

CACQS

The Canadian Association
of Consulting Quantity Surveyors



COST MANAGEMENT

BEST PRACTICES GUIDE - 2016

CACQS - MEMBER FIRMS

- 1. A.W. Hooker**
- 2. Atrium Consultants**
- 3. Beacon Construction Consultants**
- 4. RLB/Clare Randall Smith Pendlebury**
- 5. Clive Mills**
- 6. Hanscomb**
- 7. Lakeland**
- 8. Macogep**
- 9. Marshall & Murray**
- 10. Pelican Woodcliff**
- 11. SSA Quantity Surveyors**
- 12. Truest Quantity Surveyors**
- 13. Vermeulens**

■ PREFACE

The Canadian Association of Consulting Quantity Surveyors was launched as a national trade association in July, 2012. It has grown from nine member firms then to seventeen firms across Canada currently. The common vision of promoting awareness of the consulting Quantity Surveyor industry has driven a number of initiatives including the publication of the Best Practice Guide in 2014.

Senior representatives in most member firms contributed to the authorship of the original publication and now another set of leaders in our profession have participated in the updating and enhancement of this second edition of the Best Practice Guide.

It is not intended to be a guide to our members, but rather a guide to our clients, to inform and assist them in understanding the range of services offered and how these services will contribute to the success of their construction projects.

Every construction project is laden with varying risks and the consulting Quantity Surveyor is well equipped to assist the Owner and project team in identifying and mitigating these risks. A very small investment in the services of a consulting Quantity Surveying firm will often result in the avoidance of costly risks.

Become familiar with the range of services and resulting benefits within this Best Practice Guide and put them to work on all your future projects.

Alan Hand
President, 2014-2016
Canadian Association of consulting Quantity Surveyors

■ CONTRIBUTORS

Special thanks to these individuals whom have contributed, consulted, and dedicated their efforts to the creation of this document.

Donny Afonso, B.Sc. (QS), PQS, Associate, PelicanWoodcliff

Yvon Chabot, PQS/ECA, President, Group Schema

Belinda Edwards, B.Sc. (QS), MRICS

Arif Ghaffur, BSc (Hons), PQS, MCI Arb, FRICS, Founder & President, Lakeland Consulting Inc.

Alan Hand, PQS (F), Senior Partner, A.W. Hooker Associates Ltd.

Glenn Hultzer, B.Sc. (QS), PQS, MRICS, Partner, A.W. Hooker Associates Ltd

Mark Hutchinson, B.Sc., PQS, MRICS

Angela Lai, BSc (QS) MSc (Building), FRICS, PQS, LEED AP (O+M),

Louis yves LeBeau, Eng., M.Eng., PQS, President, Macogep Inc.

Arthur James Maw, PQS (F), MRICS, President, Hanscomb Limited

Dale Panday, PQS, MRICS, Director, Hanscomb Limited

Joe Pendlebury, PQS (F), MRICS, Principle, RLB/CRSP Cost Consultants Group

Bob Picken, PQS, GSC. Senior Consultant, Marshall and Murray

Anil Ramjee, PQS, MRICS, CCE, Marshall and Murray

Manoj Ravindran, P. Eng., PQS, MRICS, LEED AP

Timothy Spiegel, B.Sc. (QS), PQS, MRICS, Senior Principle, SSA Quantity Surveyors Ltd.

Doug Thomson, MA Cost E, AACE

James Vermeulen, PQS, LEED AP, Co-CEO, Vermeulens

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■ INTRODUCTION

In Canada, and around the world, Quantity Surveyors play a critical role in ensuring the financial success of building and infrastructure capital development projects. Working as key members of project design teams, they contribute a range of sophisticated design and construction stage cost planning and control tools that help owners and design professionals plan for and control the costs of their work.

From inception to completion, the skills and knowledge that the Quantity Surveyor brings to every project can help establish realistic budgets at the predesign stage, ensure that the design evolves within predetermined cost limits and control construction stage cost over-runs.

Quantity Surveyors deliver their services with three key objectives in mind:

- to achieve the best value for each dollar spent
- to keep expenditures within the amount allocated for each of the various elements or segments of the project
- to achieve a balanced expenditure between the various elements or segments of the project.

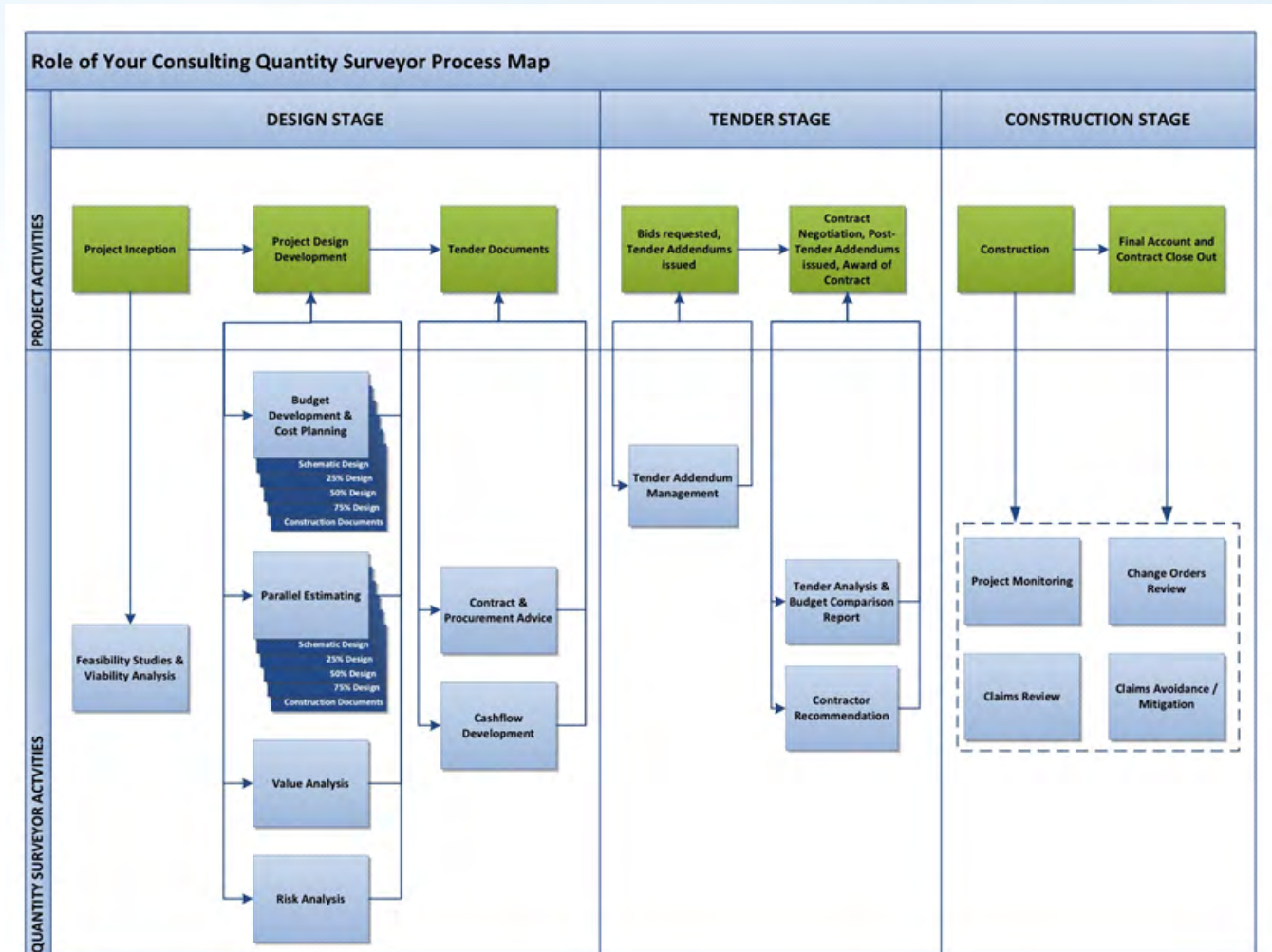
Quantity Surveyors bring a systematic form of cost planning control to project design and construction. The tools and techniques they use embody the following principles:

- a frame of reference containing a realistic first estimate of the project and a plan of how this will be spent
- a control mechanism that allows feedback or checking of the original cost plan as the project proceeds
- a clearly defined procedure for taking remedial action as the project proceeds.

To be truly effective, cost planning and control systems must not only be integrated into and operate within the total project management structure, but must also be well understood by all members of the project team.

With this in mind, the Canadian Association of Consulting Quantity Surveyors has prepared this Guide to provide owners and design professionals with a detailed description of the elements of successful construction cost control.

PROCESS MAP



DESIGN

Feasibility Studies and Viability Analysis

Knowing all the factors leads to more predictable results

The goal

Before a project gets underway, clients want to know that it's viable, particularly from a cost perspective. That's where Consulting Quantity Surveyors come in. They conduct a feasibility study and viability analysis.

The goal? To provide clients with a clear picture of all projected costs from start to finish. And just as important, they identify potential risks along the way that could impact the project.

What's involved?

To get started, the owner of the project or the owner's agent gets in touch with a Consulting Quantity Surveyor firm. Our member firms all have Professional Quantity Surveyors on staff leading the consulting team.

To earn the professional designation, Professional Quantity Surveyor (PQS), an individual must meet the requirements of either the Canadian Institute of Quantity Surveyors or the Royal Institution of Chartered Surveyors.

A core competency of Consulting Quantity Surveyors is the ability to independently estimate all facets of the project without having to directly contact the sub-trades for their input and expertise. The Consulting Quantity Surveyor then gathers as much info about the project as possible through meetings and interviews.

Sometimes, design consultants need to be engaged. If that happens, it's crucial that the Consulting Quantity Surveyor meets with and understands each discipline's unique requirements and concerns.

This process often involves specific considerations. For example, if the owner wants to focus on sustainable design, the Consulting Quantity Surveyor brings relevant consultants into the fold. Meetings and user groups with stakeholders also help move the process along.

If a specific site or sites are being considered, the Consulting Quantity Surveyor reviews any documentation for the site. They're looking for issues related to constructability, availability of site services, soil conditions, and bearing capacity. If available, a comprehensive review of existing civil plans and soil reports must be undertaken. A history of the site and an understanding of the past uses of the site are also key parts of the review.

But it's not just about where and how. It's about why. The Consulting Quantity Surveyor needs to gain an understanding of the owner's intent. By comparing the

client's program information with the Consulting Quantity Surveyor's in-house databases, they can make sure that the program includes realistic net to gross targets. Their goal is to best serve the project and the client.

The Consulting Quantity Surveyor must also have a firm grasp on the owner's budget and must be able to competently plan for, or comment on, soft costs, including consultant fees, FF&E budgets, interest rates, and legal fees. An understanding of the owner's philosophy on procurement, taxes, insurance, and bonding is important for developing a realistic cost model that accurately reflects the owner's requirements. The Consulting Quantity Surveyor must have clear knowledge of any owner requirements which may be unique to the project or which may cause the project budget to deviate from established comparable projects.

Sound like a lot of information? It doesn't end there.

Consulting Quantity Surveyor are armed with all kinds of relevant intelligence about the target area, including knowledge of local municipal building codes, permit and development charges, taxes, and other factors. They also have a clear understanding of the local economy.

Every piece of information is crucial to develop a cost model that reflects:

1. The owner's unique requirements.
2. Site specific issues or site options.
3. Municipal or provincial requirements that may affect cost.
4. The local economy and economic projections.

A viability analysis also includes recognizing risks. The Consulting Quantity Surveyor recommends reasonable risk categories and appropriate levels of contingency to facilitate risk management.

But it's not just about handing over a document and calling it a day. The Consulting Quantity Surveyor works with the client to recommend options that will bring the project cost into alignment with budget expectations.

■ Why it's valued

A well-executed feasibility study provides clients with a realistic and viable budget to work with, plus a realistic opinion of both hard and soft construction costs. It's a great document that can act as the budget benchmark throughout the lifecycle of a project—from initial design through to completion.

DESIGN

Budget Development & Cost Planning

An important part of the design process

The goal

Clients want their project to run smoothly and be successful. Underestimating a budget might lead to faster approval, but it could cause headaches along the way. Overestimating allows for breathing room, but the risk of having a project denied is too big. With smart development and cost planning, clients get a realistic and accurate budget—not to mention the information they need to make timely decisions along the way.

What's involved?

Don't confuse budget development and cost planning with a regular estimate. It goes way beyond a simple report. The process involves the Consulting Quantity Surveyor interacting with the design team to manage the budget every step of the way.

You can think of the Consulting Quantity Surveyor as part of the design team. They work closely with the design team to manage the budget throughout the design process. They're experts on design elements and help balance cost constraints while ensuring that high design standards, and the type of quality the client expects, are maintained.

The process begins with communication, and the Consulting Quantity Surveyor's top priority is making sure the client's needs are met while managing the budget within the defined constraints. During the budget development and cost planning process, there's a lot of back and forth between the Consulting Quantity Surveyor, the client, and the design team. As the design changes to accommodate the budget, the Consulting Quantity Surveyor's expertise plays a pivotal role.

Throughout the design development process, you can expect the Consulting Quantity Surveyor to regularly update the design team and client on any project cost changes and budget amendments.

Why it's valued

Saving time! In addition, there are no cost surprises after the design process has wrapped up. And no returning to the drawing board because there just isn't enough money to cover the design. These are just a few of the benefits of budget development and cost planning.



DESIGN

Cash Flow Development

Fewer surprises for better financial stability



The goal

Clients don't like surprises, especially when it comes to money. They want to know that they'll have a steady flow of funding to cover costs throughout the lifecycle of a project. That includes known costs and unanticipated ones. And that's where the cash flow report comes in.

With the cash flow report, a client gets a clear picture of not only how much money a project requires, but also how much money is being paid out—and when. This usually covers everything from the project inception through to completion.



What's involved?

With the certified and approved project budget in hand, the Consulting Quantity Surveyor puts together a custom cash flow forecast report prior to the start of a project. The report is designed to anticipate any and all potential cash requirements. Pay dates and pre-payments are taken into account to give clients the most accurate picture possible.

It doesn't end there. After the forecast has been approved, the Consulting Quantity Surveyor provides the client with updates, comparing the original forecasted cash flow with the actual cash flow.



Why it's valued

Most clients work on more than one project at a time. Juggling all these projects from a financial perspective can be a daunting task. With the cash flow report, clients remain confident they have funding for everything they need—from start to finish. That means better financial stability for each project and more peace of mind along the way.

DESIGN

Risk Analysis

When you know the risks, you can minimize surprises

The goal

Every project comes with risks. You can't eliminate them, but if you can identify them in advance, you'll always be one step ahead. Risk analysis includes mitigation planning, risk monitoring, and establishing proper contingency measures. And when done smartly, it can help clients avoid ugly and unmanageable surprises.

What's involved?

Risk analysis includes the preparation of a comprehensive risk register. The Consulting Quantity Surveyor's job is to bring an impartial and objective viewpoint to the process. Often the most effective method for doing this is by holding a risk workshop.

During the risk analysis workshop, the Consulting Quantity Surveyor will:

- Engage all project participants, especially the client, design team and other construction professionals in considering and identifying projects risks.
- Tabulate, categorize and compile each discrete type of risk into a document, which then becomes the Risk Register.
- Analyze each risk item and assign each one with a "probability of occurrence" ranking.
- Identify potential cost and time impacts that could arise from the occurrence of each risk.
- Formulate risk mitigation strategies, particularly focusing on high probability, high impact risk items.
- Publish the completed Risk Register for follow-up, monitoring, and periodic updating.

Why it's valued

When you identify the risks of a project in advance, your project becomes far easier to manage—from start to finish. And that means you're more likely to see its successful completion, on time and on budget.

DESIGN

Contract and Procurement Advice

Each project is unique and requires a fresh considered approach

The goal

Achieving competitive pricing and getting the project complete, in the most expeditious manner possible, is what every Client strives to achieve. The approach as to how this is achieved is influenced by a number of factors and needs to be carefully considered. For the best outcome, the Consulting Quantity Surveyor should be engaged early in the decision making process. Not only will they be able to help develop the project budget, but they'll be able to recommend the best contract strategy and procurement route, that to suits the individual project needs.

Construction contract strategy and procurement is crucial for making sure the project runs smoothly. But it is a complex decision driven by many factors. There are several contract strategies and procurement route options available, so making the right selection is vital to the success of a project.

What's involved?

Why is the procurement route so important? The route impacts the overall construction costs, duration of design and construction, and the overall quality of the project.

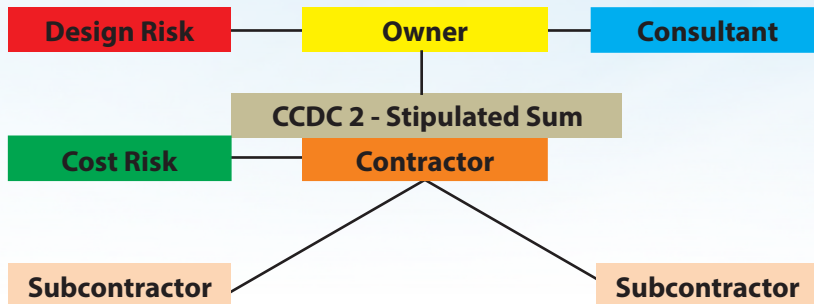
Client considerations:

- Risk equates to cost. How much risk should a Client adopt? How risk adverse do you want to be ? – The Clients' knowledge of Construction and the processes often dictates the level of Client risk adoption or avoidance. Corporate risk policies can also dictate the approach. Analysis of the level of risk adoption between Client and Contractor is an important consideration as it influences the decision on what Contract strategy should be used.
- Speed and Schedule in completing a project – this influences the decision on the procurement and contractual strategy to be adopted. A design-build approach may be a faster approach, but it attracts higher contractor risk.
- Design input – Does the client want to influence design and by how much?
- Client control – How hands on does the client want to be?
- Flexibility – Will the client want to make changes during construction or is the design firm and fixed?
- Price certainty – How crucial is certainty of price?
- Market conditions – The market conditions could play a part in design or construction?
- Complexity – How complex is the building?

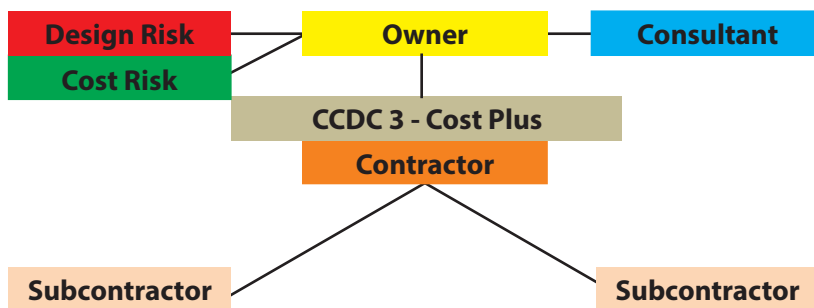
The Consulting Quantity Surveyor uses the answers to these questions to suggest the most appropriate Contract strategy and procurement route.

1) Traditional Design - Bid - Build

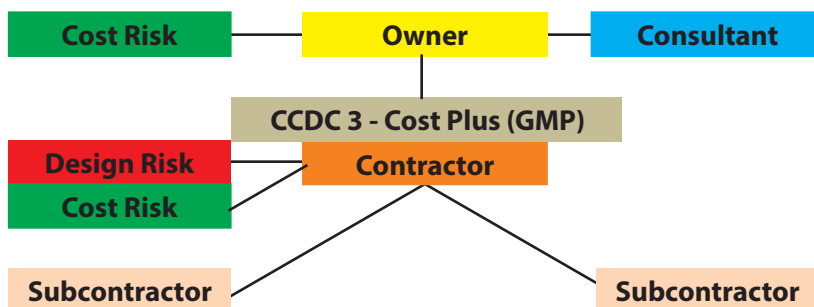
A - Traditional Design - Bid - Build



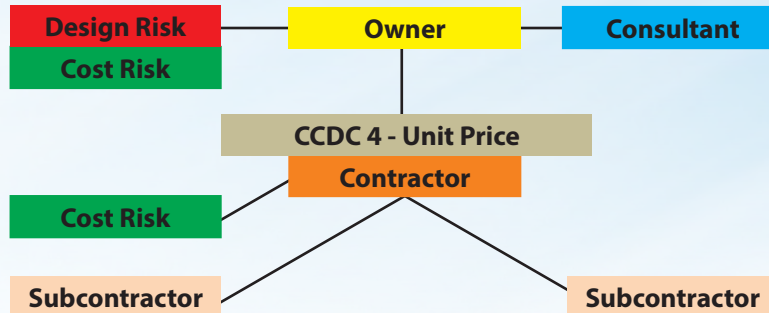
B - Traditional Design - Bid - Build



C - Traditional Design - Bid - Build

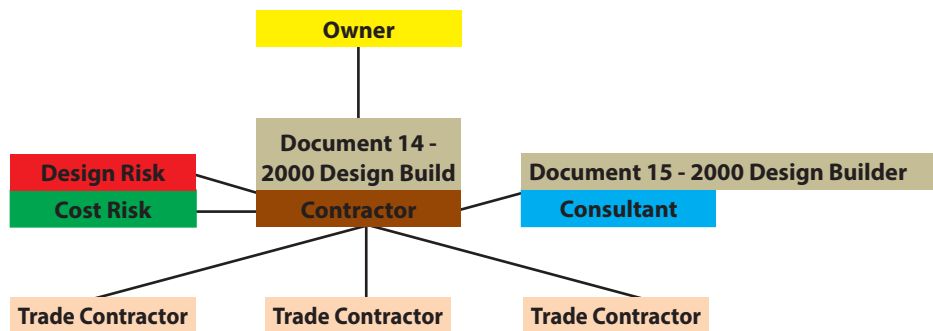


D - Traditional Design - Bid - Build



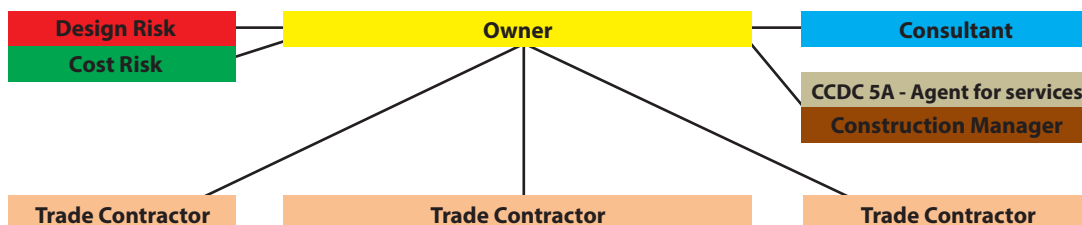
2) Design - Build

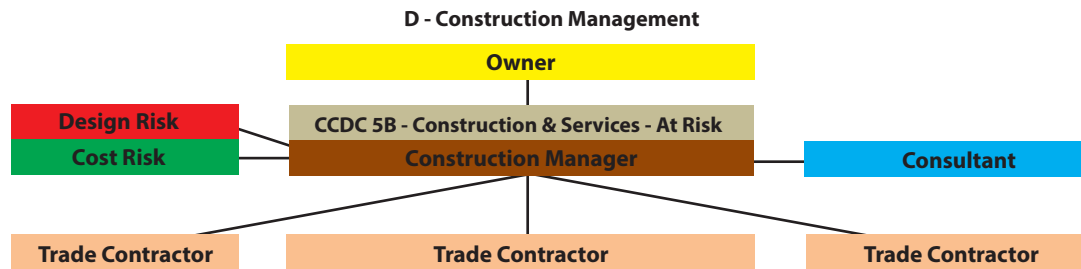
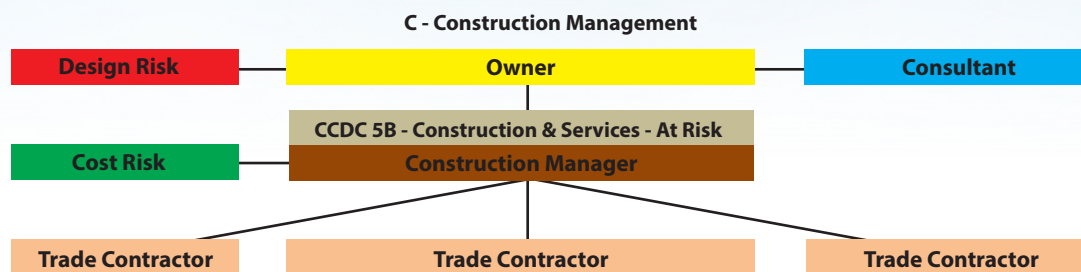
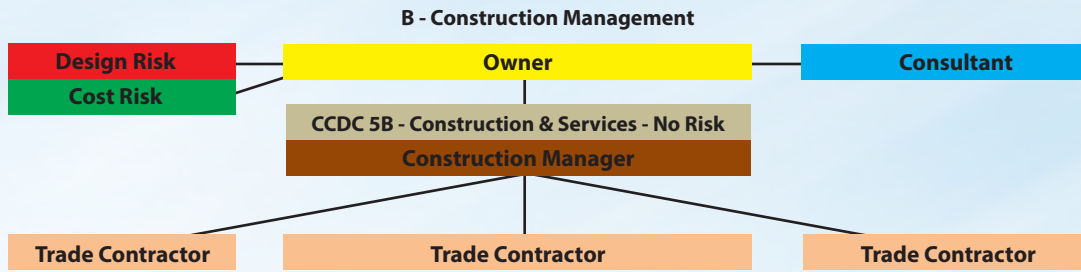
Design - Build



3) Construction Management

A - Construction Management





Why it's valued

Every project is different. And just because one contract and procurement route worked for one project, it might not make sense to go the same route for the next project, even if the client is the same. The Consulting Quantity Surveyor is skilled at providing meaningful independent procurement and contract advice based on their specialist knowledge of construction costs and construction contractual procedures.



DESIGN

Value Engineering

More value out of every dollar — without compromise



The goal

When clients are spending big money, they want to know that every dollar spent is being maximized. With value engineering, Consulting Quantity Surveyors can make sure that a project is being built for the most optimum cost while delivering value for money.

But it's not just about stretching a dollar. Analyzing functions, cost, and performance criteria enable developing objectively the solution that will provide the best value for money.

Consulting Quantity Surveyors are skilled at understanding how sustainable ideas, construction methods, and resources can help a client realize more value throughout the life cycle of a project.



What's involved?

Consulting Quantity Surveyors know that communication is everything. That's why they firmly believe in the importance of value analysis. The formal process is carried out in a workshop environment where a multidisciplinary team approach allows key contributors an opportunity to participate and voice their opinions, thoughts, and ideas.

In the workshop, all the project functions are identified, categorized and prioritized according to their respective worth for the client.

Then the proposed design and major scope of every significant component of a capital project is evaluated against the cost of the component and the functions that the component is intended to address.

The goal of the workshop? And what is the Consulting Quantity Surveyor looking for?

- to explore alternative ways of addressing the design that make it more cost effective and environmentally sustainable
- to make sure everything remains satisfied, including the owner's requirements, the project's program, building function, capital and operating budget, time frame parameters and value for money over the long term

During the free and open idea generation session, all discussed and proposed alternatives are recorded and distributed to the participants. Each alternative is evaluated from functional, capital cost, planning, design, life cycle cost, and sustainability perspectives.

The options that respect all of the above parameters are later chosen by the team. And while some options might not make the shortlist, they could be chosen at a later point in the design process.

■ **Why it's valued**

Clients want value for their money wherever they can get it. Projects that have undergone a comprehensive value analysis have the best chance of delivering better value over the entire life cycle of the project.



DESIGN

Parallel Estimating

Enjoy double cost certainty and reduced risks



The goal

They say that two heads are better than one. For larger, more complex projects, a second opinion is a smart idea, especially for improving the identification and mitigation of cost risks.

Parallel estimating involves the assessment and reconciliation of direct and indirect construction costs, and the appropriate levels of estimating risk allowances.

And here's the best part. Two independent, qualified construction cost estimating teams are involved—simultaneously.



What's involved?

Two independent, qualified Consulting Quantity Surveyor firms are separately engaged to prepare cost estimates at pre-determined design milestones. Typically the firms are retained by the design team or the owner as independent consultants.

Not just any consultant will do. To be considered qualified, both estimating firms must have the ability to independently estimate all trades internally. That means they can't resort to directly contacting sub-trades for their input. It's crucial that both firms be able to thoroughly validate their estimates and that they know the details inside and out.

Taking a similar approach

To help clients understand the cost comparisons and to speed up the process, the estimates provided by both firms must be in a common format. Examples of commonly used design stage estimate formats include the Canadian Institute of Quantity Surveyors Elemental Estimating Standard and Uniformat.

The same measurement of quantities and assessment of unit rates, application of risk alliances, and other factors must be used on both estimates.

Estimates are usually done in the following cycles:

- Preliminary / Concept Design
- Schematic Design
- Design Development
- 50% Contract Documents (optional on smaller projects)
- 100% Contract Documents

After each cycle, both estimating firms get together to compare and reconcile their estimates. Reconciliation meetings should include the participation of key representatives of the project team. The design team's participation is vital to the success of the reconciliation process. Why? Because they can speak directly to issues that relate to design and help speed up the process.

What to look for in the reconciliation meeting

The reconciliation meeting focuses on quantity and unit rate deltas as they relate to direct construction costs. Both estimating firms should come to the table armed with their independent interpretations of the design package. Estimators from both firms, representing all design and construction disciplines, should be available and prepared to discuss estimate assumptions, methods of measurement, and pricing.

The estimating firms will compare costs for materials, identifying major deltas and agreeing to reconciled items with support from the design team. Typically, as the estimating firms go through the reconciliation process, opportunities for value engineering are recognized.

The Consulting Quantity Surveyors are also focused on making sure all items necessary for the contractor to secure the bid are included in the estimates. It's also important for each firm to understand and adjust to the owner's expectations with respect to items like bonding, insurance, and permits.

The reconciliation meeting is the ideal platform for the two estimating firms, the design team, and owner's representatives to discuss and agree to appropriate levels of risk. It's also important for each estimating firm to recognize any variances in their approach to contingency items and, if necessary, reconcile their approaches to ensure their estimates line up.

The next steps

After the reconciliation meeting has ended, one of the consulting firms is tasked with creating a document that outlines the decisions made and provides a tracking mechanism from which they can develop updated estimates. With the document in hand, both estimating teams can revise their estimates.

If appropriate, a conference call or secondary meeting should be scheduled to bring any outstanding issues to a resolution.

Why it's valued

Everyone values a second opinion. Having the second opinion on the same page as the first is even better. With an improved degree of cost certainty, parallel estimating gives clients a more realistic alignment of budget and scope that they can be confident in. And the design team gets a better foundation to make even better design decisions as the project progresses.

TENDER

Tender Addendum Management

Avoid big problems that come with small changes

The goal

After the Consulting Quantity Surveyor has completed the pre-tender estimate (Class A), at 90-100% completion of the Contract Documents, the tender package is assembled and issued to the market. Interested contracting parties review and provide a tender price for the project before the tender closing date.

But the tender package is rarely final. For most projects, it's normal for tender addenda to be issued by the lead designer throughout the tender period for a number of reasons:

- To clarify errors found within the tender documentation
- To update/revise specifications and/or drawings
- To clarify any queries raised by tenderers
- To provide additional detail

A tender addendum document has the potential to have a significant impact on the overall cost of the project and could ultimately lead to a budget overrun. Managing it the right way can help keep costs in check.

What's involved?

The Consulting Quantity Surveyor is skilled at managing tender packages and should be engaged to review each tender addendum. Clients should consider the Consulting Quantity Surveyor part of the design team. Every design or specification change made should land on the desk of the Consulting Quantity Surveyor, no matter how small it might seem.

The Consulting Quantity Surveyor can then undertake a review of the proposed tender addenda and advise the client of the cost impact. There are two ways to go about this:

- 1) on a reactive basis once the addendum has been issued
- 2) on a proactive basis before the official release of an addendum document

The Consulting Quantity Surveyor can provide a formal cost estimate update report based on the information contained within each tender addendum document and track all changes throughout the tender period up until the tender closing date.

■ **Why it's valued**

The tender evaluation process is important, and any slight change could impact the overall tender price. A Consulting Quantity Surveyor is well versed at providing critical cost input and assessing the cost impact of each tender addendum.

By calling upon the skills and expertise of the Consulting Quantity Surveyor during the tender period, an accurate update to the pre-tender estimate can be developed. And since it will be more in line with the final submitted tender bids, the tender evaluation process should run a lot smoother.

TENDER

Tender Analysis and Budget Comparison Report *The right way to identify the best bidder*

The goal

Cost is important, but it's not the only factor. Looking at the bottom line of a total budget and comparing it to the tender amount is not the right approach to make sure your project is on budget.

So what is? That's where tender analysis comes in. When done right by a Consulting Quantity Surveyor, it helps make sure that the best value bidder is identified—and best value doesn't necessarily mean the least expensive.

What's involved?

The tender analysis involves weighing the detailed pre-tender estimate against the tender. Bidders should provide a breakdown of their tender price in a format that can be readily compared to the budget. With all documents in hand, an agreed number of the lowest bids are analyzed in detail and compared to the budget.

Here's a look at what the Consulting Quality Surveyors is searching for in the tender analysis:

- Bidders' exclusions, qualifications, and clarifications and their related cost implications.
- Variances between the tenders and budget on an item-by-item basis and total tender amount basis.
- Items within the bids that are significantly lower than the budget or the other bids. These items may include apparent or suspected scope of work errors or exclusions that may need to be clarified with the bidder(s) prior to contract award.
- Items within the bids that are significantly higher than the budget or the other bids. These items may include apparent or suspected scope of work errors or areas where alternate means, methods, or materials may result in savings that should be explored and finalized prior to contract award.
- The amount that the bids are below or above budget, allowing the Owner to determine the project's financial viability prior to entering into contract with the preferred bidder(s).
- Schedule, start dates and substantial completion dates if requested.

Why it's valued

Before signing on the dotted line, clients want to know that the project they're about to engage in is free of any potential issues, and that the bidder offering the

experience difficulties throughout the remainder of the project. With tender analysis, clients get peace of mind with fewer risks along the way.

TENDER

Contractor Recommendation

There's more to the perfect bid than just cost

The goal

Cost is a critical item. But when trying to select the best bid, it's only a piece of the puzzle.

In Canada, it is extremely rare that anyone but the lowest bidder is awarded the contract.

Yes, clients want to keep costs in check, but not at the risk of causing problems throughout the construction period of the project. In many cases, the lowest bid isn't necessarily the one that offers the most value. Simply looking at the bottom line and awarding to the lowest bidder may result in unforeseen risks and costs. So when selecting a contractor, the Consulting Quantity Surveyor helps the client choose one that offers the best value.

What's involved?

A contractor recommendation should take into consideration the financial aspects of the bids as analyzed in the tender analysis and budget comparison report.

Non-financial criteria that the project team may want to consider is equally important. This might include things like:

- Relevant previous experience
- Proposed staff
- Past working relationships
- Schedule, safety policies & record
- Environmental policies & record

To determine the contractor with the best value, the Consulting Quantity Surveyor uses what's known as a weighted scoring model. The technique looks at all sorts of information, including financial and nonfinancial. Each bid is evaluated for its relative strengths and assigned a total score. The bid with the highest score is the determined to offer the best value.

This undertaking isn't done blindly. The criteria in the model is developed with the help of the owner, designers, project manager, and other key people involved in the project. Sometimes, more information is required from bidders. Post-tender interviews and correspondence can help with that.

The final recommendation identifies the best value bidder and highlights the scores of other bids too. The recommendation also includes the evaluated prices relative to the budget, any contingencies recommended, and all supporting documentation used to arrive at the recommendation.

■ **Why it's valued**

When the best value bidder is selected, there's a greater chance of the project being completed on time and on budget. And that means fewer headaches for the client and everyone else involved.

CONSTRUCTION

Project Monitoring

An early-warning approach to avoiding problems

The goal

No one likes operating in panic mode. And that's especially true with construction projects. With proper project monitoring, the Consulting Quantity Surveyor provides clients with transparent and independent advice to assess the progress of a construction project. This "early-warning" approach means clients can avoid potential budget shortfalls and cost overruns.

What's involved?

Consulting Quantity Surveyors are engaged for financing a project. Many lenders and owners also require reports from independent project monitors along the way. There are usually two types of reports required:

- A preliminary report, done at the beginning of a project
- Status reports, done monthly

How involved is a project monitor? That depends on what the client and stakeholders demand.

At the very minimum, the project monitor provides these services as part of their role:

(I) Preliminary Report

Regulatory Reviews

- a. Review of all development agreements, permits and material contracts for development with a view to determine how these potentially will affect the Project budget and cash flow. The Project Monitor should check for factors such as easements.
- b. Review the plans and specifications with specific focus on completeness and adequacy. The review should determine whether all costs (including onsite and offsite or external construction or servicing costs, soft costs and financing costs) have been identified in order to fully develop the Project.
- c. Review the construction contracts with specific focus on completeness and consistency with the Project description and on determining if any contract exclusions and/or amendments require Project budget adjustments. The Project Monitor could comment on the form of contracts and any risks arising.

- d. Review the Project Budget (including both hard and soft costs) to determine the completeness, adequacy and reasonableness of the Project Budget and that the Project Budget is sufficient to complete the Project. This review is to be based on a review of construction contracts substantiating a portion of the Project Budget. The Project Monitor's opinion should explain its approach to review for the remainder of the Budget (review of trade quotations or an estimate prepared by the Quantity Surveyor). The Quantity Surveyor should review the loan and financing agreements to confirm project obligations are correctly carried in the budget.
- e. Review of any approved or potential change orders with specific focus on their completeness, adequacy and reasonableness (on both scope and cost).
- f. Provide comments on any potential problem areas or disputes that may affect completion of the Project and in particular, how they may affect the budget and construction time schedule.
- g. Review the Project construction time schedule in the context of the Project plans and specifications and construction contracts to determine whether it is realistic.
- h. Lenders or Joint Venture partners often require confirmation that initial cash equity has been injected. If this is a requirement, the Project Monitor should pre-agree the method to be used. Specifically, is this review to be done by; 1) reviewing bank statements and cancelled cheques, or 2) reviewing invoices and accounts payable reports? The Project Monitor should also confirm if ongoing disbursement audits are required (by review of cancelled cheques and bank statements).
- i. At times, Lenders or Joint Venture partners may require a review of lease and purchase and sales agreements. If this is a requirement, the quantity surveyor should pre-agree the required level of review. Specifically, is this review to; 1) perform a detailed review of the agreements to confirm that specific sales or deposits requirements are met, 2) confirm that project financial obligations under these agreements are correctly provided for in the budget, or 3) that all lease and purchase and sales agreements are reported correctly in project revenue and purchaser deposit reports?

Technical Reviews

- j. Review the soils and environmental reports (soil tests, geotechnical reports and/or environmental assessments) to check that any material recommendations are shown in the plans and specifications and the Project budget.
- k. At times, Lenders or Joint Venture partners may require confirmation that Builder's Risk and Wrap Up Liability insurances are in place. Consulting Quantity Surveyors are not insurance specialists and any Consulting Quantity Surveyor reviews should be done in conjunction with an Insurance Advisor. If this is a requirement, the Project Monitor should review insurance certificates provided to confirm any material errors in coverage amounts and periods stated.

(ii) Status Report

Financial Reviews

- a. Site Visits, coinciding with the date of the Status Report, are done to assess the progress of work on site. This visit should be the basis of the opinion of costs to date.
- b. The Status Report should include, at minimum:
 - i. the cost of work completed to date,
 - ii. the cumulative positive or negative value of any change orders,
 - iii. the amount of any lien holdbacks, and
 - iv. the current estimate of cost to complete the Project.

In addition, the Status Report will:

- c. Update the Project cash flow projection, together with comments on any material variances from the original cash flow projection.
- d. Provide comment on material changes to the plans and specifications.
- e. Provide comments on any potential problem areas or disputes which may affect completion of the Project.
- f. Recommend budget and construction schedule revisions.

Technical Reviews

Consulting Quantity Surveyors will need to review and rely on quality reports issued by Project Consultant(s) to certify that construction to date has been performed in accordance with the approved plans and specifications and complies with the applicable permit(s), municipal bylaws and the applicable code(s). The Project Monitor needs to check that material deficiency amounts are withheld from payments made to trade contractors.

■ **Why it's valued**

With project monitoring, Lenders and Owners reduce risk with “early warning” reporting and get extra peace of mind, knowing that the budget is reasonable for the project scope, that the costs reported are transparent and reasonable for the work, and that the overall cost to complete the project is adequate.

CONSTRUCTION

Change Order Review

A scrutinizing eye with a focus on the bottom line

The goal

Things rarely go exactly as planned. More often than not, project and construction plans change from what the original contract stipulated. Clients want to know that they're paying a fair cost or getting a fair cost adjustment for those changes. A Consulting Quantity Surveyor provides an independent and impartial assessment.

What's involved?

During a change order review, the Consulting Quantity Surveyor takes into account:

- The terms of the contract regarding changes, including schedules of unit rates, labour rates, and allowable mark-ups.
- Site conditions affecting the change and the timing of the change.
- Scope and quantities of work involved including appropriate deletions.
- Whether pricing changes are in accordance with the terms of the contract and reasonable given the nature of the work involved.

The Consulting Quantity Surveyor then makes a clear recommendation for a cost change. If the price difference challenges the original change order quotations, sufficient supporting details are submitted along with the change order quotation.

Why it's valued

An independent review means that change orders are fair and reasonable. But it goes beyond double-checking prices. When a Consulting Quantity Surveyor is involved, contractors know that their quotations need to be accurate and supported by the right documentation. This means that quotations will be more on target!

CONSTRUCTION

Claims Review

The best way to guarantee fair and reasonable claims

The goal

Sometimes, after work is completed, the contractor submits a claim for greater payment than the original contract called for. The claims review process involves making sure that any adjustments and changes from the original contract are priced fairly. The Consulting Quantity Surveyor even looks for opportunities to save where credit is due.

What's involved?

Similar to a change order review, during a claims review the Consulting Quantity Surveyor takes into account:

- The terms of the contract regarding claim entitlements and notifications, including schedules of unit rates, labour rates, and allowable mark-ups.
- Site conditions creating a claim condition and the timing of the condition.
- Scope, quantities of work involved including schedule impact.
- Whether pricing claims are in line with the terms of the contract and within a reasonable premium to competitive rates.
 - Investigation into the possibility of shared responsibility causing the claim
 - An opinion on a settlement amount

The Consulting Quantity Surveyor then makes a clear recommendation for the settlement of the claim, with sufficient supporting details submitted along with the recommendation.

Why it's valued

With a claims review in hand, the project owner can take comfort knowing their exposure and that they have a plan for moving forward.

CONSTRUCTION

Claims avoidance/mitigation

Avoid claims by spotting them before they surface

The goal

Not everything always goes as planned. With the complexities involved in a construction project, issues between the parties to a construction contract emerge when there is a difference of opinion that leads to disagreement.

With a pro-active strategy to avoid and or reduce the impact of claims, clients can anticipate issues that have the potential to turn into claims and if they do turn into claims, there is a plan in place to resolve such claims

What's involved?

You would think that a solid contract would mean that claims would not exist between the parties. But like all contracts, construction contracts are often open to interpretation. The parties to any contract can interpret contractual documentation differently and construction is no different.

Contractual claims can originate from one or more occurrences including scope changes, quality, drawing interpretation, work sequencing, overtime, resource utilization and multiple other occurrences that can lead to adjustments to the time and cost for delivering the construction project.

In order to avoid and reduce the impact of such claims, Consulting Quantity Surveyors can assist clients to establish clarity and prevent surprises by developing a claims management strategy. Clear, credible, and consistent communication is part of a strategy to identify and resolve claims.

Managing contractual issues, including those that impact cost or schedule, in a structured manner will prevent such issues manifesting themselves into claims. With a strategy to manage claims, the Consulting Quantity Surveyor focusses on achieving results for the benefit of the client.

How to foresee claims

Most claims normally result from requests for information, clarification or requests for change orders that remain unresolved. Consulting Quantity Surveyors monitor the requests and answers to ensure that this is managed in manner that provides clarity and certainty.

Claim avoidance starts at the project concept phase by the implementation of a strategy that also addresses how claims will be avoided. As the project progresses, many circumstances exist that could raise or lower a project's susceptibility to encountering issues that can manifest into claims.

Claims avoidance is not just in the hands of the Consulting Quantity Surveyor. All project participants can do their part to not only avoid claims but also reduce the impact of resulting claims which require resolution in accordance with the terms set out in the construction contract.

All clients, albeit developers, architects, designers, engineers, consultants, contractors, and sub-contractors have a vested interest to ensure that there is a strategy in place to identify, manage and resolve issues including claims, with a clear allocation of responsibility to project participants.

Therefore, successful claims avoidance/mitigation requires the project management team to do their due diligence throughout the project lifecycle, particularly at the start of the project to identify potential issues that might eventually lead to claims.

Unfortunately, many clients overlook important details. This lack of attention to detail means that: 1) project designs might be incomplete; 2) estimates are issued with budget allowances based on little to no scope definition; 3) permits are submitted late and incomplete; 4) schedules are planned around owner desire instead of execution requirements; and 5) contractors are selected on the basis of lowest cost and not best value.

Consulting Quantity Surveyors are accomplished masters at “detail” and work pro-actively to ensure that the grounds for potential claims are either not established before construction starts or at the least potential issues are identified in as part of the strategy to effectively manage claims.

Uncertainty leading to claims

As mentioned earlier, the issues that tend to become construction claims are those that arise from uncertainty in the contract documents, or those items that have manifested themselves due to a long-term cost and or time impact on the contractor.

The Consulting Quantity Surveyor is adept at quickly addressing these uncertainties in the contract documents. This helps maintain goodwill between the contractor and subcontractor, and limits the drain on project resources potentially assigned to defend against potential claim.

For example, claims for productivity impact cannot always be quantified at the start. What is more, they are generally difficult to control, hard to quantify, and have a tendency to attract large cost impacts.

The Consulting Quantity Surveyor is well versed at accurately addressing productivity impact claims by defining the impacted scope or manpower, the outer limit of the impact, and the details of the basis for claim.

Issuing notices when conditions change

Throughout a typical construction project, most contracts require contractors to issue notices as progress and conditions change. When the potential of a claim is recognized, it is important that the project notification, update and documentation requirements are followed thoroughly.

Claim documentation and contract review runs parallel to trying to resolve emerging situations. The Consulting Quantity Surveyor works with the impacted parties to develop solution strategies aimed at an efficient resolution of issues.

Why it's valued

By focusing on developing a claims management strategy, you will be able to identify issues that might end up as a claim; and proactively address those claims when and if they arrive, in a manner that will ensure an efficient, timely and appropriate resolution.

■ RELATED COST CONTROL SERVICES

Life Cycle Costing/Whole Life Costing

Get a clear picture of the costs for the life of the facility

■ The goal

When a client undertakes a project, they want maximum project performance, better value for money, and superior decision-making along the way. And they also want to know what a project will cost in the long-term from maintenance and repair perspectives, although this does depend on the client's value drivers.

Life cycle costing and whole life costing is a value added process that can help clients anticipate future long term costs and plan effectively. By producing an optimal design for a project and taking into account the construction costs, as well as the maintenance and operational costs over the life of the project, life cycle costing or whole life costing can help:

- Reduce operational whole life costs
- Reduce energy usage and carbon emissions
- Optimize sustainability performance
- Establish budgets for long term costs

■ What's involved?

Before the process begins, the Consulting Quantity Surveyor needs to establish what the client's objectives and requirements are. Life cycle costs can be established for existing building stock where advice is required for single component replacement to support the client in life cycle option appraisal e.g. which floor finish or boiler to select based on the long term costs. However, life cycle costing may also be required at the early stages for an entire facility or portfolio of facilities, where a long term cash flow forecast is required for budgeting purposes.

But it's not just about asking what the client wants, it is also about what his value drivers may be. A developer developing for sale may not consider having a quantity surveyor provide costs for life cycle and facilities management a useful exercise, unless consideration of long term costs makes it an attractive proposition to purchasers. Purchasers may be swayed if they are purchasing a building that will run efficiently and has the potential to save them money in the long run. An owner occupier would place value on knowing the long term costs as well as ensuring minimum disruption of facilities in use – choice of materials/equipment would be important as this would dictate frequency of replacement cycles.

A developer building for commercial lease would also focus on minimum disruption in use to ensure that tenants are satisfied. However, the focus may be on functional utility and durability of components – the reason being that tenants

may change often (necessitating a change in components in any case) and if components are retained, then hopefully minimal work is needed. An example of choice of components may be as detailed as the choice of paint finish e.g. eggshell vs emulsion paint. Egg shell is more durable and you can wash it, which would reduce the paint cycles whereas you cannot wash emulsion paint, hence cycles will tend to be more frequent.

The public sector has long been an advocate of consideration of life cycle and facilities management costs, with many costing commissions requiring consideration of life cycle costs. Also, with public private partnerships (P3) projects it is a key consideration to consider the long term cost of ownership with full transparency.

During the inception stage, decisions about both initial capital costs and maintenance and operating cost can be made to optimize a development both of terms of cost and operating efficiency.

A life cycle cost estimator can work with the client and the appointed team through all stages of the design to build up whole life cost plans/models. At the early stages, in the absence of design information, whole life cycle costs are provided as single rate estimates i.e. a rate per square foot per annum based on a gross floor area. As the design progresses and some idea of material and component specification becomes available, life cycle cost models can be developed providing a spend profile over the required assessment period. These life cycle models are generated from capital cost plans and, hence, would also be able to guide the design through design development

There is an overlap between the need to replace components and the maintenance regime adopted for the buildings. This needs to be addressed early (with input from the client) in the design and procurement process to determine what items need to be considered as life cycle replacement and what items are regarded as operating or facilities management costs.

Life cycle costs constitute major repair and replacement – it would include periodic replacement of components such as replacement of a boiler, doors or repainting, but would also include minor replacement such as door hardware, grouting of tiles or replacement of active components of mechanical and electrical equipment.

Facilities management costs are more all-encompassing and cover a wide range of areas, which can be categorized as hard, which refers to the physical maintenance of buildings and equipment and soft, which include labor intensive activities such cleaning and catering. The differential between life cycle cost and hard facilities management are often difficult to make, however as a general rule facilities management costs, which are related to the building fabric, are work activities that occur on an annual basis or more frequently such as annual maintenance on equipment and changing light bulbs. Energy costs, although not labor focused, are annual costs and would fall under operating costs.

Life cycle costing and facilities management costing usually focuses on the long term building specific costs. However, a client may require consideration of non-construction costs such as revenue streams, staffing costs, catering, reception, etc. which would provide a facilities total return on investment over the long term. This would be termed whole life cycle costing. Hence, whole life costing should be seen as a holistic approach that assesses the full design implications, and achieves the best value for money for the project, from a long-term perspective considering all expenditure and income streams.

Life Cycle Costing/Whole Life Cycle Costing Guidelines

The Consulting Quantity Surveyor calculates life cycle costs with a knowledge of component life (determined by experience, in-house data and/or recognized publications), capital costs and building type. Facilities Management or operating costs are derived from likely operating tasks required for the particular facility and resource requirements. Other inputs such as revenue streams and core service staffing will be provided by the client, and will be included into a consolidated model, which the client can use as a forecasting tool. It is recommended that a whole life cycle model be updated on a three yearly basis such as it remains an active tool. Life cycle or whole life cycle cost models can be produced at real costs or as a discounted cash flow where a net present value (NPV) will be determined.

■ Why it's valued

With life cycle/whole life cost costing, clients will understand the true financial impact of a property investment and are able to make an informed decision on long term costs, not just initial capital costs.

■ RELATED COST CONTROL SERVICES

Property Conditions Assessments

Know the potential costs of repairs before they're needed

■ The goal

It's not enough to build a property and call it a day. Buildings require maintenance and upkeep. Property Conditions Assessments (PCA reports) help clients assess the current condition of a building's various components and systems. The assessment provides everyone with a clear picture of the capital repair requirements for a building over short-term and long-term periods.

■ What's involved?

Property Condition Assessments, which are often referred to as Building Condition Assessments or Facility Condition Assessments, are an important part of the planning process. They're completed for both private and public sector clients for properties in all asset classes. This includes office, retail, industrial, and multi-unit residential. A typical report includes a capital plan and a reserve fund cash flow table to show the timing and costs of the various items in need of repair or replacement.

Often requested as part of the Condition Assessments, is either a "Replacement Cost Estimate", or a "Reproduction Cost Estimate", and either of these estimates can be enhanced with a "Depreciated Cost" for either of these cost estimates. These estimates allow the owner to develop a "Value for Money" evaluation before expending monies to address the issues raised in the Condition Assessment.

PCA reports are produced by Consulting Quantity Surveyors in consultation with engineering and construction professionals, including professional engineers, architects, and certified engineering technicians.

PCA reports for the private sector

For private sector clients, PCA reports are prepared as part of the due diligence process for commercial real estate transactions. They're also important for financing purposes to meet a lender's requirements.

It's usually the purchaser who commissions the PCA report. The goal? To determine the current physical condition of the assets and the capital requirements for repairs over a defined period.

Sometimes, vendors of real estate property will also ask for a PCA report. The independent report helps them during sales negotiations and can help reduce the sales cycle.

PCA reports for the public sector

For public sector clients, PCA reports are prepared for capital planning & asset management purposes. They're usually done for facilities and institutions like healthcare facilities, schools, transit facilities, correctional facilities, municipal and government buildings, and social housing organizations.

Condominium corporations and social housing organizations also complete PCA reports and reserve fund studies for similar reasons.

Generally a PCA report will follow the ASTM E2018-08 standard. There is also a reference standard called Protocols for Building Condition Assessment, developed by the National Research Council of Canada in 1993 as a tool for consultants, property, and buyers/investors of real estate assets.

■ Why it's valued

With a PCA report, owners, vendors, and purchasers get a clear picture of capital repair requirements over both the short term and long term. The report is an essential tool for accurately forecasting necessary costs.

■ RELATED COST CONTROL SERVICES

Expert Witness

Settling construction disputes with an impartial view

■ The goal

When a dispute arises, it's important to have an impartial witness to help settle it. A Consulting Quantity Surveyor is armed with the necessary expertise to help settle construction disputes. They can assist one or both parties to review and analyze the details of the matter and are available to present a report with their findings.

■ What's involved?

When you engage the services of an Consulting Quantity Surveyor, you get an analysis of all the facts and a clear, expert conclusion supported by relevant, impartial, and unbiased background material. And while some technical matters might require the expertise and opinion of other specialists, most litigation is about cost.

A Consulting Quantity Surveyor brings to the table a keen understanding of the construction process. Clients should remember that it's important to choose a Consulting Quantity Surveyor who is experienced and qualified as an expert witness. The witness might be called upon to testify in court.

The work begins with a discovery process. What's involved? Obtaining copies of all relevant documents, including a contract, tender drawings and specifications, change orders, progress photos, minutes of progress meetings, and other documents that are related to the litigation.

In many cases, construction work is either in progress or has been completed at the time the dispute arises. If that's the case, it's important to conduct a thorough inspection of the site or the specific work in question. The parties to the dispute may need to be interviewed to gain perspective and background knowledge that would not be evident from other sources.

With the information in hand, the Consulting Quantity Surveyor reviews and then analyzes the information and puts together an expert report.

It's important to note that the author of the report must be the nominated expert witness. They must sign it and include their own curriculum vitae with it. Most jurisdictions require a written acknowledgement that the expert understands his or her duty to be fair, impartial, and unbiased.

■ **Why it's valued**

Clients get a reliable and authoritative statement of the cost and financial implications at the root of construction disputes. And they know that the findings were impartial, fair, and accurate.

■ RELATED COST CONTROL SERVICES

Insurance Valuations & Building Reinstatement Costing

Prepare for anything without paying too much

■ The goal

No one expects serious loss or damage to occur, but we all know we need to be prepared for the worst by having the right type of insurance. That's where insurance valuations and building reinstatement costing comes in. The goal? To ensure that buildings are not over-insured or found to be underinsured when a loss occurs.

■ What's involved?

There are two types of rebuilding costs to consider—replacement cost and reconstruction cost.

Replacement cost is the property insurance standard for calculating valuation basis. In a nutshell, it's the cost to replace an entire building with one of equal quality and utility. Generally, replacement costs are calculated using square-foot or unit-count methods.

Replacement costs, calculated using square-foot or unit-count methods, are based on prices for labour, materials, overhead, profit, and fees that are in effect *prior to the loss*—not after. Replacement costs assume that modern materials and current methods, designs, and layouts will be used to replace the building.

Reconstruction costs provide the cost to construct, at current prices, an exact duplicate or replica of the building using like kind and quality of materials, construction standards, design, layout, and quality of workmanship. Because it might be impossible, impractical, or unacceptable to use the materials or methods used in the original construction, “equal quality and utility” may be substituted where necessary for “like kind and quality”.

Reconstruction costs also include site-specific and process-related costs and fees sometimes not included in replacement cost valuations including:

- Current building codes
- Reuse of building components or mechanical systems below grade level
- Loss of economies of scale associated with new construction
- Extra costs due to site accessibility
- Costs of demolition or debris removal
- Higher labour costs and premium prices for materials
- Extraordinary fees and other contingencies

Understanding the differences

The distinctions between replacement costs valuations and reconstruction cost valuations are important to understand. An insurance carrier's goal is to provide the owner with an equitable and fair settlement. Additionally, because policy and settlement terms are frequently subject to negotiation and court interpretations, it is essential that carriers receive premiums based on the fullest exposure on each building. That's the building's reconstruction cost.

Figuring out replacement cost

Research shows that the actual cost to reconstruct a building after a total loss is usually greater than the estimated replacement cost. That's because replacement cost valuations do not include costs arising out of current building codes or from a variety of costs and fees that are commonly present in total losses.

To figure out the overall replacement cost, Consulting Quantity Surveyors employ a Marshall & Swift program. Basic data, usually provided by the owner, is entered into the system and one of the four ranks are applied:

- **Low (Rank 1)** – These tend to be very plain buildings that conform to minimum building code requirements. Interiors are plain with little attention given to detail or finish. Typically, there are minimum mechanical and low-cost finishes throughout.
- **Average (Rank 2)** – These buildings are the most commonly found and meet building code requirements. There is some ornamentation on the exterior with interiors having some trim items. Lighting and plumbing are adequate to service the occupants of the building.
- **Good (Rank 3)** – These are generally well-designed buildings. Exterior walls usually have a mix of ornamental finishes. Interior walls are nicely finished and there are good quality floor coverings. Lighting and plumbing include better quality fixtures.
- **Excellent (Rank 4)** – Usually, these buildings are specially designed, have high-cost materials, and exhibit excellent workmanship. Both exteriors and interiors have custom and ornamental features. Lighting and plumbing include high cost fixtures.

Rankings can fall between two categories. For example, a building that's better than good but not quite excellent could receive a rank of 3.5.

The information provided through the software shouldn't be relied on in isolation. Marshall & Swift might not be appropriate for highly specialized buildings. Typically, these buildings are not measured and some of the adjustments for parking, and design are based on a best estimate. They might not accurately reflect the actual condition and/or site location. For a more accurate estimate, a Consulting Quantity Surveyor can help adjust for software errors and market conditions.

Determining reconstruction costs

To figure out the reconstruction costs, here's what happens:

- Building areas are measured onsite
- A building elemental description is developed
- Areas and building description is circulated to the owner for verification
- Elemental quantities are measured and priced, segregating underground and above grade construction

The estimate is inputted into a master summary. If applicable, demolition, project development management, and design fees are added to establish a reconstruction cost for the building. All statistics and building elemental descriptions are checked and verified by the owner. This is typically one of the primary issues that impact assessments.

Because reconstruction cost is more comprehensive than replacement cost, it tends to be a better representation of what an insurance carrier may expect to pay following a loss. And that makes it the more reliable valuation method for determining insurance to value at policy inception or renewal.

Square-foot or unit-count valuation methods are unable to gather or process the amount of building detail and complex algorithms required to calculate reconstruction valuations. Only automated, component-based estimating methods can analyze unique building characteristics and calculate risk-specific estimates based on localized building codes, structural considerations, labour, and material costs. This is what your Consulting Quantity Surveyor brings to the process.

■ Why it's valued

By analyzing all possible costs for replacement and reconstruction, the building owner can take comfort knowing that they're not paying premiums that are too high for the value they're getting, or too low to respond to a catastrophe, appropriately.

Estimate Classes: An Explanation

by Anthony L. Huxley, MSc, MCIQB, PQS

Introduction

For many years a system of classifying estimates using the terms “Class A, B C or D” has been loosely applied by a number of organizations. Somewhat of a mystery to some, and surrounded in myth for others, it is worth while taking a step back and considering the probable origins and the appropriate use of these terms.

As far as I can tell these classifications are drawn from definitions prepared by the Treasury Board (TB) of the Canadian federal government in the early 1970s. Designed for TB approval processes they were for application to all forms of procurement and not necessarily construction. Consequently they were generic in their description and several attempts, some ill advised, have been made to improve them since they were published. It will be worth noting that TB abandoned these designations several years ago, but they continue in use within Public Works and Government Services and elsewhere.

The following text provides primary definitions of the various estimate classification followed by an amplified explanation of the specific attributes displayed by each of the four estimate classifications. Application notes and references are also included.

Primary Estimate Definitions

The following are based on the original TB definitions but have been modified slightly to suit application to construction cost planning and cost control through design.

Class A Estimate

Based on complete working drawings and specifications, and prepared prior to calling competitive tenders, this estimate should be sufficient to allow a detailed reconciliation/negotiation with any contractors proffered tender.

Class B Estimate (Substantive)

Based on design/preliminary drawings and outline specifications for the project, which include the designs of all major systems and subsystems, as well as the results of all site/installation investigations, this estimate should provide for the establishment of realistic cost objectives and be sufficient to obtain effective project approval.

Class C Estimate (Indicative)

Based on a full description of the preferred option, construction/design experience, and market conditions, this estimate should be sufficient for making the correct investment decision, and obtaining preliminary project approval.

Class D Estimate

Based upon a statement of requirements, and an outline of potential solutions, this estimate is strictly an indication (rough order of magnitude) of the final project cost, and should be sufficient to provide an indication of cost and allow for ranking all the options being considered.

Treasury Board Estimate Classifications (Current)

The following definitions are the current terms and have been transcribed without modification. The two classifications relate specifically to the two main approvals provided by Treasury Board i.e. Preliminary Project Approval and Effective Project Approval. While the latter officially sets a ‘budget’ in TB’s terms don’t be fooled! They are quite capable of controlling and restricting expenditures to that sought as a preliminary project approval.

Indicative Estimate

This is a low quality, order of magnitude estimate that is not sufficiently accurate to warrant Treasury Board approval as a *Cost Objective*. It replaces the classes of estimates formerly referred to as Class C or D.

Substantive Estimate

This estimate is one of sufficiently high quality and reliability so as to warrant Treasury Board approval as a *Cost Objective* for the project phase under consideration. It is based on detailed systems and component design and taking into account all project objectives and deliverables.

While these definitions refer to a cost objective I have been unable to locate a TB definition and append the following as my interpretation.

Cost Objective

A planned, and approved, cost limit (or ceiling) within which the project’s scope is to be delivered. The authorized expenditure for the current phase.

It might also be worth noting that the new TB definitions state that a ‘D’ estimate is good enough to be described as ‘indicative’. This is unfortunate. I have noted a distinct ‘dumbing down’ of estimates within PWGSC lately, with insufficient consideration being given to the content of estimates prepared in support of preliminary project approvals. Consequently major problems arise when, as noted above, TB holds completion of the project to that preliminary figure.

Estimate Attributes

Each estimate classification displays a quite distinct set of attributes. These attributes, both primary and secondary, are identified in the following text and are also summarised within *Table 1. Cost Estimate Classification Summary – Estimate Attributes* that follows. In my view the primary attribute rules. Many of you may have encountered the lazy client who requests an estimate be classified higher than extant information permits. Content is everything. An estimate can be no better than the information that goes into it.

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Estimate Classes – An Explanation

continued from page 12

(A) Class A Cost Estimate

(1) Primary Attribute

- (a) Work Definition
 - (i) Complete working drawings and specifications just prior to calling for tenders.
 - (ii) Definition of project typically in the order of 95% to 100% complete.

(2) Secondary Attributes

- (a) Intended Purpose
 - (i) Confirmation of project compliance with the budget (Effective Project Approval) prior to calling tenders.
 - (ii) Provide the basis/background necessary for detailed negotiation, and cost reconciliation, with any bidder and/or contractor.
 - (iii) A final “run through” of the tender documents checking for errors, inconsistencies and omissions.
- (b) Level of Precision
 - (i) High
- (c) Appropriate Preparation Methodology
 - (i) Measured and priced, fully detailed quantities, obtained from the completed working drawings and specifications.
 - (ii) This estimate will contain only those cash allowances that are called for in the construction documents.
 - (iii) The extensive detail contained within this estimate will equal the detail within any contractors bid estimate.
- (d) Typical Level of Effort
 - (i) High (Extensive and time consuming).

(B) Class B Cost Estimate

(1) Primary Attribute

- (a) Work Definition
 - (i) Completed design documents including drawings and outline specifications at the end of the Design Development stage and just prior to commencement of working drawings.
 - (ii) Definition of project typically in the order of 20% to 35% complete

(2) Secondary Attributes

- (a) Intended Purpose
 - (i) Confirming validity of Preliminary Project Approval, and
 - (ii) Seeking Effective Project Approval, and
 - (iii) Typically setting the Project Budget
- (b) Level of Precision
 - (i) Medium
- (c) Appropriate Preparation Methodology
 - (i) Majority of estimate prepared from measured and priced quantities obtained from the completed design drawings and outline specifications

- (ii) A minor proportion of the estimate may be in the form of allowances
- (d) Typical Level of Effort
 - (i) Medium.

(C) Class C Cost Estimate

(1) Primary Attributes

- (a) Work Definition
 - (i) A completed project plan, clearly defining the intent and extent of the planned work
 - (ii) Definition of project typically in the order of 5% to 15% complete

(2) Secondary Attributes

- (a) Intended Purpose
 - (i) Establish and/or confirm cost of the recommended option, selected from the various options studied, and the associated investment decision, and
 - (ii) Seek approval from Regional and/or Headquarters Investment Management Board, and
 - (iii) Seek Preliminary Project Approval from Treasury Board
- (b) Level of Precision
 - (i) Low
- (c) Appropriate Preparation Methodology
 - (i) Prepared from measured and priced quantities, where possible, and priced parameter quantities, all obtained from the project information that is available.
 - (ii) A significant proportion of the estimate may be in the form of allowances
- (d) Typical Level of Effort
 - (i) Low

Primarily an extension of the work undertaken in preparing the Class D estimate this estimate is a hard “second look” at the preferred option.

(D) Class D Cost Estimate

(1) Primary Attribute

- (a) Work Definition
 - (i) A description of the intended solutions with such supporting documentation as is available.
 - (ii) Definition of project typically in the order of 1% to 5%

(2) Secondary Attributes

- (a) Intended Purpose
 - (i) To aid in the screening of various procurement options proposed prior to recommending a preferred procurement solution, and
 - (ii) To provide an “Order of Magnitude” cost only
- (b) Level of Precision
 - (i) Lowest
- (c) Appropriate Preparation Methodology
 - (i) Various and simple methods of estimate preparation may be employed in preparing this class of estimate.
 - (ii) A significant proportion of these estimates may be in the form of assumptions and allowances.
 - (iii) Where additional information is available it is appropriate to use it in the estimate
- (d) Typical Level of Effort
 - (i) Lowest

A minimal level of detail, and often significant assumption, combined with an acceptance of the low order of inherent precision assure that these estimates are typically prepared with a minimal amount of effort. Unique projects where existing and comparable cost data is unavailable will require an additional effort, primarily to generate (model) valid and supportable estimates.

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Table 1 – Cost Estimate Classification Summary – Estimate Attributes

Estimate Classification	Primary Attribute	Secondary Attributes			
	Project Definition	Intended Purpose	Methodology	Level of Precision	Preparation Effort
Class A	High (completed working documents)	Compliance with effective project approval (budget)	Measured, priced, full detail quantities	High	High
Class B (Substantive)	Medium (completed design development)	Seeking effective project approval	Mainly measured, priced, detail quantities	Medium	Medium
Class C (Indicative)	Low (project plan)	Seeking preliminary project approval	Measured, priced, parameter quantities, where possible	Low	Low
Class D	Lowest (described solutions)	Screening of various alternative solutions	Various	Lowest	Lowest

Estimate Classes – An Explanation

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Estimate Attributes – Application Notes

Primary Attribute

Work Definition

The level of work definition is the primary determinant of an estimate's outcome, and it is the completeness of that information that determines the classification of the estimate. No estimate can be better than the information upon which it is based, nor can it make up for deficiencies in that information. Reasonable efforts should be made to ensure that the estimate does, in fact, make use of the full information set available, else the estimate must be classified at a lower level consistent with the actual level of information used.

While expressed within this text as project documents being a certain percentage such a determination can be subjective and difficult to assess.

Secondary Attributes

Intended Purpose

Each level (classification) of estimate is intended for a specific purpose within the approvals process. While higher level estimates can be used for lower level purposes the reverse is not the case.

Level of Precision

Described here in the relative terms, as Lowest, Low, Medium and High inherent levels of precision, the size of a project has a significant impact on any numerical measure of precision. Contrary to common belief Treasury Board has never attached a numerical level of precision to estimates, and with good reason. Such numerical measures when expressed as a percentage of project cost will vary inversely with project size.

Expressions of precision are also subjective. In addition to project size, consideration should also be given to the availability and/or quality of reference cost estimating data, the uniqueness and/or complexity of the project, and also the competency and skills of potential bidders.

In my view the term 'level of accuracy', while often used, is misleading. Accuracy is a function of both estimate precision and information variability. It also leads to the question "Measured against what?" which can provoke significant debate.

Past research into the results of competitive bids, received by PWGSC, has identified a major distinction between the behaviour of bid competitions for projects of less than \$1,000,000 and those above that mark. Two examples were chosen from that research as they are most typical of the size of projects undertaken by PWGSC.

Projects in the order of \$100,000

In this category the demonstrated range, about the mean bid, for 95% of all bids received, was $\pm 25\%$

Projects in the order of \$7,500,000.

In this category the demonstrated range, about the mean bid, for 95% of all bids received, was $\pm 4\%$

Application

Within the two major ranges (i.e. above and below \$1,000,000) projects of lesser value than the examples provided will exhibit a wider range of precision and vice-versa.

Remember these are the results of competitive bids based on complete drawings and specifications. If you should wish further detail on this research then examining the *Construction Economist* archives will show up a précis of a paper that I wrote and presented at the AACEI Annual General Meeting in Seattle in 1991.

Appropriate Preparation Methodology

Numerous estimate preparation methods are available, the choice of which depends primarily on the level of project definition available and to a far lesser extent on intended estimate purpose. Typically, for building construction projects, stochastic type estimates are relatively rare (except perhaps for some "order of magnitude" estimates). Deterministic, i.e. measured,

estimate types are the norm. Above all it is important to use an appropriate methodology that uses the all project information available, delivers an appropriate answer, and at a reasonable (affordable) level of effort.

Typical Level of Effort

The circumstances surrounding any project or estimate are extremely variable and as a result the necessary level of effort may also vary significantly for reasons other than project size.

NOTE: Regarding Class C Estimates – the description included relates to that estimate needed in support of a preliminary project approval submission i.e. a confirmation and second look at the Class D estimate. That second Class C estimate often prepared later, after project commencement and at completion of the formal project definition phase, will be a new estimate with additional information, and will entail a level of effort, approaching that required of a Class B estimate.

References

Treasury Board Manual

Chapter 2-1 Project Approval – 01-06-94

Appendix A – Requirements for Treasury Board Submissions Seeking Preliminary Project Approval; Appendix B – Requirements for Treasury Board Submissions Seeking Effective Project Approval; Appendix C – Requirements for Treasury Board Submissions Seeking Lease Project Approval; Appendix F – Project Brief; Appendix G – Use of Estimates in Treasury Board Submissions.

Chapter 2-2 Project Management – 01-06-94

Appendix D – Project Progress Reports and Databases for Project Management Guideline

Chapter 2-3 Management of Major Crown Projects (MCP) – 01-06-94

Appendix C – Submission of Requirements for MCP's

Glossary/Lexique – 01-06-94