment of the Inner House sets out five principles relating to the evaluation of a delay and “loss and expense” claims.

1. For an extension of time claim to succeed the relevant event must be shown to be likely to cause delay or have caused delay, and that completion of the works is likely to be delayed or has been delayed by that relevant event.
2. Whether or not a relevant event causes delay is a question of fact to be determined by common sense.
3. It is for the decision maker to decide what evidence to use in forming his or her conclusion. This may take the form of a critical path analysis, but the absence of such an analysis does not mean the claim will necessarily fail. What matters is that the evidence used is sound, whatever form it takes.
4. If there is one dominant cause, all other causes will be disregarded. The dominant cause must be a relevant event for a claim to succeed.
5. Where a situation exists in which two causes are operative, and one is a relevant event and the other is caused by the contractor, and neither can be described as a dominant cause, it will be open to the decision maker to approach the issue in a fair and reasonable way to apportion the delay between the causes.

Furthermore, the court also approved the lower court’s decision to the effect that the same approach should be applied to claims for loss and expense under the JCT Form.

In contrast Lord Carlway, in his dissenting opinion, agreed with the overall result of the other judges, but applied different reasoning. He considered that apportionment was not the correct method of awarding extensions of time between two concurrent causes of delay.

Commentary

Whilst decisions in Scottish courts are not binding in England, they can, however, be referred to by English courts for guidance.

At first reading then, this case appears to be a condemnation of the use of computer-based critical path analysis in determining criticality and the effects of delaying events. It is, however, an unusual case in that nowadays tribunals are normally asked to choose between two competing critical path analyses, both of which are computer-based, but relying upon different methodologies. In this case, the choice was between no critical path analysis at all, and a patently inaccurate one.

In deciding upon the criticality of the alleged delaying events, and therefore the entitlement to extension of time, the judge considered that the application of practicality and common sense was more reliable than a flawed as-built critical path analysis. That must of course be right, and the message that Lord Drummond Young appears to be sending out is not that critical path analysis is inappropriate but that, if it is to be relied upon, it has to be done accurately and with due recognition of practicality and pragmatism.

Most construction and engineering projects are extremely complex and, without the assistance of planning and programming software programs, it would be impossible to bring them to fruition. Similarly, the analysis of delaying events and their consequences is just as complex, and it is the duty of the architect, or later the judge, arbitrator or adjudicator to analyse those delays in order to grant the extension of time in a proper and objective manner. Whilst the judge acknowledged this (“the architect exercises discretion, provided that it is recognised that the architect’s decision must be based on the evidence that is available and must be reasonable in all the circumstances of the case”), his emphasis on the “judgement” and “discretion” of the professional is bound to lead to a rather broad-brush, or impressionistic, approach if not constrained by a rigorous methodology, such as computer-assisted delay analysis. Indeed, in other cases, such as *John Barker Construction Ltd v London Portman Hotel Ltd* (1996),¹⁶ it has been said that the architect is to undertake

“[a] logical analysis in a methodical way of the impact which the relevant matters had or were likely to have on the plaintiffs’ planned programme.”

Overall conclusions

What has been gleaned from these seven judgments handed down during “the noughties”? The following are what the author considers to be the important matters and lessons to be learned.

1. **Programmes**
 - a) A proper programme should be maintained during the execution of the works: *Balfour Beatty Construction Ltd v Lambeth LBC* (2002).
 - b) In determining an extension of time, the “foundation” should be the original programme, subject to justification and substantiation of its validity and reliability: *Balfour Beatty v Lambeth LBC*.

¹⁶ *John Barker Construction Ltd v London Portman Hotel Ltd* 83 B.L.R. 31; (1996) 12 Const. L.J. 277.

- c) In establishing a reliable base line for analysis, the objective is to remove flaws in the original master programme. Furthermore, if more detailed sub-programmes are available, they should be considered in any reconstruction of the master programme, in order to provide a reliable base line programme for the assessment of delays: *Skanska Construction UK Ltd v Egger (Barony) Ltd* (2004).

2. Determining EOTs and analysis of delays

- a) 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: *Royal Brompton Hospital NHS Trust v Hammond* (2000). This approach was endorsed in *Motherwell Bridge Construction Ltd v Micafil Vakuumtechnik* (2002), both judgments confirming again what was stated in *Henry Boot* (2001).
- b) In *Mirant Asia-Pacific Construction (Hong Kong) Ltd v Ove Arup & Partners International Ltd* (2007), the judgment emphasised the importance of a reliable critical path analysis when assessing the extent of delay to a project. Judge Toulmin also considered that it is important to look at the other work activities which were close to the actual critical path at the time of an event.
- c) An extension of time for completion of the works may be granted in respect of a relevant event occurring during a period of culpable delay: *Motherwell v Micafil*. This is an endorsement of the approach in *Balfour Beatty*.
- d) Judge Wilcox had some comments about the potential difficulties with the “collapsed as-built delay analysis”. The judge’s view was that, unless this takes account of the actual events which occurred on the project, it can only give rise to hypothetical answers. The judge commented that it was necessary to do more than compare actual release against the original construction programme, stating that if you only do this, the analysis will not take account of the facts: *Great Eastern Hotel Co Ltd v John Laing Construction Ltd* (2005).

3. Concurrency

- a) The matter of concurrency should be looked at closely: *RBH v Hammond*; and these should be demonstrated where necessary: *Balfour Beatty v Lambeth LBC*.

4. **Other advice**

The judgment in *Skanska v Egger* gave the following good advice to all delay analysts and expert witnesses on planning/programming matters:

- a) It is not advisable to overpower the court with information and numerous delay charts which are difficult to understand. Whilst planning software nowadays is capable of producing a wide variety of reports and charts, careful consideration should be given in selecting the outputs to be incorporated in a report.
- b) It is fundamental that the delay analyst is “objective, meticulous as to detail, and not hide bound by theory as when demonstrable fact[s] collide with computer programme logic”. This applies to all methods and techniques of delay analysis, time impact analysis or other methods.
- c) If a report is to be presented to court, or a tribunal, the expert must be fully conversant with his or her report. Whilst this may seem self evident, it is common practice on large and complex projects for an expert to engage assistants to carry out aspects of the investigation. However, an expert’s opinion becomes less compelling if the impression is created that the expert is not entirely familiar with the details of his or her own report.

All good sound advice.

Finally, on a personal note, the author had a major involvement in the *Royal Brompton Hospital NHS Trust v Hammond* case; being the only planning/programming expert who was cross-examined in court during the hearings.