



by Stephen G. Revay

Reference is made in the main article of this issue to an unfortunate practice by many contractors (and/or subcontractors) of signing statutory declarations, month after

month, without considering or perhaps even understanding the potential pitfalls associated with false declarations.

Contractors (and/or subcontractors) are usually required to declare that all due accounts for labour, supplies, equipment, subcontractors and other indebtedness such as unemployment insurance, worker's compensation, etc. have been paid. On certain projects, the contractors (and/or subcontractors) are also required to declare the amounts of outstanding claims and/or waive all other (so far undisclosed) ones.

Signing such a waiver could, of course, provide a powerful defense against otherwise valid claims. Accordingly contractors, particularly those who have already suffered the consequences, may be more cognizant of the importance of such declarations.

The same recognition, as underscored in the main article, is apparently non-existent with respect to declarations concerning timely payments.

This practice is mentioned in the main article as one of the common failings of the construction industry. Nevertheless, a 1999 decision by Mme Justice Young in New Brunswick deserves special mention here.

A Mr. Murphy, owner and president of Ramco Contractors Ltd. pleaded guilty to signing false declarations, several months in a row, so as to be able to receive regular progress payments, even though he did not pay his suppliers and subcontractors due to financial difficulties. Not an unusual predicament many contractors (and/or subcontractors) may find themselves in, from time to time. Mme Justice Young refused to accept the argument that signing false declarations is such a common practice. She, instead, decided to send a strong warning to those who may be tempted to keep the practice alive and sentenced Mr. Murphy to one year in jail. She also ordered him to pay \$250,000 restitution to the municipality, which was the amount the municipality had to spend to satisfy the lien claims of unpaid suppliers and subcontractors.

## Scheduling and Monitoring for Successful Projects

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### INTRODUCTION

As most recognize, there exists three common requirements of the Contract that are typically ignored by all parties to the construction agreement and they are:

- Statutory Declarations which are too frequently fraudulently signed,
- Change Order provisions that require written authorization before proceeding,
- Scheduling requirements defined by the specifications.

Explanation for the first two items is largely an issue of expediency. It is quicker and more convenient to ignore the specific requirements that deal with these issues. In the case of the last item, significant additional time and cost are a common result of ignoring the contract provisions defining scheduling requirements. Nevertheless, they are commonly ignored. Essentially, there are two reasons for ignoring scheduling requirements:

- A bias that less communication is better, and
- The view that the output provided by project schedules are of questionable value and therefore not reliable.

Unfortunately, this latter view is more prevalent and more difficult to circumvent.

The comments, which follow, will expand on these reasons; explaining why the project/construction management tool "scheduling" is currently only paid lip service. Suggestions will then be provided as to how the tool can be better utilized. Before proceeding with these comments, some initial comments on the need to improve management techniques are presented.

### IMPROVEMENT REQUIRED

In 1965, The National Research Council looked at efficiency in the Canadian Construction Industry. Their report said:

- There was interference and congestion at job sites due to lack of proper organization and planning.
- There was inadequate forward scheduling for control and implementation of alternative procedures.
- There was a lack of detailed cost information available to most contractors.
- There was a lack of supervisory training.

The report also said:

- Other industries had experienced improvements in management skills (so-called scientific management techniques). The same could not be said for the Construction Industry.

Some thirty-five years later, our industry cannot be proud of the gains which have been made on the above list. How many of us can say that these problems are no longer prevalent. In the early 90's, a survey of the Canadian construction industry conducted by the Canadian Construction Association revealed the following:

- Only 28% of contractors use any form of job scheduling system, or computer aided management controls.
- The 28% of the industry that use Management Systems mainly comprises larger EPC and international contracting companies who may also have parallel commercial interests in BOOT or similar Projects.
- Of the medium-sized and smaller companies that make up a major section of Canadian contractors, most are still being operated with only minimum planning and scheduling control.

These statistics are alarming. Some might suggest that the statistics are irrelevant since these days, most contractors own and use these tools. It is respectfully suggested that current use of scheduling is woefully inadequate when compared to the power of the tool.

To be clear when reference is being made to project management tools, the author means those software packages that provide the following:

- Analysis of actual vs. scheduled progress, showing Critical Path and float;

- Reports of actual resources consumed compared with those estimated;
- Resource leveling;
- Milestone and roll-up reporting available for management overview; and
- Purchasing/expediting reporting showing schedule of material delivery is available.

## Less Communication

Too frequently, due to a dispute, the project schedule is utilized to a far greater extent after the project is complete than during execution of the work. Often, a network schedule, becomes the focal point of a construction dispute, notwithstanding the fact that the site office ignored it shortly after it was received from the head office. Its primary use during construction was as wallpaper on the site office; now and then marked up with some colours, so as to give the illusion of importance and /or use.

The frequent reliance on schedules by parties to a construction dispute should not be surprising. After all, schedules can provide an indication of intent and be useful historical records. Furthermore, schedules allow one to calculate delays and therefore, damages. That reliance, however, should not result in confusion as to the purpose of scheduling. It is first and foremost an essential management tool, which, if used effectively, can result in the first instance to an on time, on budget project and in the second instance avoidance of protracted construction disputes.

That being the case, why then, are contractors not using this tool more often? After all, contractors, in portraying their intent to execute the work, are invariably required to presume certain expectations on the part of the owner and/or its agent(s). These expectations will usually pertain to one or all of the following:

- The release of information (design) material and/or equipment;
- Site availability; and
- Work of others.

Owners, on accepting (approving or remaining silent) that schedule, obligate themselves to comply with the assumptions contained therein. Consequently, on receiving the proposed schedule from the contractor, the owner should ascertain what specific obligations it is being asked to accept. Understanding, of course, that the owner has an obligation to facilitate the contractor's efforts to complete the work pursuant to the contractual completion date.

Even if it were not requested, a contractor would be wise to identify these assumptions for the owner. This is, of course, based on the expectation that what is desired is a joint effort to complete the work to the satisfaction of all concerned parties.

By identifying these assumptions, the contractor is forewarning the owner, thereby hopefully ensuring that these obligations are met. If not met, this initial identification could be construed as notice. Logically then it is in

the contractors benefit to submit a detailed schedule. The contractor identifies its requirements on a time line for the owner and provides, arguably, contractual notice in the case where the requirements are not met.

Why then are contractors not providing that information? The reasons are twofold: (1) a perception that the schedule information will reduce the contractors' work sequencing flexibility with the owner and (2) more commonly, a concern over the reliability of the tool addressed in subsequent discussion.

Unfortunately, some contractors consider a schedule as nothing more than a vehicle used by the owners to beat on them. Pursuant to that opinion, there is a fear that the contractor will constantly be in a position of having to explain actual progress against the schedule. There is a fear that not achieving the goals in the schedule will result in interference by the owner or worse yet, a demand to accelerate at the contractors' cost. There is, of course, the fear of backcharges for delay. The viewpoint of contractors with this mentality is that owners should be treated as mushrooms, i.e., kept in the dark and fed compost. Unfortunately, contractors with this mentality will often times feel that its own management (head office) should be treated in the same fashion.

The ultimate fear of contractors with the above bias is that their own schedules will be used to defeat any efforts they might have to collect additional monies through claims.

It should be appreciated that the above mentality is not a common trait of contractors. It nevertheless does exist and should therefore be noted. Most contractors have progressed beyond the above rather naive approach on schedules.

Owners have different reasons for not ensuring that contractors comply with the specifications. Typically, when asked, owners will respond that despite all efforts the contractor would simply not comply. The view presented is that the owner has no mechanism to require the contractor to comply. Too often, one hears that it was necessary to stop asking for the schedule as the work was ongoing and therefore one had refocus energies on the task of monitoring the contractor and not on the compliance of the specifications. This is a rather ironic rationalization. That rationalization is frequently accompanied with a shrug that the contractor's schedule was likely going to be unreliable anyway.

There are other owners who unfortunately consider schedules not as a tool to monitor work, but rather as ammunition by contractors to set up claims. These owners have at one time or another received an early completion schedule, which was at best optimistic, and at worst the first step in the preparation of a claim. These owners will not consider the schedule as a means of advising the owner when their requirements must be met, but rather an attempt by the contractor to set them up or to modify their own obligations under the contract.

Unfortunately, often the owner and the con-

tractor fail to see the schedule as a positive means of communication for the end purpose of achieving a successful timely project. Additionally, each party fails to see the positive claim implications that can serve their best interest - a realization for many that occurs some years after project completion, while being involved in a protracted dispute that cannot get to the facts.

## Reliability of the Tool

Notwithstanding the popularity of detailed schedules by the courts and claim analysts, they simply are not held in the same esteem by many of the personnel actually executing the work.

Criticisms that one hears on a construction project regarding schedules are either founded on the detailed use of the tool or the very output. Examples of each type are provided below; the first list deals with the detailed use while the second list deals with output.

### Detailed Use

- Network plans are too constrained, too detailed or too condensed;
- Time estimates are haphazard and changed without rationale;
- External constraints not properly established;
- Lack of monitoring and guidelines;
- No feedback/dialogue between scheduler and site;
- Proper summations are not provided for; and,
- Difficult to read or be understood by those who need to use it.

### Output

- Not resource loaded;
- Updated schedules are out of date by the time they are issued;
- Not a useful tool for monitoring ongoing work that is constantly changing in priorities or criticality;
- Critical resources not scheduled; and,
- Wrong application of the Critical Path method.

The criticism regarding detailed use can be overcome with training and some experience. Those dealing with output are not as readily circumvented. For the most part, these criticisms all pertain to resources and the treatment or lack thereof.

The following excerpt from an article titled "Who Owns the Float" by John C. Pearson discusses the importance of resources.

***"Few of even those claim to be CPM experts appear to fully appreciate the fact that in a resource restrained programme the concept of float breaks down, and quite often the concept of a critical path breaks down. Since almost all construction projects are resource restrained, at least to some extent, this***

*becomes a source of major problems. The classic legal question in recent years as well as the subject of numerous professional papers is 'who owns the float time'. It is difficult to claim ownership of something that may not exist or hasn't been quantified properly. These are fundamental matters that after 30 years still don't seem to be understood."*

There are some who go further and suggest that the very concept of Critical Path is flawed because scheduling software programs are based on scheduling activities whereas, those actually doing the work, schedule based on the available resources, rather than activities. On site, the focus is not to complete a sequential chain of activities pursuant to a predetermined (usually by others) chain, but rather to employ available resources to their full potential. That dichotomy exists and will create problems if not addressed.

If resources are ignored when preparing a schedule, the result is an erroneous impression of the float and flexibility that exists in the schedule. This fallacy becomes evident with use. Unfortunately, the conclusion invariably reached is that the tool is wrong, and not that the tool was not used appropriately. If a schedule is prepared using resource leveling, incorporating resources such as cranes (which are often on the critical path), and introducing constraints to the schedule, the conflict between the software output and those responsible for completing the work is minimized. The tool can then become truly effective in the management of the project.

It should be noted that there are instances where the critical path is not the appropriate scheduling method. On sequential production type work (tunnels, highways and pipelines) a line of balance schedule is more appropriate. On projects where logic restraints are primarily economical and not physical, such as a refinery or the finishing trades in a commercial project, the schedule must address crew deployment and not a sequential chain of activities. Before commenting on other strategies, which improve the usefulness of the tool, it is assumed that all understand the following basic premise.

Scheduling is merely; deciding in advance when and where work will be performed, and how it is to be sequenced in relation to other activities. It involves decisions concerning:

1. The duration of the work;
2. The trades who will perform the work;
3. The resources to be applied;
4. Monitoring the work progress against the work programmed; and
5. Recording and updating the program.

The value of a complete and well thought-out approach to the way the work is expected or planned to be carried out cannot be over-emphasized. The as-planned schedule is the benchmark upon which many decisions will be based and upon which will be gauged

the contractor's performance. It is also the source of identification for problems relating to the integration of successive trades and activities, the tool for analyzing the impacts on time and cost of change, the tool for re-planning the project in the event of change, and the principal method of demonstrating excusable delay and compensable disruption. Without an as-planned schedule to act as the baseline, proper management of a project is difficult, if not impossible.

## SUGGESTED IMPROVEMENTS

The theme of this paper could be summarized with Nike's ad slogan, Just Do It! Assuming some have been convinced (hopefully not too many as there would be far too few claims) the discussion, which follows, presents three concepts, which can further enhance the use of scheduling programs.

### Cost Loading

A number of American government agencies including the Corps of Engineers, Postal Services, Veterans Administration, GSA, and other agencies have required cost loading of Critical Path schedules for many years. Very few private manufacturing or service companies require cost loading of schedules. Since the cost of a job has a direct relationship to the amount of time that it takes for construction, it should follow that tighter cost control should be maintained along with better scheduling of the project.

Cost loading of a practical, realistic and usable CPM schedule is the best way to schedule both time and money. Furthermore, updating of the CPM schedule on a monthly basis, maintains current time and cost control.

Only on-site activities of work should be cost loaded. Therefore, no procurement activities related to fabrication and delivery should be cost loaded with the exception of some special requirements such as erection of mock-ups, factory testing, or payment for raw materials such as structural steel, exterior cladding, etc. The value loaded on each of the on-site activities, will project a credible amount of value for work in place as scheduled through the sequencing of activities from area to area, as the projected flow of work is anticipated to take place.

After the CPM schedule has been cost loaded, the subtotals can be compared to the required lump sum price breakdown. Adjustments can then be made to the values in the CPM schedules so that they meet the exact dollar subtotals, and thus the total contract amounts.

Once the proper contract amounts are reflected in the CPM schedule, a dollar forecast curve can be produced through sorting of the activities in the computer. Sorting the on-site activities by early finish and then subtotalling the dollars at the end of each month will plot an early forecast curve for each month of the project to anticipated completion. The same activities are then sorted by late finish and then plotted on the

same graph in order to reflect the late finish curve. A dotted line between the early curve and late curve indicates the anticipated dollar forecast curve. In essence what is commonly referred to as an "S" curve.

This process results in a cost loaded as planned CPM schedule with a dollar forecast curve showing anticipated progress and costs. The schedule is ready to be used through periodic updating to reflect past progress, present status, and anticipated progress along with monitoring past, present, and anticipated costs.

Normally, it is required that the CPM schedule be updated monthly, which coincides with progress billings. The updating of the schedule will monitor both time and money on the project. If the subtotalling of the dollars in the CPM schedule matches the item breakdown within the progress billing, then the dollars earned in updating of the schedule should be exactly the dollars earned in the progress billing. Thus, the updating of the CPM schedule becomes the document to produce the monthly billings. Since the procurement activities in the CPM schedule are not cost loaded, updating of the schedule will produce dollars earned in accordance with work in place as generally required by specification. Payment of equipment and materials stored either on-site or off can easily be added to the computer printout of the updated CPM schedule as separate line items at each update representing the actual payment as certified. The value of materials in the CPM schedule will then be reduced from the schedule as the materials are installed, and the activities of work are updated to completion.

The net result is that the updating process and the billing process become more relevant and correct. At each updating of the CPM schedule, changes in the work should be reviewed and included in the schedule. Thus, the updating of the schedule will produce a truer picture of the status of the work and the anticipated progress to be made including changes.

It should be noted that the same process can be used with manhours as well as cost. This can be most effective on reimbursable projects wherein the primary concern is the utilization and productivity of the work force.

## Team Concept for Reviewing Contractor's Schedules

On-time completion is one goal that all parties in a construction contract have in common. Team reviews of a contractor's schedule can help each party obtain the goal that they all want to achieve. The team review should have the contractor, owner, designer, and construction manager all participating. It is essential that the team composition has a member from the contracting parties responsible for project execution and as well as a member of the contracting parties responsible for schedule progress monitoring. It is imperative that the review team be mindful that the contractor is typically responsible by the contract for the means,

methods, and sequence of the work, and this must remain its responsibility.

The team review concept, however, is a technique that can be used to give the owner or its designated representative a better understanding of the contractor's reasoning behind its chosen plan and sequence for the construction effort. The team review also forces the contractor to have a plan and sequence that it can present to the other review team members in a convincing manner.

The process begins with the submittal of the contractor's schedule which is to be prepared based on the requirements outlined in the contract documents. Instead of the owner reviewing the schedule and returning it with comments, the contractor is invited to participate in the review. The review session can be conducted somewhat like a Value Engineering session where suggestions are made and evaluated by the review team. It is important that during the review all parties are aware that there are resource limitations imposed on the schedule by the contractor, and they must be adhered to unless the contractor agrees to change them. The contractor must have a good understanding of those limits in its labor, equipment, commodity availability, and supervision capabilities.

The team approach can also insure that the contractor has appropriately incorporated items that may be important to the owner, engineer, or architect; these items include:

- a) Sufficient time for reviews of shop drawings and other submittals,
- b) Owner-furnished material and equipment delivery dates, and
- c) Startup and commissioning activities.

The contractor will also develop a better understanding of the reasons behind the owner imposed contract times or sequences. The team review also enhances acceptance of the concept of joint ownership of float, if that is specified within the terms and conditions of the contract. The team review process may take three or four sessions with a core team. The contractor can have some specialty subcontractors at one or two sessions. The owner should have the counterpart of the design team that relates to the specialty subcontractors at those same sessions. This may be especially true on projects that have a substantial amount

of mechanical and electrical components. Having the electrical and mechanical designers as well as the appropriate plant operational personnel, involved in the review will increase the effectiveness of the review process by expanding the knowledge of all attendees to those typically critical work items. If the subcontractors are not present, the contractor must be familiar enough with their work, sequence, resource limitations, etc., to be able to speak on their behalf.

At the end of the team review process a summary of the team's comments and items for resolution needs to be developed and acknowledged by all parties involved in the review. This summary should itemize the modifications that the contractor has agreed to make to its schedule and the planned date of any re-submittals, if such are required. Any re-submittals should be re-reviewed by the same team to verify that all comments have been appropriately incorporated and the schedule continues to be in compliance with the contract documents. Subsequent updates/revisions do not necessarily need to be reviewed by the team unless major changes in logic or the scope of work have occurred or are being contemplated by either party.

The implementation of the team review concept requires that the process be specifically described in the contract documents. The technical requirements for the development of the schedule should be the same as one would typically specify and not necessarily influenced by the fact that a different review process is being implemented.

Some of the more salient benefits of performing the schedule review with the contractor present include:

- a) A reduction in adversarial and defensive attitude that may surround a schedule submittal review,
- b) The fostering of early and open communications between the parties on a document which is critical to the mutual goal of on-time completion, and
- c) Development of a common understanding of what it will take to accomplish the project's schedule objectives and why the sequences are being performed in a way that reflects the contractor's schedule.

## CONSTRUCTION UPDATING/MONITORING WITH DIGITAL IMAGES

As a previous Revay Report (Vol. 15 No. 2) covered this item, only brief comments are necessary.

With the recent increase in popularity of digital cameras and portable computers, field staff on distant projects can now take digital photographs of project progress, problems (site conditions, utility conflicts, changed conditions, etc.) and instantaneously transmit the annotated photographs to the head office, owners' representatives, professionals, etc. either by modem or the Internet. The images can also be electronically linked and transmitted with detailed daily reports for further documentation.

Project participants can view the site conditions without leaving their offices. Problems can be understood and resolved much more quickly. The photographs can be immediately pasted at any time to site instructions, change orders, letters, daily or weekly reports via current word processing programs for hard copy printing or imported into any slide show for presentation purposes.

The digital image is stored in an electronic database and can be coded with key words, work package numbers, activity ID's, or virtually any type of identifier to allow rapid retrieval possibilities, otherwise impossible with ordinary photographs. These images can be accessed by date, keyword, job number, subcontract, etc.

As the old adage goes "A picture is worth a 1,000 words." This tool enhances communication through clarity, speed and ease in retrieval.

## CONCLUSION

Sir Michael Latham, in his report "Constructing The Team" states:

***"Implementation begins with the clients. Clients are at the core of the process and their needs must be met by the industry."***

If the above suggestions are to be integrated into our industry, owners, who are the buyers of construction services, will have to take the first step as they will benefit the most from the initiatives discussed.

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