Programme, Delay and Extension of Time: a Practical Approach

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1. Introduction

Delay and disruption issues that ought to be managed within the contract all too often become disputes which have to be decided by third parties. Such procedures are time consuming and very expensive for both parties. The number of such cases could be substantially reduced by introducing an adequate approach to understand the programmed works and their expression in recordings, and to identify as quickly as possible the consequences of delays and disruption.

The aim of this article is to present some practical considerations in relation to the programme, completion date, delay, extension of time and compensation. Special attention is given to the following themes:

- specific aspects of the construction contract in relation to delays;
- the programme, its follow-up and updating;
- delay, acceleration and extension of time;
- compensation for the costs of the delays;
- recommendations.

The various events linked with the execution of a construction contract have a direct influence on the programme of the works. What are the consequences in terms of completion date for the employer, the investor and the contractor? What is the role of the programme? Should it be considered a fixed picture, or a tool for communication and management? What are the requirements when setting up the programme at contract signature and how to deal with the follow-up and the updating of the programme? From the outset of the contract, a lot of events may have an influence on the progress of the works that leads to a late completion date. Is there any methodical approach to treat the issues of delay, acceleration and extension of time? Delay will result in additional costs and the question of who should bear the cost for the delay is often a contentious issue. The aim of this article is certainly not to give a detailed answer to all these questions, but to draw the attention of the reader to these issues by using a practical approach and to mention some main guidelines which could be useful when dealing with this matter.

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2. Specific features of the construction contract

2.1 Requirements

The construction contract is unique because it includes many specific features coming from the essence of the construction business. Actually, any kind of construction depends on various factors, whose importance may vary according to the specific conditions of each contract. These features are:

- A construction is in most cases a prototype, executed on site and not in a workshop.
- Large amounts of money are involved. It is a long-lasting investment and the investors—public or private—have legitimate expectations as to the end result and the return on their investment.
- The completion date is essential, as it corresponds to the beginning of the use or lifetime of the construction.
- Large impact on the environment.
- Numerous actors with various education, background culture, experience and expectations. They are committed to work together during the whole duration of the project without previous joint experience.
- The construction time is a more or less long-lasting period. External conditions, such as for instance local, political, or meteorological conditions cannot be easily mastered.
- The great number of various decision makers implies a strong need for efficient co-ordination.
- Quality of design, preliminary investigations, specifications, provided documents and contract documents are of great importance.
- Unforeseeable events.
- Underground conditions.
- Meteorological conditions.

From the above features, it can be seen that construction is linked with a large number of risks and that a lot of various events may have an influence on the programme of the works.

In this article, the two contracting parties are known as the "employer" and the "contractor". In some forms of contract, a third person, the "engineer", is appointed by the employer to act as contract administrator for the purpose of the contract. In the text, for the sake of clarity, the term "employer" includes both the engineer and the employer.

2.2 Objectives of the contract

The construction contract fundamentally includes an obligation of result in terms of time—the completion date, quality and costs. This means that the contractor is obliged to deliver the works according to the contract provisions and that the employer has a legitimate expectation to get a result in line with their objectives. Therefore, they should also be ready to pay the corresponding amount of money. In some forms of contracts, the completion date is not part of the main obligation

but the contract provisions include milestones and/or a completion date, together with delay penalties.

Among these objectives, the completion date plays a major role for the employer as it corresponds to the beginning of the period of use of the work and of the return on their investment. Moreover, the respect of the completion date also plays an essential role for the investor in relation with their own investment constraints, their cash management during the construction process, as well as with the financial interests which should be taken into consideration.

The contractor should organise the whole logistical management of their works, as well as the performance of the works in such a way that they should be able to respect their obligation to perform the works within the contractual deadlines. In addition, a lot of costs—known as "time-related costs" (meaning costs which vary in direct relation with the passing of time)—incurred by the contractor are calculated in relation with the total duration of the works, which means that, if the completion date is delayed, such costs will further develop over the time and result in additional costs. On the contrary, the fixed costs included in the contract value are in general not affected by the actual duration of the completion of the works.

2.3 Need for a completion date and a programme

The vast majority of construction and industrial contracts include a completion date and/or intermediate milestones and these time requirements are supported by a programme. This situation results from the fact that any investor, owner, employer or industrial needs to know when the works will be completed and when they will be able to make use of the construction, or of the production line. This consideration also concerns the investor(s), not only in terms of investment programme and cash flow, but also in terms of return on investment, or amortisation. One key factor to reach these goals is the programme of the works, with its whole set of actions and measures to be taken. These time-related features are so important nowadays that most contracts—if not all—include a so-called contractual programme, milestones, a completion date—or various completion dates—and delay penalties.

For the contractor, the existence of a contractual programme is also of first importance as such a programme is an essential tool to manage the follow-up of the contract in terms of cost, productivity, mobilisation of human resources, supply of material and equipment, storage on site and so on. The programme also plays a major role in the management of the activities of all sub-contractors and suppliers.

3. The programme

3.1 Setting up a programme

In the construction industry, the first draft of the programme is generally prepared by the engineer according to their own experience and to the expectations and/or needs of the employer. This first programme represents a prevision and the intention of one party, i.e. the employer. It is therefore included in the call for tenders as the *tender programme* and submitted accordingly to the bidding contractors.

The contractor should not only review this tender programme, but they should also calculate their own programme in relation with human resources, machines,

equipment, productivity ratio, supply conditions, sub-contractors' and suppliers' resources and capacities. This contractor's programme is then included in their proposal and represents a commitment to the time for the completion of the works. Of course, the contractor's experience in preparing such a programme is essential, as well as the quality of the factual data which are included in it. This programme is submitted to the engineer/employer for their approval. The role of the engineer is to check the milestones and the completion date, but not to challenge all details of the programme. After its acceptance, this programme becomes the *contractual programme*.

It should be kept in mind that any programme represents a more, or less realistic view of a large range of tasks—the rational part—but also includes the forecasts and the intentions of the parties to the contract—the prospective part. In addition, such a programme also relies on the base conditions as mentioned in the bidding documents, the technical specifications and on the drawings, but also on assumptions to be evaluated according to the contractor's experience.

Therefore it should be underlined that any contractual programme includes a lot of risks to be borne by the contractor. For instance, the local conditions always represent a major risk as their impact on the actual programme development may be very difficult—if not impossible—to assess. As a consequence, the setting up of the programme is part of the risk evaluation of the project which is to be carefully carried out by the contractor before the signature of the contract.

3.2 Role of the programme at contract signature

Quite often, the consequences of the programme, and in particular the completion date, represent a major challenge, or even a big issue between the parties at the time of the signature of the contract. Both parties want to preserve their own direct interest: the employer is looking for a shorter duration of the works, while the contractor tends to avoid any risk leading to delay penalties.

This difference in the approach of both parties is well known and frequently represents a major source of future disputes as negotiations on the programme may be very tough under the pressure of the employer—who makes the final decision—and the contractor's stress in the hope of a new contract. It is not rare to state at a later stage that a reduction of the duration has been agreed upon without thorough consideration of all possible consequences.

Nowadays, in any case, the contractual programme—sometimes known as the "baseline programme"—is generated with the help of a critical path method project planning system, supported by specific software running on a computer. Such a programme usually includes many different levels of details. It also includes all milestones and deadlines, as well as the completion date and mentions all detailed activities for each part of the project, or scope of works. Each activity is represented by its starting date (the outset of the activity) and its finishing date (the end of the activity), its duration in working days and the corresponding allocated resources. These activities are connected with system links—e.g. the outset of the activity B depends on the end of the activity A—and the critical path is then calculated by the software.

3.3 Follow-up of the programme—the revised contractual programme

The contractual programme set up at the outset of the performance of the works offers a prospective picture reflecting the intentions of the parties. This picture should not be considered a result, but rather a starting point for an evolutionary process. After the beginning of the works, the programme should be updated by the contractor at regular intervals and submitted to the employer for information and approval. The programme is a record of the past activities—the as-built situation—and a forecast for the future activities. In case the programme should be modified for any reason, the contractor, after agreement with the employer, should issue a *revised contractual programme*.

Thus the programme should not be considered a fixed picture, but should be used as an evolutionary tool to plan the project development and the measures to be taken by the contractor in order to respect the completion date. It is therefore essential regularly to update this picture according to the actual events which develop during the contract implementation.

It is one of the major tasks of the contractor's project management to *update* the programme on a regular basis in such a way that the updated programme still reflects the actual progress of the works, but also the future consequences of any delay event. Another important task is to *inform* the employer and their own company—including the sub-contractors and the suppliers—of any delay and to *propose* the required mitigation, or acceleration measures. Such a detailed review at regular intervals is essential for both parties, as it allows planning correcting measures—mitigation, or acceleration—at a point when it is still possible to react in such a way that any delay may be partially, or totally compensated.

3.4 Use of the contractual programme

The programme is not only a contractual document, but also a management tool and more particularly an essential *communication method*. The follow-up of the programme and its review at regular intervals is a key point for communication between the parties and should be used as an early warning signal by the contractor in case a delay begins to appear. In particular, once a delay event occurs, the programme is to be used as basis for the impact the delay may have on the completion date. Such a procedure is required to analyse the consequences of a delay event and to prepare a contractor's claim in view of justifying an extension of time. In addition, many softwares take into account the costs of the various activities, namely the cost of the project, and allow the contactor to operate a cost controlling at any time during the performance of the works.

4. Delays, acceleration and extension of time (EOT)

4.1 Origin and causes of delay

The characteristics of the construction contract—see section 2.1 above—show that the construction activity is linked with a large number of events which may have an influence on the progress of the works and on the completion date. The

comparison between the initial contractual programme—the intention—and the revised contractual programme—the reality—highlights a "difference" between two observations made at different times. This difference may be close to zero, but in most cases it represents either a gain in time—the actual progress is ahead of the programme—or a delay.

The origin of a delay may result from numerous causes, such as:

- late delivery of the execution drawings;
- variation in the scope of works;
- late decision—from one, or the other party;
- late approval;
- change in the technical specifications;
- insufficient productivity;
- lack of quality—correction works;
- weather conditions;
- unforeseeable physical conditions;
- supply issues;
- technical issues;
- unqualified sub-contractor;
- customs administration;
- transport issues.

From the above, it results that in most cases the causes of delays and more particularly the corresponding responsibilities and consequences are attributable not only to the contractor, but also to the employer. Therefore the assessment of such issues requires a detailed and sometimes complicated analysis.

4.2 Principles of delay analysis

In order to clarify the responsibilities for a delay between the parties, it is necessary to make a clear distinction between "culpable" and "excusable" delay. Typically, a culpable delay, or contractor delay results from a *contractor delay event*—also known as contractor risk event - while an excusable delay, or employer delay results from an *employer delay event*. This distinction is not subjective but actually depends upon who bears responsibility for the delay event, which is essential for the assessment of the consequences of a delay.

In case of a culpable delay, the impact on the completion date results from the contractor's activity and responsibility and may lead—depending on the contract provisions—to delay penalties to be charged to the contractor.

On the other hand, an excusable delay entitles the contractor to submit a claim for an extension of time or EOT. The aim of an EOT is to relieve the contractor of liability for delay damages during the period prior to the extended contract completion date. Depending on the circumstances and on the contract provisions, the contractor may be entitled to compensation. For the employer, the benefit of the EOT is that it establishes a new completion date and prevents time for completion of the works becoming "at large".

A delay analysis must therefore be started by identifying and clearly distinguishing between contractor delay events and employer delay events. But sometimes such a clear distinction is not possible because of a complex

inter-relationship between the events. In such cases, a possible approach consists in an assessment of the extent of the delay attributable to the employer—also known as compensable delay—and to make a reasonable estimate of the resulting costs.

4.3 Entitlement to an EOT

Culpable delay

In case of a culpable delay alone, i.e. resulting from a contractor delay event, there is usually no need to perform a sophisticated analysis of the consequences, as there is no entitlement to an EOT. The comparison between the actual—or as-built—programme and the contractual programme allows the identification of the delay. Depending on the contractual provisions, such a delay frequently allows for compensation in favour of the employer in form of delay penalties.

Excusable delay

In case of excusable delay alone, i.e. resulting from an employer delay event, most if not all standard forms of contract contain obligations for the contractor *to give notice* to the employer as soon as the employer delay event occurs. Later, when preparing their claim, the first task for the contractor is to identify the delay event, to clarify the responsibilities and to justify *the relation of cause and effect* of the delay event on the progress of the works. This point is considered essential by many dispute board members, judges, or arbitrators having to make a decision on such issues.

Then the contractor should perform a delay analysis according to a recognised method in order to demonstrate the impact of the employer delay event on the completion date and to justify the requested EOT. Such analysis should be done at the time when the delay event occurs. This allows calculating the final impact at that date and, moreover, to plan mitigation, or acceleration measures for the moment when such measures may really be implemented.

Unfortunately, such a delay analysis is very frequently not performed at the time when the delay event occurs, but at a later stage, or even later, at the end of the performance of the works. In such cases, the keeping of accurate *contemporary records* by the contractor is essential for the analysis which should be carried out on the basis of a simulation of the existing as-built programmes at the date of the event. There are many methods to analyse delays and their impact on the programme. The best method may be selected on the basis of the type of demonstration which should be achieved and by taking into account the advantages and disadvantages of each method.

In some cases, the responsibility for the delay event is shared by both parties to the contract. In this situation, a possible approach is to assess the issue on a case by case basis in taking into consideration the role and the responsibility of each party in the occurrence of the delay event and in the relation of cause and effect between the event and the delay.

Concurrency of delays

In many cases, the problem is more complex as the programme is actually affected by a contractor delay event and an employer delay event which happen at the same time. In other words, a contractor delay to completion occurs *concurrently* with an employer delay to completion. The situation is similar when two, or more delay events arise at different times, but the effects of them are felt at the same time. In such a case it is more correct to speak about the concurrent effect of sequential delay events.

Concurrency is a contentious issue because there are different views on the correct approach to concurrency. Guidance given by many protocols considers that the contractor's concurrent delay *should not reduce* any EOT due to the contractor as a result of the employer delay.

In any case, it is necessary to carry out analyses of each delay *separately* and in the sequence in which they arose. This analysis is essential for determining whether any compensation will be due for the employer delay.

4.4 Disruption of the works

In general terms, disruption of the works, as distinct from delay, is disturbance, hindrance, or interruption of a contractor's normal working method, resulting in lower efficiency. In other words, disruption of the works corresponds to a loss of productivity, or the interruption of the progress of the works. The consequence of disruption may, or may not be a late completion of the works. If the completion of the works is delayed, the contractor is entitled to claim for an EOT. If the contractor finishes the works by the completion date, they will not have to claim for an EOT, but may claim for the cost of reduced efficiency of their workforce. Not every disruption leads to compensation. The contractor will be able to recover disruption compensation only if the employer causes the disruption.

4.5 Acceleration measures in case of delay

Acceleration measures refer to any measure taken by the contractor in order to make up for a delay, partially, or totally. In case of a contractor delay event, the challenge for the contractor is usually to reduce, or to avoid delay penalties due to the employer. But acceleration measures may also be taken by the contractor in case of an employer delay event, or in case of concurrency of delays. Typical acceleration measures include:

- improved human resources;
- night shifts;
- additional material, machines and/or equipment;
- simultaneous execution of activities which were originally planned in chronological sequences;
- use of a specific execution method allowing a faster progress of the works;
- use of additional sub-contractors (if a simultaneous execution of activities is possible).

Acceleration measures must be introduced in the programme and their impact should be taken into consideration when assessing the entitlement to and the extent of an EOT. A comparison between the two programmes with and without acceleration measures allows the assessment of the impact. In addition, it should be noted that any acceleration measure has a cost which should be taken into consideration when assessing the costs of the delay and their compensation. If the delay was caused by the employer, the use of acceleration measures gives rise to a right to compensation for the contractor.

5. Compensation of delay costs

In general, a delay results in additional costs. In practice, the question of who should bear the costs of the delay is often contentious. At first it should be noted that entitlement to an EOT*does not automatically* lead to entitlement to compensation. In some standard forms of contract, the contractor is required to claim for the entitlement to an EOT under one provision of the contract and to claim for its compensation under another provision. Before assessing compensation, they must consequently identify in the contract provisions any specific condition which governs such compensation.

5.1 Compensation in cases of contractor delay events

In general, any prolongation costs resulting from contractor delay events should be borne by the contractor and there is no compensation.

5.2 Compensation in cases of employer delay events

Prolongation costs resulting from employer delay events are compensated by the direct costs for the change, or variation of the works and by the contractor's costs for prolongation and disruption. Such costs are also known as time-related costs.

The valuation of the direct costs (labour, plant and material) for the change, or variation of the works must be made by the contractor with all required details according to the provisions of the contract (variation clause) and in such a way that the presentation of the valuation should be understandable by the other party and/or the judge, or a neutral expert.

The valuation of the contractor's costs of prolongation and disruption includes the extended use of time-related resources, notably the site overheads. But compensation for prolongation may also include other additional time-related resources, or any type of recoverable loss incurred by the contractor and resulting from employer delay events. Of course, the recovery of prolongation compensation depends upon the contract provisions and the cause of the prolongation.

A good approach is to consider that compensation for prolongation should not be paid for anything other than work actually done, time actually taken up, or loss and/or expense actually suffered. In other words, the compensation for prolongation caused by other than variations is based on the *actual additional costs incurred* by the contractor. In such case, it is up to the contractor to demonstrate that they have actually suffered loss and/or expense, if they want to be entitled to compensation, unless the contract provides otherwise.

Another very useful approach is to be found in some contracts where TRC—time-related costs, which occur in cases of delay—are defined in the contract by a global unit price per day. It means that the mechanism leading to compensation in case of an approved EOT is already agreed upon by the parties and is not subject to additional negotiation and agreement. The principal advantage of this approach lies in the fact that the contractor is not obliged to prove the incurred costs. The valuation of the compensation results from a simple calculation.

5.3 Compensation in case of concurrency of delays

Concurrency of delays is one of the most contentious issues in the determination of recoverable prolongation compensation. Basically, it seems appropriate to consider that if the contractor incurs additional costs caused by both employer and contractor delays, they may not recover compensation for the employer delay event unless they are able *to separate* the loss and/or expense (additional costs) caused by the employer delay from those caused by the contractor delay. Actually, the prolongation will be compensated if the contractor can prove that their losses result from the employer delay.

Accordingly it seems appropriate to consider that if the contractor would have incurred the additional costs *in any event* as a result of their own delays, they will not be entitled to recover those additional costs. This means that the contractor will be entitled to compensation only for any period by which the employer delay *exceeds* the duration of the contractor delay.

For such an analysis, the contractor should be able to submit the following documents:

- As-planned programme, including the as-planned critical path. This programme should be realistic and achievable in terms of productivity and progress of sequences.
- As-built programme, including the as-built critical path. This programme should be in line with the progress records and monthly reports.
- Identification of activities and periods of time resulting from employer delay events.
- Identification of activities and periods of time not included in the scope of works but at contractor's risk as to their costs.
- Identification of costs attributable to the two above activities.

Such an analysis should be coordinated with the analysis carried out by the contractor to claim their entitlement to an EOT.

5.4 Period of reference for the assessment of prolongation costs

The question is to know which period of reference of the programme should be used when assessing the prolongation costs: is it the period when the employer delay event actually occurs, or the extended period at the end of the contract? The answer to this question depends logically on the nature of the costs incurred by the contractor as a result of the employer delay event.

- If the contractor suffers costs directly related to the period when the employer delay event occurs—e.g. manpower, machines or equipment which are prevented to work during a specific period—then the assessment of prolongation costs should be carried out by reference to this period. In this way, the assessment is carried out with reference to the period when the amount of expenditure (daily, or weekly amount) actually corresponds to the costs incurred by the contractor.
- If the contractor suffers costs in relation with the extended period at the end of the contract—e.g. site facilities/equipment, management/supervision which remains mobilised for a longer time on site at the end of the contract—then the assessment of prolongation costs should be carried out by reference to this period.

5.5 Approach for assessing the disruption costs

Only in cases where the employer causes the disruption, the contractor will be able to recover disruption compensation. The contractor is responsible to demonstrate that the disruption comes from an employer delay event and to establish the relation of cause and effect. To carry out a disruption analysis, it is necessary to understand what kind of work was carried out, when it was carried out and what resources were used. In this view, the contractor should keep all necessary records and submit them with their analysis.

One appropriate method to establish disruption is to make use of a technique known as the "*measured mile*". The aim is to compare the productivity on an un-impacted part of the works with the productivity on the impacted part. If such disruption is caused by the employer, it may give rise to a right to compensation either under the contract, or as a breach of contract. When establishing the compensation for disruption, it is necessary to isolate issues which can affect productivity, but are unrelated to the employer's liability. The contractor has an obligation to manage their own change efficiently and their failure to do this should not be compensated.

5.6 Approach for assessing the acceleration costs

The benefit and the cost of acceleration measures should be assessed in the light of responsibility for the delay.

- In case of culpable delay, resulting from a contractor delay event, the acceleration measures will allow the contractor to reduce, or to make up for the delay and to avoid partially, or totally the payment of delay penalties. In such cases, the costs of acceleration measures are to be borne by the contractor.
- In case of excusable delay, resulting from an employer delay event, the employer will benefit from the acceleration measures and a fair compensation should be assessed and paid to the contractor.
- In case of concurrency of delays, the analysis should demonstrate which part of the acceleration measures allows making up for the culpable delay and which part for the excusable delay. In general

terms compensation is due for the part of the acceleration measures which covers the excusable delay.

6. Recommendations

6.1 Setting up and maintenance of programmes and keeping of records

Practical experience shows that many disputes could be avoided if the parties properly monitored and recorded the progress of the works during the course of construction.

Programme

According to contract provisions, or as soon as practicable, the contractor should summit a programme of the works, supported by a critical path method project planning software. In this programme, the contractor should clearly show the manner and sequences in which they plan to carry out the works. Practical experience shows that in addition to the contract requirements, the parties should reach a clear agreement on the programme which should cover:

- The form of the programme: critical path network, software package, relevant activities, milestones, date of completion, essential decisions, or approvals and so on.
  Interaction with method statement: how the contractor intends to construct the works and the resources they intend to use to do so.
- The deadline for the contractor to submit their proposal for the contractual programme. It should be kept in mind that sufficient time should be allocated to the contractor to plan their works properly.
  A procedure for obtaining acceptance of the contractual programme: the contractual programme represents a contractually compliant, realistic and achievable depiction of the contractor's intended sequence and timing of the construction of the works. Disagreement on the contractual programme should be treated as it arises and should not be allowed to continue throughout the project.
  The requirements for updating and saving of the contractual programme: updating and saving of the programme provide good evidence on what happens on the project. In this view, the joint meeting is essential to ensure regular communication between the parties and to jointly check the progress of the works.
- An agreement on the appropriate approach, or method of analysis in case of request for an EOT. Such an agreement may reduce the time investment and consequently the cost of such an analysis.

Software

Many types of software are available on the market and it is therefore important for both parties to reach an agreement on the software to be used to produce the contract programme from the beginning and during the progress of the contract.

Record keeping

As mentioned above, the quality of the records and good record keeping are essential in any delay analysis and EOT procedure. This task should be carried out meticulously and at regular intervals by the contractor. The parties should reach a clear agreement on the records to be kept.

Approach/method of delay analysis

It is recommended for both parties to agree on the approach and the method of delay analysis to be used to determine a delay to completion. Moreover, it is also useful to decide in advance who will carry out the analysis, i.e. a neutral party, or the contractor?

6.2 Assessment of EOT and its costs during the course of the project

These recommendations highlight some key points to be followed in order to deal efficiently and accurately with EOT applications.

Basic requirements

- The programme should be updated at regular intervals and the results as well as the corrective measures should be analysed and agreed upon by the parties in a joint meeting.
- Records should be kept and their registration should be checked.
- Any delay event should be treated as it arises, or as soon as practicable.
- A good communication between the parties is essential to deal efficiently with delay issues. In this view, the role of the joint meeting, held at regular intervals, is essential in the prevention of disputes.

EOT procedure

- The contractor should notify in due time any employer delay event.
- Any employer delay event should be treated as soon as it arises.
- The contractor should be able to demonstrate the relation of cause and effect.
- The contractor should demonstrate their entitlement to an EOT and should support their claim with all required records and documents.
- The choice of the method used to assess the EOT should allow the correct demonstration of the entitlement to an EOT.

If the submission is set up without respect of the above recommendations, there is an evident risk that the claim will be simply rejected, or that only a minimum EOT will be awarded.

6.3 Assessment of EOT and its costs after completion of the project

If the above recommendations (see sections 6.1 and 6.2 above) have been followed during the course of the works, but the analysis of delay events has not been carried out contemporaneously, it can be carried out retrospectively.

If the above recommendations have not been followed during the course of the works, the assessment of delays and prolongation after completion of the project will largely be dictated by the following:

- conditions of contract;
- nature of the delay events;
- value of the dispute;
- time available;
- as-built programme, records and available information.

The terms of the contract and the nature of the required proof will determine which method should be used to carry out the retrospective delay analysis.

In general, many methods may be used for identifying delays to completion. In practice, four of them are most frequently used, i.e.:

- as-planned v as-built analysis;
- impacted as-planned analysis;
- collapsed as-built analysis;
- time impact analysis.

The first three methods enjoy the benefit of simplicity and are therefore not very expensive to be implemented. They are restricted by their inability to identify concurrency, re-sequencing, mitigation, or acceleration. They may be not optimal because they typically include only one party's delay events while at the same assuming no delay event from the other party.

The fourth method, the "time impact analysis", takes account of the effects of progress and the timing of the delay events on the works. It is the best technique for determining the amount of EOT that a contractor should be granted when an employer delay event occurs. This method is more complicated and, therefore, more time consuming and more expensive, but it generates results showing entitlement and allows the resolution of complex disputes related to a delay and its compensation.