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Quantification of Construction Claims

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Over the years, there have been numerous Revay Reports on the calculation of damages, dealing with delays, extensions of time and additional costs. Reviewing the fundamental principles of damage calculation on a regular basis provides insight into how courts are currently approaching construction claims[1]. However, as is stated further, we do recommend consulting legal counsel when dealing with actual cases.

Although this article focuses primarily on contractor claims, it will also briefly discuss claims by project owners. This article does not address claims by contractors or owners against design professionals who, by their actions or inactions, can also be a source of problems in the construction phase[2]. To that end, claims against design professionals, in particular those initiated by project owners, appear to be more and more frequent.

Revay's experience, which encompasses more than 6000 disputes spanning over 45 years, is that proving and substantiating a claim or developing an effective defense against a claim is often difficult due to insufficient supporting documentation. The importance of maintaining updated project documents cannot be overemphasised. In this regard, we recommend reading previous articles on that topic published in the Revay Report[3].

The principles presented in this article are based on the author's own commercial experience and should not be interpreted as legal advice. The author recommends consulting legal counsel before applying the principles described below.

I- CONTRACTOR CLAIMS

1. CAUSES OF CLAIMS

Claims submitted by contractors typically arise from contract changes:

- Design changes to the work or other construction components;
- Increased project scope;
- Differing site or subsurface conditions; or
- Changes in work conditions caused by the project owner or its consultants.

Any such change can lead to longer completion time, increased costs, or, more often than not, both.

2. PROOF OF CLAIM

The dictionary defines a claim as "a demand or request for something considered one's due"[4]. When a contractor considers that contract changes caused damages, it will seek adequate compensation either in the form of an extension of time or additional payments, or both. The contractor believes it has a right to such compensation because the contract binding it and the owner provides, in its opinion, for such compensation.

To proceed with a claim, the contractor first needs to provide substantial proof for the following four points:

1. The existence of a change to the contract;
2. The extent of the damages sustained as a result of the change;
3. The causal link between the change and the damages claimed; and
4. The right to compensation for such damages.

Demonstrating the existence of a change to the contract (item 1) can be fairly straightforward. Contract changes can generally be examined in an objective manner and be established on factual grounds, such as, larger quantities of reinforcing steel, differing subsurface conditions, etc. Some facts may prove more difficult to substantiate, such as delays in the communication of information by the owner (e.g. responses to requests for information, change orders, notices of change, and revised drawings), delayed access to the site or to specific work areas, or delays or defects in work performed by others. Proving such facts, however, can be challenging if the contractor's documentation is incomplete or non existent. It is therefore important that contractors ensure proper document management, as this may prove very useful in establishing the history of events underlying a possible claim.

In a recent ruling[5], the Superior Court of Quebec stressed the importance of contemporaneous documentation in substantiating claims:

> [56] […] Causality must be founded on documents relating to the use of labour, equipment and materials, notably daily reports. The reason for this is obvious: such documents prove what really happened on a construction site and can therefore disprove any subsequent assertion in this respect.
>
> [82] […] What is the purpose of such daily reports, if not to constitute proof of what happens on a site?
>
> [83] […] when asked whether the work was behind schedule as of October 6th, [the witness] said that, as far as he was concerned, wall and column footings had already been completed […] This testimony is contradicted by the pictures […] dated October 8th which show workers installing formwork for footings.
>
> [Our translation]

The main challenge in substantiating and defending a claim often lies in demonstrating the damages sustained, i.e. time delays and related costs (item 2) and the causal link between the contract change and such damages (item 3). Although listing all the cost elements involved can be straightforward, the amounts themselves may be difficult to establish with accuracy.

The principle underlying the calculation of damages was emphasised in a ruling of the Superior Court of Quebec: unless contract provisions dictate to the contrary, the goal is compensation for all, but only for, the damages that were sustained[6]. In other words, the effect of any compensation must be that the aggrieved party finds itself in the same financial situation as if the fault in question (i.e. the contract change) had never occurred. This principle is also applicable to common law jurisdictions[7].

It is also necessary for the injured party to prove its loss if it is to recover the full measure of damages[8].

The right to compensation (item 4) is essentially a legal issue: do the contract or general principles of law provide for such compensation, and were the correct procedures followed and sufficient evidence provided by the claimant? It is crucial for a contractor to understand not only its rights, but also its obligations!

3. COST CALCULATION METHODS

3.1 Contract Provisions

It bears repeating that the contract constitutes the law between the parties. Relevant contract provisions must be applied as warranted[9], especially when the price of a change can easily be established before execution. This is the case, for example, if the contract expressly provides for specific unit prices or mark-up when extra work is required.

If the contract includes detailed provisions on compensation for any contract change, such provisions will help quantify the compensation for extra work. Contract provisions may apply before a change is implemented or, later, if a claim is submitted after completion. In the case of *Aluminerie Alouette Inc.* v. *Les Constructions du Saint-Laurent Ltd*[10], the Quebec Court of Appeal based its decision on that very principle:

> [73] In this particular case, in the light of relevant contract provisions, the claim essentially relates to adjustments, not damages.
>
> [Our translation]

3.2 Cost Estimate Method

This method, as its name suggests, consists in estimating the costs associated with any change before the change work is executed. This ensures that the owner is aware of all the costs involved for any extra work being considered prior to implementing the change.

To safeguard itself, a contractor should provide timely notice with the most comprehensive information and estimates available.

The practical reason was explained succinctly in the context of delay by Locke J.A. in *Doyle* v. *Carling O'Keefe*[11]:

> From the standpoint of the contractor, he may not, of course know precisely what the monetary effect of accumulation of delays might bring about, but an early notification of his concern will also enable him to get himself into a negotiating position.
>
> Early notification increases the chance that some contingency remains in the budget and/or that the required funding can be managed by other means.

Some contracts specify that the owner may order the contractor to implement a change even if the parties are unable to agree on a price beforehand. It is interesting to note that both owners and contractors see such provisions as removing any power on their part to negotiate a price once the extra work is completed.

3.3 Total Cost Method

The Total Cost Method is certainly the method most favoured by contractors. Generally, it is quickly rejected by owners and rarely accepted by the courts. In essence, the Total Cost Method involves claiming the difference between the total costs incurred by the contractor for the entire contract, increased to include overhead and profit, and the revenue earned pursuant to the contract. For this method to be valid, a number of conditions must be satisfied:

- The total cost of the work, as submitted, is reasonable and well documented and the contractor is not responsible for any portion of the cost overrun;
- The contract price is reasonable and not underestimated;
- The cost overrun, i.e. the amount claimed, is entirely attributable to the contract change in question; and
- No other method can be used.

The burden of proof for the Total Cost Method is challenging. It is no wonder the courts hesitate to use the Total Cost Method for damage calculation: perfect execution by the contractor is taken for granted and the owner is responsible for any and all additional costs incurred.

In order to alleviate this shortcoming, another method was developed; the Modified Total Cost Method. In this revised method, the contract price is increased to account for any underestimation, and any cost overruns caused by errors or inefficiencies on the part of the contractor are subtracted.

It should be noted that the courts generally consider this method to be no more than a variant of the Total Cost Method and remain reluctant to accept it.

Nonetheless, the Modified Total Cost Method was recently used before the Quebec Court of Appeal, leading to a decision granting a subcontractor damages of over $5.7 million[12]. The following excerpts outline the reasons behind the ruling:

> [210] It appears that DCCI, when quantifying the additional costs caused by the delays and construction acceleration, used a method similar to the "Total Cost Method" to evaluate the various costs (overtime, night work, productivity loss due to overstaffing, etc.) caused by such acceleration […].
>
> [211] The use of this type of method is not generally encouraged since it is a rare occurrence, especially in projects of such scope and complexity, that all costs relating to project acceleration can be attributed to a single party. The use of such method would normally be questionable because it "provides minimal links between the costs and specific claim issues" and because it "makes it extremely difficult, sometimes impossible, to isolate the causes of delays or additional costs which are not due to changes or differing conditions, but rather to contractor specific problems". Establishing causality would therefore be problematic here. […]
>
> [214] However, facing the "difficulties inherent in quantifying the acceleration program" imposed by Birdair, DCCI elected to base its claim on a variant of the Total Cost Method. No doubt, the accuracy of such method is far from perfect, and more than a few critics could find fault with it, but the judge was satisfied with it, with good reason since the specific circumstances of the case minimised the risks (or at least some of the risks) usually associated with the Modified Total Cost Method.
>
> [217] In short, from initial project planning to contract termination, Birdair committed breach after breach, which led to the need for construction acceleration; any blame on the part of DCCI pales in comparison. Attributing the extra costs caused by delays and acceleration (overtime, night work, productivity loss due to overstaffing, etc.) to Birdair does not, therefore, seem unreasonable in the circumstances of the case, even if calculated on the basis of a (modified) Total Cost Method, the use of which would otherwise be questionable.
>
> [Our translation]

The Modified Total Cost Method has also been tested in other jurisdictions. The approach taken in *Morrison-Knudsen Co* v. *British Columbia (Hydro & Power Authority)*[13] *and Opron Construction Co. Ltd.* v. *R. In Right of Alberta*[14] was to deduct from the aggregate amount claimed sums to cover *"errors made by the Plaintiff with respect to the plaintiff's bid, scheduling, planning, equipment election and utilization, efficiency, losses due to weather and other inefficiencies related to the plaintiff's operation..."*

3.4 Measured Mile Method

The Measured Mile Method is based on identifying differences in actual versus tendered costs associated with productivity that are the result of changes in actual versus tender conditions of execution. The Measured Mile is the method that best demonstrates the causal link between a contract change and the damages claimed. The method reflects the basic principle of damage calculation: the amount paid for damages should allow the aggrieved party to find itself in the same financial situation as if no change had been made to the contract. It is not surprising that this method is preferred by the courts.

The Measured Mile Method compares productivity in the period affected by a contract change to the same work performed in the conditions which were initially prescribed in the contract or could be expected at the tender stage. The timeframe used in such a comparison can be derived from work performed earlier (or later) on the same project, when conditions arising from the said change were not yet (or no longer) a factor, or from work performed in other, unaffected areas of the project, as the case may be.

> [2208] […] the "measured mile" method should be used when circumstances allow it. Such is the case here, in the opinion of this Court, considering the preponderance of evidence[15].
>
> [Our translation]

In the *Ciment Indépendant Inc.* v. *C.U.M case*[16], the judge observed:

> The expert compared the cost of excavation in solid rock with the excavation required in the critical area; he concludes that excavation was much more costly in the critical area and establishes the extra costs incurred as a consequence […].
>
> The method used here […] consists in establishing the cost difference between tunnelling in solid rock and in the critical area, and to claim only such cost difference […].
>
> [Our translation]

3.5 Differential Cost Method

Applying the Measured Mile Method requires very good data relative to the execution of the work and to the costs thereof. If such data is incomplete or is not entirely reliable, or if no part of a project can be executed under normal conditions (i.e. as described in the contract) and consequently, no basis for a comparison to measure damages exists for that site, data from the same contractor, for other construction sites may be used under the Differential Cost Method. Evidently, for this method to be valid, the claimant must demonstrate convincingly that the work thus used for comparison is similar to the work for which it is claiming and that the conditions under which it was executed are representative of the unaffected conditions that the contractor would have encountered if no change had occurred. This was the solution adopted in the *Construction Kiewit Cie* v. *Hydro-Québec case*[17]:

> [719] In short, Kiewit determines overall productivity loss not by means of a comparison with the productivity of normal, "problem-free" work, since such work was rejected by the Owner, but using a method based on the weighted average of productivity rates at three comparable James Bay projects.
>
> [721] Hydro-Québec cannot reject Kiewit's calculation method, since it did not agree, for reasons of its own, to suspend project acceleration for a period three months, a measure which would have allowed the contractor to establish a reference for the subsequent calculation of damages.
>
> [728] The court adopts the method proposed by Kiewit, which appears more appropriate in the circumstances.
>
> [Our translation]

Whether under the Measured Mile Method or the Differential Cost Method, the claimant must demonstrate that all extra costs being claimed resulted from the change in question and that none of the factors under the contractor's control contributed to the increase in project costs. An objective analysis must therefore take into account any potential issue which would be attributable exclusively to the contractor (e.g. poor work organisation, too few or insufficiently qualified resources, lack of communication between supervisory personnel and the workforce, etc.). Any negative impact on performance resulting from such factors must be isolated; such costs could obviously not be claimed from the owner.

3.6 "Discrete" Costs

Depending on specific circumstances, the various methods described above can be used to calculate damages by adopting an approach based on "discrete" costs.

The calculation of discrete costs involves isolating the costs associated with a given event, change or delay from other project costs. Each cause of additional cost is reviewed individually; such costs are therefore determined separately. This method, which is very demanding because it analyzes each event and its associated impact on the contractor's costs, is nevertheless advantageous as it establishes a clear causal link. The discrete cost method should be given priority whenever circumstances allow it.

However, it is often not possible to calculate discrete costs, either because there are too many problems, with interrelated impacts, or because the documents available do not allow for any detailed analysis of additional costs.

4. COST CATEGORIES

4.1 Direct Site Costs

Listing direct costs is generally straightforward. Direct costs essentially relate to the workforce, subcontractors, equipment and tooling used in project execution as well as to materials which are either consumed or integrated into the works.

For example, in the case of concrete foundations, the following items would generally be considered direct costs:

- formwork lumber and hardware;
- reinforcing steel;
- concrete;
- labour and equipment to build and dismantle the formwork, to install the rebar and to pour the concrete.

When calculating damages to be claimed, only additional direct costs which are attributable to the change in question should be included. This exercise is easier when the contractor keeps detailed ledgers based on which costs for the various activities can be determined with reasonable accuracy, in particular those activities affected by the said change.

4.2 Indirect Site Costs

There are two types of indirect site costs. The first type of cost varies with the duration of construction: wages, fringe benefits and vehicles of site management; rental, operations and maintenance of various site facilities such as offices, garages, camps, etc.; communication expenses; heating of work areas and shelters; snow removal, cleaning, pumping; safety and security; guarantees and insurance; etc.

The second type of indirect cost includes costs which are not time related and remain fixed regardless of the duration of construction, for example mobilization/demobilization and permitting costs.

Whether specific items — such as support crews, quality assurance, surveying, travel and subsistence — are direct or indirect costs depends largely on facts and on the way these costs were considered in the contractor's tender. When calculating damages, the cost allocation (direct vs indirect) should match the allocation made in the bid.

4.3 Cumulative Impact Costs

The notion of impact cost continues to be perceived as being somewhat vague. Many hesitate to acknowledge the right to compensation for impact costs or even to recognize that such costs exist. Yet, impact costs do exist and are increasingly being recognized by the courts. Impact costs do not represent a distinct category, rather, they are at times categorised as direct or indirect costs.

An analogy often used to describe impact costs is the "ripple effect" caused by a stone thrown in a pond. The stone hits a very specific and limited area of the pond, but its impact is propagated over the whole water surface in the form of waves. The contact between the stone and the surface of the water represents the initial change in a limited area: the point of impact (i.e. a specific activity on the construction site). But change quickly affects the rest of the pond (i.e. other activities at the site).

This analogy helps to understand a widely accepted definition of impact costs:

> Impact costs are additional costs incurred for various activities of a construction site, all such costs resulting from a single incident, action or failure in a different activity. The expression "ripple effect" is often used to describe impact costs, which originate from one or more isolated problems and then spread unabated through the project like ripples across a pond[18].

The Superior Court of Quebec based its ruling on a similar definition in the *Agropur Coopérative* v. *Cegerco Constructeur* case[19]:

> [2174] The term "impact costs" refers to additional costs associated with the monetary repercussions that are caused by a failure on the part of the owner to fulfill its obligations or by one or several changes implemented during project execution.
>
> [Our translation]

Another similar definition was applied in the case of *Les Industries Falmec Inc.* v. *Société de Cogénération de St-Félicien/St-Félicien Cogeneration Limited Partnership*[20]:

> [120] Impact costs are unexpected costs that cannot be attributed solely to the execution of extra work, but result from the repercussions that such work can have on the whole project. Impact costs are generally included in productivity loss costs.
>
> [Our translation]

In other words, impact costs are additional costs incurred in one activity which resulted from problems encountered in another activity.

One of the most frequent causes of impact costs is the inordinate number of changes introduced to a project which affect the execution of the work, a fact recognised by the Superior Court of Quebec in the Falmec case:

> [139] Evidence shows that the sole reason Falmec did not complete the work as prescribed in the project schedule for the week of November 17th is the large quantity of extra work performed on the site over an additional period of six months, especially considering that the original contract was itself to be completed in only six months. This is evidenced by the fact that the paid and disputed extra work represents a total of $1.5 million, which is close to the value of the original project.
>
> [Our translation]

In a recent ruling[21], the Superior Court of Quebec raised another factor that should be taken into consideration when determining impact costs, namely, that these costs cannot be foreseen and quantified in advance:

> [35] Although there certainly is confusion as to the exact definition of impact costs, the fact that they cannot be foreseen is often mentioned in jurisprudence and by authors.
>
> [55] Consortium MR Canada's witnesses gave many examples of impact costs, mentioning, inter alia, work initially planned for the summer which must now be performed during the winter season. However, they have not established that these examples applied to their own situation. Impact costs, by their very nature, are difficult to foresee and, consequently, to quantify in advance.
>
> [Our translation]

However, the Court added a cautionary note, which contractors would do well to heed:

> [59] It is clear, in the opinion of this Court, that impact costs which were impossible to quantify during construction must be compensated at the end of the project, however such is not the case for costs which were foreseeable when establishing the price for the extra work.
>
> [62] On the contrary, as shown by *Doyle Construction Co.* v. *Carling O'Keefe* ruling[22], if evidence shows that impact costs could be predicted when estimating the value of the changes in question, the conclusions of the Supreme Court do not apply here. The negotiation process must therefore take foreseeable impact costs into account, otherwise the Court cannot grant such costs when claimed after the work is completed.
>
> [Our translation]

In this particular case, the court refused to grant the costs claimed by the contractor after project completion, on the grounds that such costs could and should have been included in the price agreed for the contract changes.

> [65] The various extensions practically doubled the contract's duration without, however, a doubling of contract price. The Court does not doubt that site maintenance costs actually incurred may have exceeded the percentage specified in the contract. Nevertheless, it was Consortium MR Canada's responsibility to agree to such indirect costs when submitting a price to execute the changes in question.
>
> [Our translation]

The author of the present paper is of the opinion that the Court correctly concluded that the costs claimed by Consortium MR do not, *per se*, constitute impact costs, but rather costs resulting essentially from the extended duration. We will address the question of these costs in more detail below.

At any rate, one cannot overemphasize the importance for contractors to reserve their rights when negotiating and accepting a change order[23]. The advice of an experienced legal counsel in this matter could prove to be very valuable.

Impact costs which most frequently lead to a claim are costs resulting from a loss of labour productivity, often due to construction delays or acceleration. As we said earlier, the calculation of damages, particularly for construction contracts, is as much a matter of know-how as it is of science. For impact costs, the experience and know-how of the analyst are of particular importance.

Costs related to loss of productivity are sometimes more difficult to prove than other cost elements of a claim. It is worth recalling that in any circumstances, when establishing damages, the burden of proof belongs to the contractor. Failure to present convincing evidence may lead to rejection of any claim.

4.3.1 Productivity Losses Caused by Delays

Interruptions and Wait Time

The first cause of loss of productivity that comes to mind is the time lost waiting for drawings, instructions or materials. The activities of an entire team may be stopped or personnel may be relocated elsewhere for tasks that were planned to be executed at a later time and therefore cannot be performed in an optimal manner due to lack of preparation of the workforce, unavailable work areas or lack of materials. Such interruptions disrupt work, negatively impact labour productivity and end up being very costly.

Adverse Weather Conditions

Productivity can at times be impacted when work is performed in inclement weather conditions which could not be anticipated at the tender phase, for example when a project is postponed until the winter season.

> [170] Similarly, the performance of work in winter is more costly, as the cold weather reduces workforce productivity. The Court recognises a 30% reduction in workforce productivity for one work week in January 2004 […][24].
>
> [Our translation]

Just like in other cases, however, the contractor must prove an actual decrease in productivity, either by using the Measured Mile Method or the Differential Cost Method described earlier or by referring to various recognized studies[25].

> [77] […] In addition, when comparing the performance achieved in January-February 2004, i.e. in winter conditions (2.59 hours/m^3), to the period from October 11th to December 20th (2.58 hours/m^3), it is clear that winter conditions had no impact on the productivity of Astra's workforce. Consequently, the additional delay is largely due to the reduction in the number of Astra employees at the site[26].
>
> [83] […] When asked to explain additional delays in winter, [the witness] justifies such delays by invoking a 20% decrease in productivity. However, as seen earlier, there was no decrease in productivity during the winter season.
>
> [Our translation]

Lack of Resources

Additional costs can also result from the unavailability of qualified resources, for example if delays postpone the execution of the work to a period where workforce is in short supply or if, due to workforce reductions during such delays, the contractor loses its best workers and must now use personnel with less experience and qualifications. Newly recruited workers also need to familiarize themselves with the site and with their tasks, which may make them less productive than the workers they are replacing.

4.3.2 Productivity Losses Caused by Acceleration

When delays occur, the owner may often require the contractor to accelerate in order to complete the work by the contractual completion date or may impose a different completion date. Work must be executed much faster than what had been originally planned.

Acceleration may have disastrous effects on labour productivity.

Overtime[27]

Increasing the number of hours worked per week generally improves production for a few weeks. However, studies have shown that, later on, labour productivity starts declining until it reaches a steady pace. In fact, weekly production is usually only marginally increased when compared to production before overtime was implemented. Due to overtime premiums, each unit of work ends up costing much more than originally planned.

Additional Work Shifts

The addition of one or two work shifts often only generates marginal gains. With the addition of work shifts, work requires a high degree of coordination on the part of the supervisory personnel in charge of the various shifts, adequate preparation for the work to be performed by the next shift, and optimal site conditions for evening and night work.

Increase in Team Size

Increasing the number of workers in a team can have a negative impact on productivity. On the one hand, workers who join teams already in place must familiarize themselves with the site and with the tasks to be performed. New worker performance is lower than that of workers already present; global team productivity is therefore reduced, hopefully temporarily. New workers need to go through a learning curve[28], the duration of which will vary greatly depending on the complexity of the tasks performed[29]. Such a phenomenon is easy to understand, as all of us have gone through this process at some point in our lives. As an example, let's consider someone who buys four bookcases from a well known Scandinavian store chain: when assembling the first bookcase, the person frequently refers to the instruction booklet and needs to undo and re assemble more than a few components; assembly of the second bookcase is quicker, as some of the earlier pitfalls can be avoided; the last bookcase ends up being put together much more quickly and efficiently than the first one. If there were two or three more bookcases to assemble, that person would realize that the time required to assemble them is more or less the same as for the fourth bookcase.

Adding less experienced workers to a project can have another negative impact: decreased productivity in other workers, either because they need to help the new workers learn how to perform their tasks or because of a lack of organization brought about (involuntarily) by the new arrivals.

> [709] It must also be understood that the learning period for such additional workers, and the simple fact of their presence among a more experienced team, necessarily had an impact resulting in loss of productivity[30].
>
> [Our translation]

Overcrowding (Trade Stacking)

An additional consideration is that of overcrowding, which decreases individual space and may lead to injuries.

Overcrowding occurs on a construction site when, contrary to good construction management practices, and probably not following the original baseline schedule, different trades and subcontractors find themselves working simultaneously, rather than sequentially, in a given work area. Lack of space creates problems similar to road congestion. This is compounded by inefficiencies caused by the simultaneous and potentially conflicting performance of work, for example the installation, at the same time, of formwork, reinforcing steel and electrical conduits in columns. All these activities can even be further impacted if other trades start working on the site.

Unavailability of Work Areas

Implementing acceleration measures will not solve all the problems at hand. The contractor may find itself with a larger workforce without necessarily knowing how to use the extra workers in an efficient, much less optimal manner, as some work areas may simply become unavailable. For this reason, productivity may also be reduced from the need to execute the work in a different sequence.

4.4 Home Office Overhead and Profit

The cost categories described above relate to the costs incurred for work performed on the construction site.

The associated home office overhead and profit costs also need to be addressed. They are discussed in Section 6 below.

5. DELAYS AND ACCELERATION

5.1 Schedule Analysis

As the Quebec Court of Appeal stated in the *Ste-Agathe-de-Lotbinière (Municipalité de) v. Construction BSL* Inc. case[31], the project owner has an obligation to allow the contractor to perform its work within the contractually prescribed duration. This means that the owner needs to complete the preparatory work, make the site available to the contractor by the contractually-agreed date, not hamper or delay the contractor's work and grant extensions, if necessary, in the event of a contract change. The contractor should be allowed all the time that was agreed to complete the work[32].

A schedule analysis involves establishing the chronology and the sequence of the work performed. Once again, complete and accurate project documentation is paramount.

The chronology of events allows the analyst to determine the sequence of the work performed and the duration of each activity in order to establish an as-built project schedule. This schedule is but one of the elements necessary for a schedule analysis.

The goal of such an analysis is first to establish the duration of delays and to measure any recovery achieved by acceleration measures. Second, the analysis determines the responsibility for the various delays, assigning each delay to one of three categories:

- Non-excusable delays are entirely due to the contractor and therefore do not justify an extension of time or any financial compensation. This is the case, for example, for delays caused by inefficiency on the part of the contractor, its subcontractors or suppliers (i.e. underestimation of the time required to complete the work, poor scheduling or insufficient resources).
- Excusable delays give rise to an extension of time, but no financial compensation. These delays are generally caused by events of force majeure (i.e. strikes, extreme weather conditions, etc.).
- Compensable delays entitle the contractor to an extension of time as well as compensation for any additional costs resulting from delays. These delays are, under the terms of the contract, attributable to the owner (i.e. delays in site access, delays in the production of drawings, extra work, differing soil conditions, etc.).

The statements above are general principles. Specific contractual provisions determine who, the owner or the contractor, is responsible for any event causing a delay in project execution.

As with financial damages, the contractor must provide evidence to support any claim related to delays:

> [53] Burden of proof and preponderance of evidence are the two pillars of any claim. The progress of a construction project cannot be assessed without examining several more or less predictable factors. Construction projects, especially projects of a scope similar to the one at hand, essentially rely on drawings, specifications and project schedules. As both parties said, there is a critical path in project execution, which is key to completing the work by the contractually agreed dates and within the budget planned on the basis of such dates.
>
> [54] A delay in one part of the project does not necessarily cause delays to the project as a whole. […]
>
> [55] […] the impact of a delay […] must be assessed taking into account the project's characteristics as well as progress of the work after a delay occurs. In particular, what are the actual consequences of the delay on critical path progress? The burden of establishing a causal link between a change or a delay and any consequential damages falls on the plaintiff[33].
>
> [Our translation]

Moreover, any analysis of delays in project execution must be based on a realistic project schedule, or at the very least a credible one.

> [62] Chevrier and the plaintiff's expert […] object to the approach followed by Bouchard. Chevrier deems the original project schedule to have only relative value as it was developed for the purpose of obtaining financing from banks and was not, in fact, used in project execution. […]
>
> [63] Chevrier's testimony is perplexing. Mortgage financing for a project of this size is no small matter. The project, as proposed to lenders, is analysed by a banker, who examines the project schedule and assesses any risk involved. The project schedule provided to a mortgage lender should not be the product of wishful thinking, but a scenario that truly reflects the realistic execution of the work, with specific goals and deadlines. The Court concedes that some of the parts of the scenario may be modified in time, but not the whole story. […]
>
> [64] Based on the foregoing, the Court is of the opinion that it is, at the least, presumptuous to contend that Project Schedule D 12A was not used in performing the work. Maybe the schedule

was not followed in its entirety, but it did exist and constituted a framework for what the contractor and subcontractor, in their wisdom and based on their experience, were originally contemplating in terms of work progress, with project completion planned for mid-December 2003. It is not enough to simply contend that things are going well and that the mid-December deadline will surely be met, without comparing actual progress with the critical path schedule. One can say what one wants, but it doesn't make it valid evidence. Statements must be substantiated by clear evidence.

[67] At any rate, the Court must assess the situation as it was on October 20th, considering project and critical path progress compared to the deadline mutually agreed by the contractor and formwork subcontractor, namely to have concreting completed by mid December 2003[34].

[Our translation]

The analyst in charge of identifying the duration of delays and measuring any schedule recovery achieved by acceleration can use various proven methods: as-planned vs. as-built, windows analysis, impacted as-planned schedule, collapsed as-built schedule, etc.[35] The analyst will choose a method on the basis of a number of factors: the quality of the available information relating to planned schedules and actual work progress; the complexity and duration of the work; the number of activities to be taken into account; the level of accuracy required, etc.

[147] The windows analysis, based on a contract-compliant baseline schedule, examines the immediate impact on critical progress of an event or change, after the schedule is updated to reflect such event or change.

[148] Generally, the initially approved baseline schedule is used for windows analysis. The process, however, is far from easy. The baseline schedule needs to have been designed and developed in sufficient detail, as we will see[36].

[Our translation]

The analysis of the project progress, required for the subsequent calculation of delays and acceleration, is often confronted with significant challenges. The analyst's experience and expertise will help him/her resolve such difficulties and produce a conclusive analysis. The analysis must, inter alia, clearly establish the duration of delays attributable to different causes, separate critical and non critical delays, establish and, as the case may be, distribute concurrent delays (i.e. delays which occur at the same time, but originate from different causes or individuals).

5.2 Costs Resulting from Delays and Acceleration

As seen earlier, delays and acceleration can lead to significant additional costs related to loss of productivity. Other costs must also be included in the calculation of damages resulting from delays and acceleration. Clearly, only costs resulting from delays for which a party is entitled to compensation may be claimed.

5.2.1 Costs Resulting from Delays and Extended Duration

The following examples are some of the additional cost items commonly encountered when work is delayed:

- increased costs of supervisory and support staff (including all burdens), and of their vehicles;
- increased costs of bonding and insurance;
- wage increases (including all burdens);
- inflation;
- increased rental or depreciations costs for major equipment on site;
- protection, sheltering and heating of work;
- special additives and heating of concrete;
- increased costs of pumping, site cleaning, snow removal, security.

5.2.2 Costs Resulting from Acceleration

The contractor may be forced to accelerate the performance of its work.

Acceleration can be expressly ordered. For example, a project owner recognizes that the contractor would normally be entitled to an extension of time because of delays sustained or because it performed extra work which affected the critical path. It nonetheless requires the contractor to accelerate its work in order meet an imposed completion date.

Acceleration is often ordered by the owner in a more implicit manner: the owner refuses to recognize that the contractor is entitled to an extension of time and insists that the completion date be achieved as prescribed by the contract. The term constructive acceleration is often used to describe such a situation.

The general principle here is that if a contractor is ordered to accelerate its work in order to make up for delays, even though it would normally have been granted an extension because of just such delays, it is entitled to compensation for the costs caused by the acceleration. On the other hand, if the contractor is forced to accelerate its work to make up for delays that it caused itself, it is responsible for the costs associated with such acceleration.

In cases where the contractor accelerates to recover compensable delays, the costs incurred in order to implement such acceleration are claimable.

The situation is somewhat different when the contractor needs to accelerate its work for delays which only allow for an extension of time (excusable delays), i.e. without financial compensation. When such delays occur, the contractor is required to incur any related cost. The owner must also pay for its own costs caused by such delays, which means that acceleration could generate net savings for it. Some authors – and the author of the present paper is of the same opinion – believe that in such cases, where the contractor is required to accelerate work to make up for excusable delays, the damages to which it should be entitled are the difference between the costs it incurred for acceleration and the costs it would have paid had completion time been extended[37].

The most common costs associated with acceleration are:

- loss of labour productivity;
- loss of productivity due to the learning curve of new/additional crews;
- overtime, evening and night shifts premiums (including all burdens);
- mobilisation and demobilisation of extra equipment and tooling;
- wages (including all burdens) and expenses for additional supervisory and support personnel;
- for remote sites, costs related to greater camp capacity.

6. HOME OFFICE OVERHEAD AND PROFIT

A contractor incurs costs for its firm's general operations, in particular for head office departments: Administration and Finance, Human Resources and Payroll, Accounting, Purchase and Sales, Estimation, etc. The contractor must also generate sufficient profits to be used as capital investments to ensure continued growth and dividends for shareholders.

Consequently, when developing the price in response to a call for tender, the contractor adds to the estimated direct and indirect costs an amount which serves to cover a portion of home office overhead costs and generate profit. The contribution of each contract in this respect is generally established on the basis of a number of parameters: contract value, proportion of total corporate revenue, duration of the work, complexity of the work, technical and other risks, etc. If contract revenue is lower than expected (e.g. scope of work reduced by the owner) or if the work takes longer than expected without generating any extra revenue, a loss of revenue will show in overhead and profit.

Claims related to home office overhead and profit are generally caused by situations like the following: the contractor's work was delayed and completion time extended. In such cases, it often happens that the contract ends up generating no extra revenue or that any increase in revenue is insufficient to adequately contribute to home office overhead and profit.

Overhead costs remain fairly constant in time. The contractor knows that a certain level of annual revenue is required to cover such costs. If the performance of a contract takes too long,

the contractor's resources which were assigned to this contract cannot be employed on another site to generate new revenue. Therefore, if a contract is unduly extended, compensation should be paid for home office overhead costs and profit, as such contribution cannot be provided by work on another site.

Home office overhead and profit is an issue that sometimes gives rise to significant difficulties. One thing is certain, however: those costs are real.

> [50] […] Overhead costs exist and are recognised as being difficult to assign to specific projects. For this reason, a percentage is used, which may vary from one firm to another; in this case, Devec assigns 12% of administrative costs to its contracts. There is no reason to reject such costs.
>
> [Our translation]

It is quite true, as mentioned by the magistrate in this case, that assigning administrative costs to specific projects is not a straightforward affair. Indeed, just as indirect site costs are assigned to all activities on a site, overhead costs should be assigned to all projects. Determining damages in this respect can be particularly challenging when a project is unduly extended. There are, however, methods that can be used to calculate damages in such cases, which have been recognised by the courts.

Before addressing these methods, it is worth repeating the principle stated earlier: the contract constitutes the law of the parties – relevant contract provisions must be applied when they expressly prescribe pre established price increases for extra work. Courts also rely on this principle:

> [48] In this case, an amount equivalent to 16% of the value of each change was provided for in the contract as "overhead, administration and profit".
>
> [69] In addition to direct costs, the parties agreed that such costs would be increased by 16% if the work was performed by Consortium MR Canada and by 8% if performed by a subcontractor. This percentage, as mentioned in the relevant Article, includes overhead and administration costs. Therefore, Consortium MR Canada may not, under the contract, claim more than 16% for its indirect costs. Furthermore, it is the opinion of this Court that the costs claimed constitute indirect costs[39].
>
> [773] The Court considers that Kiewit's claim in this respect, in comparison with the 15% agreed for cost-plus work is too high.
>
> [774] Off-site overhead costs must therefore be reduced to 15%[40].
>
> [Our translation]

Several calculation methods can be applied to determine damages relating to home office overhead[41]: The simplest and most often applied is the so-called Shore & Horwitz calculation method, named after the ruling of the Supreme Court of Canada, which recognised its validity[42].

The Shore & Horwitz method was accepted by the Quebec Court of Appeal in the *Les Industries Falmec Inc.* v. *Société de Cogénération de St-Félicien / St-Félicien Cogeneration Limited Partnership* case, mentioned earlier. The method uses a simple rule of three:

$$\text{Damages} = \frac{\text{Home office overhead assigned to the contract} \times \text{Number of days of delay}}{\text{Planned contract duration in days}}$$

The method is straightforward and the contractor can generally easily demonstrate the amount of home office overhead that it had included in its tender.

II- OWNER CLAIMS

Claims submitted by contractors make the headlines more often than claims submitted by owners. But owners also have rights, which should be respected by the contractors who build their projects and – more and more frequently, it would seem – by the engineers and architects who design them. We will not address, here, claims made against designers and will rather focus on claims against contractors.

Since it was founded, over four decades ago, roughly half of Revay's mandates were carried out on behalf of contractors and the other half for project owners; half for the claimant and half for the defendant. We are therefore well placed to understand all points of view.

1. CAUSES OF CLAIMS

It is often said that the owner is entitled to receive what the contractor promised: completion of the project in compliance with contractual requirements, delivered at the agreed time, in return for the contract price.

The reasons which most frequently lead to claims by a project owner are quite simple:

- Deliverables do not comply with contractual requirements or trade practices;
- Delivery was late, by fault of the contractor alone.

Of course, this is a bit of a generalisation: the contractor's obligations towards the owner are more extensive[43].

For the purposes of this article, we will only address claims due to delays.

2. PROOF OF CLAIM

Everything stated hereinbefore regarding proof of claim required from contractors applies to claims made by project owners.

It goes without saying that an owner can only submit claims for delays caused by the contractor.

3. COSTS

From the owner's point of view, damages for delays caused by the contractor generally consist in increased supervisory costs and, possibly, loss of revenue. The contract sometimes includes a provision, called the penalty clause, which specifies liquidated damages, generally for each day of delay.

To the actual or liquidated damages – depending on contractual provisions – must be added the costs required to complete or to correct work, as the case may be, should the contractor abandon the site of its own volition or after being so ordered by the owner, as shown by a recent case of the Quebec Court of Appeal[44].

III- CONCLUSION

In the construction industry, unexpected situations are hard to avoid. It is often difficult, sometimes impossible, to establish fundamental data such as subsurface conditions or the actual condition of a structure that needs to be repaired or refurbished. Changes to a contract are bound to happen, with the potential consequences described throughout this article.

We are often asked what documents are required to prepare and support a claim. The answer is simple: the same documents that ensure good contract administration and effective project management. A good understanding of the contract is also essential in order to be in a better position to defend and exercise one's rights.

Jean Hudon studied at École Polytechnique de Montréal, where he obtained a Bachelor's degree in civil engineering in 1980. He also attended law classes at University of Montreal's Continuing Education Faculty and received arbitration training at the Institut d'arbitrage du Québec. Between 1983 and 1991, he worked at Revay and Associates Limited as a Consultant and Senior Consultant. He provided consulting services both to contractors and project owners in the public and private sectors. Mr. Hudon has been recognised as an expert by civil courts and arbitration tribunals. In 1991, he started a 21 year career at Hydro Québec, one of the largest energy production, transmission and distribution companies in North America and one of the largest producers of hydro-electricity in the world. At Hydro Québec, Mr. Hudon acquired extensive experience in the tendering/ RFQ process, in contract negotiation, in award and administration for civil and electrical engineering projects, in the trading of electricity and in regulation of electricity transmission and distribution. He was asked to appear as a witness before the Régie de l'énergie du Québec and other judicial authorities. In 2013, Mr. Hudon re-joined the Revay team at its Montreal office. He also ensures Revay's presence in Quebec City and across the province.

1 The author being from Quebec, he is more familiar with the recent decisions from that jurisdiction. Therefore, most of the cases referred to herein are from that province. Jurisprudence relative to construction law has been evolving rapidly in Quebec over the last few years, and several new cases are cited as illustrations of legal principles being applied now under Civil Law. Similar developments in Common Law cases elsewhere in Canada are cited where available. Based on its experience through the years, dealing with construction claims in Canada (including Quebec), the US, the UK and elsewhere, it is Revay's opinion that principles of damage calculation are generally universal.

2 Éric DUNBERRY, *La responsabilité des professionnels*, in Olivier KOTT et Claudine ROY (dir.), *La construction au Québec : perspectives juridiques,* Wilson & Lafleur, Montréal, 1998, p. 459. R. Lopez P. Love (2012). *"Design Error Costs in Construction Projects."* J. Constr. Eng. Manage., 138(5), 585-593.

3 E.g. *The Revay Report*, Volume 30, Number 1, January 2012.

4 http://www.oxforddictionaries.com

5 *Développement des éclusiers Inc.* v. *Ciment Québec Inc.*, 2013 QCCS 6307;

6 *Laurentide Motels Ltd* v. *Ville de Beauport*, [1989]1 RCS 705, p. 829, cited in *Aluminerie Alouette Inc.* v. *Les Constructions du Saint-Laurent Ltd*, REJB 2003-47683 (C.A.).

7 *Wertheim* v. *Chicoutimi Pulp Co.* [1911] A.C. 301 (P.C)

8 *Comstock International Ltd* v. *Crane Supply Ltd.* (1987), 23 C.L.R. 19 (Ont. H.C.)

8 *Corpex (1977) Inc.* v. *Canada* [1982] 2 S.C.R 643. Broadly speaking, Canadian cases since Corpex have held timely notice to be a prerequisite to recovery, see: *Impala Construction Ltd.* v. *Spade Construction Ltd.* 18 C.L.R. 124; *Acme Masonry Ltd.* v. *Bird Construction Ltd.* 20 C.L.R. 228; AC Landry & fils Ltée v. *New Brunswick* 27 C.L.R 156, *Dilcon Construction Ltd.* v. *ANC Developments Inc.* 6 C.L.R. (3d) 34

10 REJB 2003-47683 (C.A.).

11 23 C.L.R. 143 (S.C.B.C)

12 *Birdair Inc.* v. *Danny's Construction Company Inc.*, 2013 QCCA 580.

13 85 D.L.R. (3d) 186 (C.A.B.C)

14 (1994) 14 C.L.R. (2d) 97

15 *Agropur Coopérative* v. *Cegerco* Constructeur, J.E. 2005-175, EYB 2005-94595 (S.C.Q.).

16 (1982) Quebec Superior Court 1049.

17 2010 QCCS 6266. Affirmed by the Quebec Court of Appeal (2014 QCCA 947)

18 Stephen G. REVAY, *Calculating Impact Costs*, (1988) 27 CLR 239.

19 J.E.2005-175,EYB 2005-94595

20 REJB 2003-40996 (S.C.Q.)

21 *Consortium MR Canada Ltd* v. *Commission scolaire de Laval*, 2013 QCCS 5537.

22 (1987) 23 C.L.R. 143 (S.C.C.), p. 157.

23 *Développement Tanaka Inc.* v. *Corporation d'hébergement du Québec*, 2011 QCCA 1278.

24 *9042-2592 Québec Inc. (Les Entreprises MCCO Inc.)* v. *Roger Rivest et Fils Inc.,* 2006 QCCQ 9196.

25 Example: *Productivity in Construction*, NRC, 1993.

26 *Développement des éclusiers Inc.* v. *Ciment Québec Inc.*

27 Regula BRUNIES and Zey EMIR, *Calculating Loss of Productivity Due to Overtime Using Published Charts — Facts or Fiction, The Revay Report*, Volume 20, Number 3, November 2001.

28 Zey EMIR, *Learning Curve in Construction, The Revay Report*, Volume 18, Number 3, October 1999.

29 For example, an 80% learning curve means that every unit of work requires 80% of the number of hours spent on the previous work cycle.

30 *Construction Kiewit Cie* v. *Hydro-Québec*.

31 2009 QCCA 145. The court was quoting the words of the Supreme Court of Canada in *Penvidic Contracting* v. *International nickel Co.*, [1976] 1 S.C.R. 267.

32 *Ellis-Don Ltd.* v. *Parking Authority of Toronto*, (1978) 28 Build.L.R. 98. *Fischback & Moore of Canada* v. *Noranda Mines* (1978), 84 D.L.R. (3d) 465.

33 *Développement des éclusiers Inc.* v. *Ciment Québec Inc.*

34 *Ibidem.*

35 E.g.: *Forensic Schedule Analysis*, AACE® International Recommended Practice No. 29R-03.

36 *Développement Tanaka Inc.* v. *Corporation d'hébergement du Québec*, 2009 QCCS 3659.

37 Ian GOSSELIN and Pierre CIMON, *op.cit.*, in Olivier KOTT and Claudine ROY (dir.), Wilson & Lafleur, Montreal, 1998, p. 400; Guy SARAULT, *Les réclamations de l'entrepreneur en construction en droit québécois*, Ed.: Yvon Blais, Cowansville, 2011, p. 229.

38 *Développement des éclusiers Inc.* v. *Ciment Québec Inc.*

39 *Consortium MR Canada Ltd.* v. *Commission scolaire de Laval*. In Paragraph 69, the Court uses the term "indirect costs", but it seems clear that these are "overhead and profit" items, as stated in Paragraph 48. According to the contract, the 16% increase covers both the indirect site costs and the home office overhead costs.

40 *Construction Kiewit Cie* v. *Hydro-Québec.*

41 Paul SANDORI, *Contractor's Head Office Overhead – What is The Right Formula*, *The Revay Report*, Volume 22, Number 2, June 2003.

42 *Shore & Horwitz Construction Co. Ltd.* v. *Franki of Canada Ltd*, [1964] S.C.R. 589.

43 Marianne IGNACZ and Jeffrey EDWARDS, *La responsabilité de l'entrepreneur et du sous-entrepreneur*, in Olivier KOTT and Claudine ROY, (dir.), *op. cit.*, p. 537-575.

44 *Roch Lessard 2000 Inc.* v. *Saint-Augustin (Municipalité de)*, 2013 QCCA 1606.

* Any views expressed in this article are those of the author and may not necessarily reflect the views of the company.

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