GUIDELINES

for Procuring Consulting Engineering Services in Nova Scotia

Including

- Selection of Consulting Engineer
- Remuneration for Engineering Services

Published by:
Consulting Engineers of Nova Scotia (CENS)

and

Endorsed by:
Engineers Nova Scotia

FOREWORD

This Guideline has been prepared to assist both public and private sector clients in retaining consulting engineering services in the Province of Nova Scotia. It has been prepared by CENS and has been endorsed by Engineers Nova Scotia. It identifies the types of engineering services commonly provided, including:

- Consulting, advisory, investigative and pre-design services
- Project management services
- Detailed design services
- Contract administration and general review during project implementation
- Resident services during project implementation
- Services after project implementation
- Construction management services

These above services are described in detail in Appendix A – Divisions of Service.

Section 1 of this document outlines how to go about selecting professional engineering services, including identification of scope of proposed work and contract / agreements that can be used. Section 2 presents three methods by which fees are commonly determined. Because each method has distinct applications, it is not uncommon for more than one method to be used for different aspects of the same project. Section 3 deals with fees for special services and conditions. Section 4 deals with reimbursable expenses. Section 5 covers payments.

This Guideline provides a framework by which fees for engineering services can be established. The recommended fees are only suggested minimums. The fees are computed on the basis of providing fair remuneration to an engineer providing competent and responsible standard of care for professional services in accordance with standards appropriate for the service and protection of the public, while recognizing the costs associated with operating a business. The scope of services and the basis of fees are matters of contractual agreement between clients and engineers. This fee schedule is intended to assist in the process of developing a fair contractual arrangement.

This guideline is also available on the Engineers Nova Scotia website (***engineersnovascotia.ca***) and the CENS website (***cens.org***).

Figure 1 – Typical Breakdown of Project Lifecycle Costs

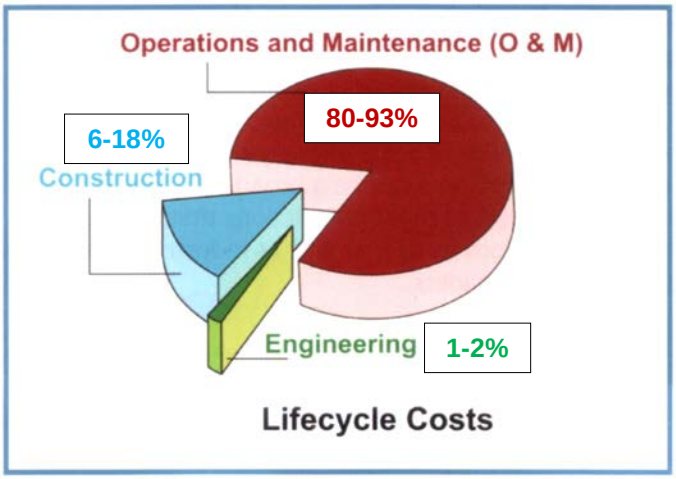


Figure 1 shows the total relative costs for design, construction and operations and maintenance over the life-cycle of the project. The Engineering component, while only in the range of 1% and 2% of total costs, has a significant influence on both construction costs and operations and maintenance costs, as well as the overall reliability of the project. Construction costs can range from 6% to 18% of the total investment. Operation and maintenance costs represent between 80%

and 93% of the total investment. The optimal design will determine the quality, longevity and efficiency of the project. ***Why "under invest" in the vital 1% to 2% of design costs?***

It should also be noted that the additional cost to the client for choosing the overall best technical proposal is the difference between it and the lowest price – a fraction of the 1-2% of the total investment. From a business perspective, CENS encourages the selection of the best technical proposal for any project. This will provide the greatest value to clients, both public and private sector.

Additional reasons for selecting the most qualified consultant, and/or the best technical proposal include:

- Studies have shown that selecting a consultant based on the lowest price results in extra costs during construction of approximately **10%**. The same studies show that selection of the best technical solution results in extra costs of **less than 5%**.
- Clients have noted that less staff monitoring time is required when the most qualified consultant is selected.

Consulting Engineers specialize in creativity, not commodities. Too often, public agencies select engineering services based heavily on price because it appears to their constituents that they are providing the most economical solution for their publicly-funded project. Analysis shows that projects awarded to the most qualified consultant will result in fewer additional costs during construction and lower operations and maintenance costs, much greater costs than the costs of the consulting engineer. The statement that explains this best is: ***when a client demands engineering services at a minimum price, they must expect the minimum effort to meet the project requirements.***

1.0 General

1.1 Selecting a Consulting Engineer

Selecting a consulting engineer is one of the most important project decisions a client makes. The success of any project is enhanced by the engagement of the best engineering expertise. Using Nova Scotia consulting engineers ensures that experience and expertise remains available for the long term benefit of clients in Nova Scotia.

Selection processes based on fee-based bidding procedures are usually not in the best interest of the project and may provide the engineer with insufficient funds to examine best solutions. This could result in construction and life-cycle costs far exceeding initial fee savings. A qualification-based selection process usually provides the best value-for-money approach for professional engineering services. The InfraGuide, National Guide to Sustainable Municipal Infrastructure publication S*electing a Professional Consultant* provides additional information on this subject. For information on implementation of the InfraGuide Best Practice, contact ACEC* at ***www.acec.ca***.

Normal qualification criteria used for consultant selection include:

- technical competence;
- managerial ability;
- experience on similar projects;
- qualified personnel available for the project's duration;
- proven performance;
- financial stability;
- location and/or local knowledge; and
- professional independence and integrity.

Engineers deal in creativity, not commodities, and therefore the selection process should reflect this. A client is often looking for an answer to a technical or design problem which has many possible engineering solutions. Caution must be exercised using a selection process which places a major emphasis on the lowest price.

InfraGuide Best Practice is a proven process for retaining the services of a consulting engineering firm. First, it involves selecting the best consulting engineering firm from a set of qualitative criteria and second, negotiating a fair engineering fee directly related to the scope of services required.

For all projects, the nature and scope of services required must be determined through:

- development of a detailed description of the proposed project (scope), its purposes and objectives;
- establishment of desired timetable;
- determination of budgets and construction cost estimates for all phases of the project; and
- identification of any special considerations.

** The Association of Consulting Engineers of Canada (ACEC) represents the private sector engineering companies in Canada. Consulting engineering is a $12 billion industry in Canada, with 30% of revenue coming from international work. The industry employs over 72,000 people.*

CENS recommends the following procedures for the appointment of a Consulting Engineering firm:

A. Direct Appointment: Many clients, through experience, develop a long-term "trusted advisor" business relationship with one, or more Consulting Engineering firms. Under this arrangement, CENS recommends direct appointment of the Client's preferred firm based on known qualifications. The following action steps are recommended:

1. Interview the candidate Consulting Engineer to confirm availability of personnel and to discuss the scope, schedule and budget of the project including the services required; and
2. Directly appoint the Consulting Engineering firm who the Client has determined is best suited for the project.

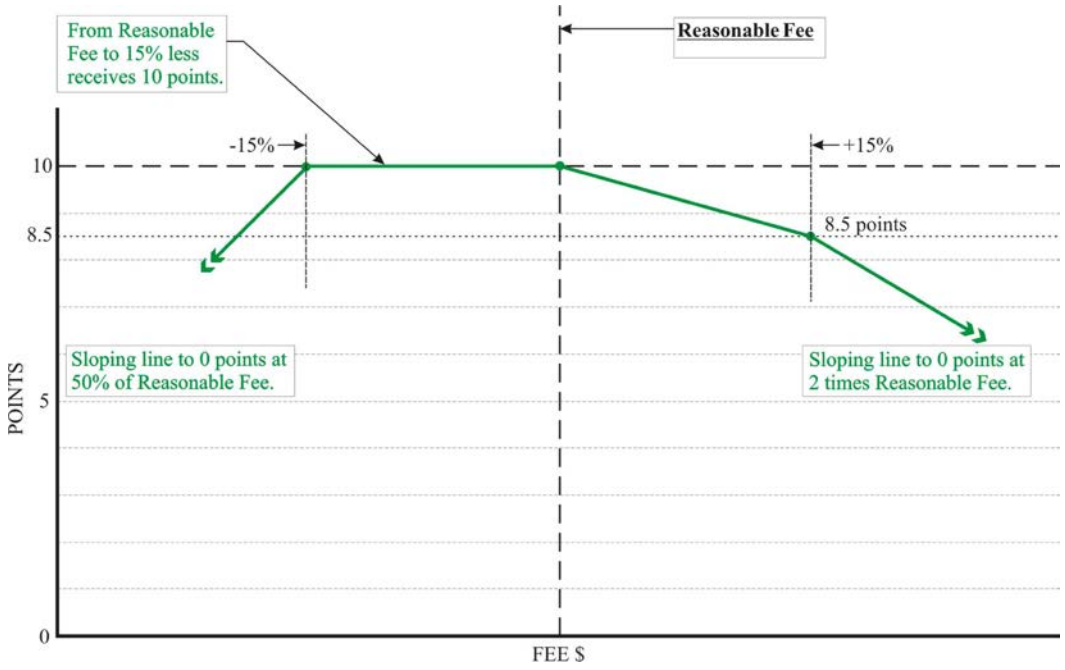
B. Formal Selection Process: Where an established working relationship does not exist, clients may wish to assess the capabilities of a number of firms before making a selection. In this case, CENS recommends the following Quality Based Selection (QBS) process:

1. Identify a number of candidate firms based on:
   - personal experience;
   - referrals;
   - reputation in the marketplace; and
   - industry directories (e.g. CENS, Engineers NS, ACEC).
2. Request confirmation from those identified of their interest in the project and an outline of their capability to provide the required services including:
   - a statement of interest in and a demonstrated understanding of the project;
   - evidence of the ability to do the work;
   - profiles of the firm's principals and staff who would be assigned to the project;
   - suitable references, including previous clients.
3. Verify references to confirm past performance.
4. Select a short list of 2-4 firms for further evaluation.
5. Interview each of the short-listed candidates to further examine their qualifications, meet the project team members and discuss the scope of the project and the services required. Identify expected / reasonable range of fees either based on previous experience or percentage of construction cost.
6. For projects where the client considers it necessary, written proposals may be requested in response to comprehensive and complete Terms of Reference. CENS recommends a briefing session between the short-listed consultants and the client prior to proposal preparation. Personal interviews/presentations should then follow the written submissions. Evaluate and rank the candidate firms the Client feels best suited for the project.
7. Select the highest ranked firm and:
   - Negotiate the final scope of services and level of effort required. By first agreeing on the scope of the project, the client can make clear the emphasis on factors such as environmental impact, cost, schedules, and social implications.
   - Negotiate a fair / reasonable fee and contract based on the most appropriate method of remuneration for the specific project. Fees established at this stage are fairer to both client and consultant because they are negotiated after the parameters of the work are fully defined.

- If primary negotiations are unsuccessful, begin negotiations with the second ranked Consulting Engineering firm.
- When an acceptable contract has been negotiated, notify the other candidates.
- A good client-consultant relationship is encouraged from the beginning of the QBS Best Practice process. Effective and frequent communication avoids adversarial situations and leads to successful projects.

1.2 Reasonable Fee

While neither CENS nor Engineers Nova Scotia recommend selecting a professional engineer based on fee alone, the identification of a "reasonable fee" should be undertaken, either based on a percent of estimated construction cost, or some average / mean / median of fees submitted for a project. Once a reasonable fee is identified, this can provide a benchmark for comparing and rating proposals as a final step in consultant selection. The following graph indicates a suggested means of comparison whereby fees in excess of the "reasonable fee" will be assigned reduced points based on the sliding scale shown. Fees lower than the reasonable fee and within 15% of the reasonable fee are suggested to offer no value to the client. Fees below 85% of the reasonable fee should, in fact, be considered detrimental to the project and a reduced number of points assigned.



Appendix A provides a method for determining reasonable fee based on a percentage of estimated construction cost for both building, and other than building (e.g., civil, municipal, industrial) projects.

1.3 Contracts and Agreements

Many clients/consultant agreements include no more than clear identification of: scope, schedule and budget. These three (3) components however, are a must, and need to be agreed upon and signed off by both client and consultant.

For a larger and complex project, a written contract such as the ACEC Document No. 31 (latest revision) should be used. ACEC also has other standard contracts available for project management, studies and reports or design-build projects. Professionals and clients contemplating changes to these agreements are advised to consult with legal counsel. Reference is made to the ACEC booklet, *Guidelines for Engineering Practice*, where the provisions of this Agreement are discussed in detail.

2.0 REMUNERATION FOR SERVICES

Most engineering projects result in construction and have long-term operational ramifications. Accordingly, the cost of engineering services is typically a small percentage of the full (life-cycle) cost of a project. The most cost-effective solution to a Client's needs will not usually result from minimum or lowest cost engineering services. Care should be taken, not only to select the best qualified Consulting Engineer, but also to agree upon a basis of fee that fully compensates for the services required.

Consulting Engineers perform services on a professional fee basis. The term "fee', as used in this publication, represents the total charges for engineering services, including all project expenses incurred by the Consulting Engineer. This Section outlines primary methods for determining a Consulting Engineer's fee. These methods are:

1. **Fee Basis A: Agreed Fixed Fee**
2. **Fee Basis B: Time and Expenses**
3. **Fee Basis C: Other**

Success in meeting the Client's overall project objective is of paramount concern. The determination of the Consulting Engineer's scope of services and associated fee is only one step in the process of project development; however, in many cases, this step will govern the remainder of the project. It is very important for all parties to reflect on the potential impact that the selected method of fee computation may have on the overall project. They should select a fee basis which would be beneficial to the project's objectives.

2.1 Fee Basis A: Agreed Fixed Fee

For those projects where a clearly defined scope of services is agreed to by a client and a Consulting Engineer, fees can reasonably be established as an Agreed Fixed Fee. In these cases, both the Client and the Consulting Engineer should be clear in the written agreement as to the scope of work and the extent and level of service to be provided. It is also recommended that the agreement provides for a method of payment for services that may be incurred beyond the limits of the agreement.

2.2 Fee Basis B: Time and Expenses

Time-based methods provide an opportunity to overcome the many uncertainties that often exist at the start of a project. The critical issue here is that, if the full scope of services cannot be established, it is nearly impossible to accurately estimate the cost of engineering services in advance of the start of the project. Similarly, the amount of time required to observe and review construction is largely in the control of the Contractor, not the Consulting Engineer. Accordingly, the type and quantity of services required may, and in many cases should, vary. Therefore, time and expenses-based fee methods are often appropriate.

Where time and expenses-based fees are used, it is important that the Consulting Engineer and the Client collaborate to control cost without jeopardizing the overall quality of the services provided. Prior approval of budget limitations by the Client is assumed. However, time-based fees are not compatible with a fixed upper financial limit.

The Following table outlines the generally accepted levels of responsibility including identification of levels of recommendations, decisions and commitments, and leadership authority and/or supervision exercised for each level.

Levels of Responsibility	Recommendations, Decisions and Commitments	Leadership Authority and/or Supervision Exercised
Level A	Few technical decisions called for and these will be of a routine nature with ample precedent or clearly defined procedures guidance.	May assign and check work of technicians or helpers
Level B	Decisions made are normally within established guidelines.	May give technical guidance to junior engineers or technicians, assigned to work on a common project.
Level C	Makes independent studies, analyses, interpretations and conclusions. Difficult, complex or unusual matters or decisions are usually referred to more senior authority	May give technical guidance to engineers of less standing, or technicians assigned to work on a common project. Supervision over other engineers not usually a regular or continuing responsibility
Level D	Recommendations reviewed for soundness of judgment but usually accepted as technically accurate and feasible	Assigns and outlines work; advises on technical problems; reviews work for technical accuracy, and adequacy. Supervision may call for recommendations concerning selection, training and discipline of staff.
Level E	Makes responsible decisions not usually subject to technical review. Takes courses of action necessary to expedite the successful accomplishment of assigned projects.	Outlines more difficult problems and methods of approach. Coordinates work programs and directs use of equipment and material. Generally makes recommendations as to the selection, training, discipline and remuneration of staff.
Level F	Makes responsible decisions on all matters, including the establishment of policies subject only to overall company policy and financial controls.	Reviews and evaluates technical work, selects, schedules and coordinates to attain program objectives; and/or as an administrator makes decisions concerning selection, training, rating, discipline and remuneration of staff.

2.3 Fee Basis C: Other Methods of Remuneration

In response to a changing marketplace and clients' needs for varied project delivery approaches, several other (innovative) alternatives and variations to the historical time-based or fixed fee bases are beginning to develop. Other methods being introduced to the industry include:

- Value-added–usually determined as a percentage of the projected or perceived project savings;
- Profit sharing–an agreed percentage of profits, either estimated or long-term actual;
- Equity participation–where the engineer participates financially in the project through contribution of services or direct investment;
- Performance-based–a two-tiered payment schedule to the engineer in the form of basic payment for design services, plus a bonus for predetermined tangible results.

Comments on the applicability, advantages and disadvantages of each of these innovative fee bases are presented in the following subsections. If any or all of these methods become more commonplace, CENS and Engineers Nova Scotia intends to provide more specific guidelines in future fee schedules.

2.3.1 Value-Added

This fee structure is best suited for predesign services but could be applied at any stage, if there is a clear basis for normal expectations, against which innovative approaches can be judged. It requires a good engineer/client relationship and is best suited to long-time "repeat" client projects. It has the potential to exceed the basic fee for detailed design services; for example, an engineer's innovative thinking before commencing basic design can introduce major value to the client in the form of significant project cost reductions. The fee is usually determined as a percentage of the projected, or perceived, project savings.

- Advantages–good potential for significant improvements on specialized assignments; encourages innovative thinking by engineers.
- Disadvantages–needs a method of agreeing on intangible gains over a base case; high financial risk for an engineer if unsuccessful.

2.3.2 Profit Sharing

This fee structure is appropriate for engineers who are in a position to adequately assess the risks associated with the project. It can be applied to first-time clients or repeat clients, and is simply calculated as an agreed percentage of profits, either estimated or long-term actual. It requires careful definition of what constitutes "profit" and the nature of the accounting process, to avoid later disputes.

- Advantages–encourages an increased engineering emphasis, for total project benefit; good potential for engineers with sufficient financial backing to engage in such business arrangements; develops good client/engineer relationships, since success depends on team/project results.
- Disadvantages–engineers require solid financial resources to finance operations during project design and construction; high financial risk for engineers, relating not only to personal performance but also to the calibre of project partners; remuneration depends on the performance of others on the team.

2.3.3 Equity Participation

This fee structure is very similar to profit sharing, except that engineers participate financially in the project, either through contribution of services or direct investment.

- Advantages–encourages an increased engineering emphasis for total project benefit; introduces and encourages entrepreneurship; good long-term potential if project is successful; develops good client/engineer relationships.
- Disadvantages–engineering firms generally do not have significant equity capital to participate in projects in this manner; engineers require venture capital resources for investment, as well as for

ongoing operations; high financial risk for engineers, because payment depends not only on personal performance, but also on the caliber of partners; payback period is long-term with increased chance of changing financial conditions.

2.3.4 Performance-Based

This fee structure involves a two-tiered payment schedule to the engineer, comprising basic payment for design services, plus a bonus for predetermined tangible results, e.g. completion ahead of schedule, shorter approval times, lower construction costs, lower operational and maintenance costs. In the same sense that bonuses are developed, penalties may also be applied. It differs from profit sharing/equity participation in that the entire remuneration does not necessarily depend on overall project success, but on meeting or exceeding defined goals and performance.

- Advantages–encourages clients to define performance priorities; significant profit potential for engineers in return for optimum performance; high incentive for engineers to achieve defined performance objectives; promotes innovative thinking by engineers.
- Disadvantages–tends to downgrade the basic fee in favour of increased bonus/penalty arrangements; requires predetermined goals to be accurately identified, to reduce future client/engineer disputes.

3.0 FEES FOR SPECIAL SERVICES AND CONDITIONS

For the special services and conditions outlined below, engineers and clients should mutually determine the appropriate fee basis to be used.

3.1 Extra Services

Services required beyond the agreed scope of assignment (regardless of the original basis of fee) should be negotiated Time Basis. If the extra work can be defined adequately, Fixed-Based Fees may be used.

3.2 Reuse of Drawings and Specifications

The design represented by drawings and specifications prepared and stamped under the supervision and control of an engineer is the engineer's responsibility. Fees for the use of the design by the original client, as described in this guideline, cover only one project. All plans, sketches, drawings, graphic representations and specifications prepared by the engineer are instruments of service for carrying out the project. The engineer retains copyright for such instruments of service, which may not be used for any other project without the engineer's written consent.

Time-Based Fees should be used for review of and any modifications to a design, to accommodate different conditions encountered on a second project.

Fees to cover professional responsibility resulting from second and subsequent reuse of a design should be the subject of negotiation for each reuse. Fixed-Based Fees should be used to reflect the complexity of the design and the exposure to risk that arises from its reuse. Fifty per cent of the fee is normally appropriate for the first reuse, 25 to 50 per cent for second and subsequent reuses.

3.3 Delays

There are circumstances where a delay, causing an increase in the cost of services provided, is beyond the engineer's control. Projects that are temporarily stopped and then recommenced should be subject to shutdown and start-up fees, which compensate the engineer for the drop in staff utilization and for the time required to reorient staff. Time-Based or Fixed Based Fees should be used.

3.4 Abandonment of Projects

If a project is abandoned or suspended through no fault of the engineer, the value of the engineer's service should be determined on the basis of the proportion of the services completed, making appropriate allowances for the cost resulting from the suspension.

3.5 Alternative Designs

Where clients request that engineers prepare alternative designs beyond the scope of the original assignment, the fee for all extra work required to prepare alternative designs should be on a Time Basis.

3.6 Negotiation of the Construction Contract

Where a client elects to negotiate a construction contract rather than call for tender, the extent of the service required on an engineer's part may be increased beyond the work required under basic services. In such cases, it is advisable for the client and the engineer to review the circumstances and objectives of the negotiations, and agree on the extent and basis of fee adjustment to be paid.

3.7 Separate Construction Contracts

Where clients, project managers or construction managers require separate construction contracts for a single project, engineers should be informed during the fee negotiations or at the request for proposal phase. Separate contracts, or "fast-tracking", require additional work from engineers. If this requirement

is not defined until after fees are agreed upon, the additional work should be outlined by the engineer, and Time-Based or Fixed-Based Fees applied to such additional work.

3.8 Final Drawings on Electronic Storage Media

Some clients require final drawings on electronic media for their records. This requirement should be identified during the fee negotiation stage, and included in the contract between the parties. If not, additional fees may be required to compensate engineers for changes or additions to the method of drawing production for the project, or for costs to generate drawing storage for a different operating system. Time-Based, Percentage of Construction Cost, or Fixed-Based Fees are appropriate once the requirement is defined.

4.0 REIMBURSABLE EXPENSES

Reimbursable expense items should be discussed and agreed upon when the agreement is being negotiated. Internal office, sundry expenses, communications and information technology costs can be recovered as a percentage of billings (normally around 5-10% of invoice amount). This precludes the need for detailed itemization. Some typical office expense items include, but are not necessarily limited to:

- communication expenses such as: phone, fax, email, etc.;
- routine photocopying and check prints;
- information technology equipment and software;
- routine mail and courier services; and
- sundry office equipment and supplies.

Project specific reimbursable expenses (not included in the 5-10% identified above) include, but are not necessarily limited to:

- reproduction of drawings, specifications and reports;
- travel expenses;
- accommodations and meals when travelling;
- project specific advertising expenses;
- use of other consultants (as approved by Clients);
- specialized, project-specific computer equipment and computer services;
- use of highly specialized equipment detailed in the agreement;
- chemical and physical tests;
- site office supplies, equipment and utilities;
- approvals, permits, licenses, and specific taxes applied to fees;
- additional professional liability insurance, if required by Clients;
- use of subcontractors (as approved by Client) to collect information for design purposes; and
- other expenses paid on Clients' behalf and not covered by the agreed fee;
- project specific, specialized design software.

Project specific expenses are chargeable to the Client at cost plus a small administrative charge. The administrative charge is to cover all overhead directly attributable to the expense.

5.0 PAYMENTS

5.1 Monthly Payments

The majority of engagements allow for monthly progress payments to the Consultant.

5.1.1 Fixed-Based Fees

Payment of fees, including reimbursable expenses, should be made within 30 days after receipt of engineers' invoices. The monthly fee should be prorated as agreed between engineers and clients, based on the amount of work completed.

5.1.2. Time-Based Fees

Payment of fees, including reimbursable expenses for services performed by engineers, should be made within 30 days after receipt of engineers' invoices.

5.1.3 Other Fee Basis

Payment of other (innovative) fees should be the subject of specific agreements between clients and engineers.

5.2 Payments Due When Rendered

Fees, including reimbursable expenses, should be paid within 30 days after receipt of engineers' invoices. Payment beyond this period may be subject to a monthly carrying charge. A charge of the prime rate plus 2 per cent per annum interest may be applied to overdue accounts.

5.3 Retainers

For some projects, retainer fees may be required and may not be refundable. Retainers establish the minimum payment under the contract, and are payable upon execution of agreements between clients and engineers.

5.4 The Engineer's Right to Stop Rendering Services

If an invoice submitted by the engineer remains unpaid by the client longer than the time specified in the contract between the engineer and the client (normally 60 days), the engineer may give notice to the client that the engineer will stop rendering services. The procedure by which the engineer stops rendering services should be defined in the agreement for engineering services between the engineer and the client.

6.0 REFERENCES

- InfraGuide Innovations and Best Practices – Selecting a Professional Consultant
- CENS Directory (2017 / 2018), Members, Fields of Practice and Services Offered
- Nova Scotia Government Procurement Process
- Guidelines for Design – Build Method of Construction, as published by CCA
- Draft Request for Proposals (Endorsed by Service Nova Scotia and Municipal Relations)

APPENDIX A – DIVISIONS OF SERVICE

The current scope of engineering practice encompasses both "traditional" services (including design, management and construction services) and "non-traditional", innovative services (e.g. computer software development, environmental studies and biotechnology/genetic engineering).

As the scope of engineering practice evolves over time, non-traditional services may eventually become viewed as traditional services, long-standing traditional services may no longer be deemed relevant, while new non-traditional services may be offered. Engineering services, whether traditional or non-traditional, may be categorized within seven divisions of service:

- Division 1 – Consulting, advisory, investigative and predesign services;
- Division 2 – Project management services;
- Division 3 – Detailed design services;
- Division 4 – Ongoing review and contract administration during project implementation;
- Division 5 – Services at site during project implementation;
- Division 6 – Services at site after project implementation;
- Division 7 – Construction management services.

Division 1–Consulting, Advisory, Investigative and Predesign Services

These services may include but are not limited to:

- expert testimony;
- appraisals and valuations;
- investigations and studies;
- rate structure and tariff studies;
- inspections, explorations, surveys, testing or other services for collecting, analyzing, evaluating and interpreting data and information, leading to specialized conclusions and recommendations;
- study of client's needs, analysis of conditions or methods of operation, development of alternative concepts, economic analyses, environmental studies, site location studies, and similar matters undertaken to establish sizes, capacities, locations, methods of operation and other principal features determining a proposed project's feasibility;
- value engineering at various project stages;
- development of preliminary design reports, including outline specifications, preliminary cost estimates, etc.;
- schematic design and design development for building projects; operation and maintenance plans; and emergency response/contingency plans.

Division 2–Project Management Services

Project management is intended to include comprehensive management of the entire project process. It involves mobilizing a design and project implementation team to plan, control, and implement all activities of a project from conception to completion, to meet the client's requirements of function, quality, schedule and budget. Project management services may include, but are not limited to:

- selecting consultants;
- conceptual economic feasibility studies;
- planning, scheduling, monitoring, and controlling;
- estimating, budgeting, and cash control;
- arranging financing;
- procurement;
- risk management;

- commissioning;
- quality assurance; and
- approvals and permitting.

Division 3–Detailed Design Services

These services are based on previously established project requirements, and comprise preparing engineering designs, drawings, specifications and contract documents. They may include, but are not limited to:

- preparing drawings, resolving detailed problems, selecting equipment and developing specifications;
- coordinating engineers and/or other design services groups;
- preparing detailed calculations, design drawings, specifications and contract documents;
- preparing, or collaborating with others responsible for preparing, estimates of the cost of the work;
- assisting and advising the client immediately preceding construction on tender call, evaluation and award;
- preparing performance specifications and designs for design/build projects; and
- designing software/systems.

Division 4–Contract Administration and General Review During Project Implementation

These services comprise administering the project implementation contract and providing engineering review during the project period (following the award of the contract). These services are distinct and separate from the services provided by resident field personnel and should not be considered as a substitute for resident engineering services on either conventional or design/build projects.

They may include, but are not limited to:

- advising the contractor or client on interpreting contract documents, and issuing supplementary details and instructions as required;
- reviewing shop drawings for general compliance with design requirements and contract documents;
- reviewing contractor's progress claims, including the validity of additions or deletions, and issuing progress certificates and change orders for the client's acceptance;
- periodically visiting the site to assess progress generally and the work's conformity with the contract documents;
- reporting to the client on the work's progress;
- arranging for and attending regular site meetings;
- carrying out final review at the conclusion of the construction contract, and issuing the substantial completion certificate; and
- periodically reviewing the record drawings kept by the contractor, and advising the client on their adequacy.

The services in Division 4 do not include directing the contractor's personnel in methods, scheduling, procedures, sequence of work, equipment selection, or job-site safety, except as may be specifically prescribed in the engineer's terms of reference.

Division 5–Resident Services During Project Construction

Services during project construction are considered to be "resident" when all office facilities required by staff at the site are provided by the client at no cost to the engineer, and when staff assigned by the engineer are on site full time for a continuous work period as agreed between the parties.

They may include, but are not limited to:

- providing reference surveys to the contractor, (not including surveys of legal property boundaries) and, where necessary, checking the contractor's surveys;
- determining that the contractor's work satisfies the intent of the design, and conforms to the plans and specifications;
- arranging for and/or carrying out all prescribed field testing and inspection of materials and equipment;
- investigating, reporting and advising on unusual circumstances that may arise during project implementation;
- carrying out final inspection at the conclusion of the project implementation contract, including any elements of commissioning agreed to as part of the client's acceptance program;
- maintaining sufficient data to outline current progress of the work; and
- certifying contractor's requests for payments regarding progress, quantities of work completed, materials delivered to the site, change orders, etc.

The services in Division 5 do not include directing the contractor's personnel in methods, scheduling, procedures, sequence of work, equipment selection or job site safety, except as may be specifically prescribed in the engineer's terms of reference.

Division 6–Services After Project Implementation

These services will vary according to the client's needs, and should be described in the scope of work. They may include, but are not limited to:

- commissioning and start-up assistance;
- preparing maintenance and operating manuals;
- determining deficiencies during the warranty period;
- preparing the final acceptance document at the end of the warranty period;
- assisting in facility management and/or operations after commissioning and start up; and
- providing record drawings.

Division 7–Construction Management Services

These services may include, but are not limited to:

- contract strategy, administration, and expediting;
- construction logistics, planning, scheduling and human resources forecasts;
- labour relations, safety;
- field office management, temporary facilities;
- materials receiving and warehousing;
- progress and trend monitoring and reporting; and
- cost performance, trend monitoring and claims processing.

Notes to Divisions of Service

1. Innovative engineering services refers to new engineering services that emerge to meet the evolving demands of society.
2. Value Engineering is a defined process that uses analysis of function, quality and cost to determine cost savings, efficiencies or quality improvements of a product (can be applicable to a commodity such as software or an automobile, or to construction projects). It can be implemented after a design is finished, however it is most effective if it is built into the entire design process.
3. Partnering is a management tool used in contracting that emphasizes the importance of trust, respect for others' goals and cooperation between all parties involved. It is used to diminish the adversarial environment of the contracting process and to aid in avoiding or minimizing disputes. This is accomplished by establishing a working relationship between the parties where a cooperatively developed formal charter committing to the ideals is signed by all participants. Acting as one project team, the parties adhere to the philosophies of the charter throughout the execution of the contract.
4. Many versions of design/build contracting methods exist. Contracting for services involves engineering the designer and builder in a single contract, from the concept to completion of the product. Applicability includes anything that can be described by performance specifications, and can cover such new fields as development of software, electronic equipment, and traditional construction projects.

APPENDIX B – Percentage of Estimated Construction Cost

General

This method for estimating fees may be used for projects where the engineering has been established over many similar projects, and where the scope of work is very well defined.

However, experience has shown that it is difficult to predict actual engineering costs accurately as a percentage of construction costs. For this reason, Percentage of Construction Cost methods should be applied only if the client and the engineer have agreed to a comprehensive outline of the project. This method may apply to parts of Division 1 – Consulting, Advisory, Investigative and Predesign Services, Division 2 – Project Management Services, Division 3 – Detailed Design Services and Division 4 – Contract Administration and General Review During Project Implementation services.

Percentage Fees

Percentage fee tables have been established by reviewing the engineering costs associated with various types of project, and establishing a percentage which, when multiplied by the construction cost, would provide fair and equitable compensation. These percentage tables will be adjusted periodically to reflect changes in the costs of construction and engineering, which do not change at the same rate. The percentages in the charts do not apply to work involved in:

- commissioning;
- preparing record drawings;
- preparing reinforcing bar schedules;
- translating contract documents;
- preparing environmental assessments and obtaining environmental approvals;
- preparing landscaping plans or zoning plans, opinions;
- preparing reports and documents related to approvals under the Planning Act;
- preparing reports and documents required for project financing;
- reimbursable expenses (see Section 5);
- undertaking topographic surveys, subsurface and special investigative surveys and/or exploration;
- preparing profiles and cross-sections required for design purposes and for tender quantities;
- preparing operating manuals;
- preparing maintenance manuals.

These additional services must be considered separately when establishing a percentage fee.

Building Projects

Engineers acting as prime consultants provide the usual services of structural, civil, mechanical and electrical engineers and of the architect, as well as coordinating all disciplines. Engineering services typically includes the following functions and approximate percentage breakdowns:

Division 1 – Consulting, Advisory, Investigative and Predesign Services, 25 per cent;
Division 3 – Detailed Design Services, 55 per cent;
Division 4 – Contract Administration and General Review During Project Implementation, 20 per cent.

(a) Subconsultants

When the prime consultant retains subconsultants for portions of the design, the fees for those services are usually between 75 per cent and 90 per cent of the prime consultant's fee for that portion of the design. This percentage depends on the complexity of the project, and will be paid out of the prime consultant's fee. The actual amount is determined by multiplying the above-noted percentage by the construction cost of the work designed by the subconsultant, including the proportional amount of the project overhead and profit.

(b) Calculation of Percentage Fee

The initial fee calculation is arrived at by identifying the appropriate building category, as found in subsection (c). The fees are computed by multiplying the cost of construction by the appropriate percentage. The final fees are normally based on the final construction costs, which include all changes to the original scope of work. During rapidly changing market conditions, or in the case of extended project delays, other mechanisms may be appropriate.

(c) Building Categories

Percentage of construction cost is determined by building category. Buildings not specifically listed in any of the categories belong in the building category to which they most closely relate.

Where a project involves more than one building type in separate or connected buildings, the total cost of construction is calculated for each building type, and the fee computed separately for each type under the appropriate category.

In the event of a substantial change in the degree of complexity of certain buildings, their classification should be modified jointly by the client and the prime consultant. Should disagreement arise on the classification of a given project, CENS/Engineers Nova Scotia may be able to advise on a proper classification by established building type.

Category 1: simple industrial buildings with large open areas.

Category 2: a) elementary and junior high schools;
b) multiresidential buildings;
c) repair and maintenance garages;
d) fire stations;
e) office buildings, excluding tenant improvements; and
f) shopping centres.

Category 3: a) owner-occupied offices and administration buildings, excluding tenant improvements;
b) high schools;
c) grandstands, stadia;
d) convention and exhibition buildings;
e) municipal and industrial plants of average or medium complexity;
f) institutional residences;
g) jails and correctional institutions;
h) homes for the aged;
i) railway and bus terminal buildings;
j) hangars, arenas;
k) parking buildings;
l) hotels; and
m) police stations.

Category 4: a) communications buildings;
b) TV and radio buildings;

c) computer centres & data centres;
d) theatres, museums, art galleries;
e) industrial plants of above-average complexity;
f) hospital buildings;
g) recreation buildings;
h) research buildings;
i) university and technical college buildings;
j) airport terminal buildings;
k) libraries; and
l) courthouse, city hall.

Engineering Projects Other Than Building Projects

Percentage of the Estimated Construction Cost can also be used for projects other than buildings (see below examples). For other divisions of service (Appendix A) and more complex engineering projects, Time-Based or Fixed-Based Fees are usually used.

Percentage fee agreements can apply to the following engineering projects in undeveloped areas where complexity is not introduced by existing structures:

- roads, highways and access roads;
- trunk and supply watermains;
- storm and sanitary sewers;
- sewer and water tunnels (non-pressurized);
- water, gas and oil distribution systems;
- street lighting;
- telephone lines;
- railroads;
- irrigation and drainage ditches;
- canals;
- conventional dikes, flood walls and retaining walls;
- parking lots (excluding traffic studies and parking layout);
- landing fields and associated aprons and taxi-ways;
- playgrounds, landscaping, grading and paving; and
- reservoirs.

These projects are more complex when undertaken in developed areas and fees should be adjusted upward accordingly.

Fees for Additional Services

(a) Changes During Progress of a Project

If a client wishes to change work that has already been approved; or revisions are required by changes to codes, laws or regulations after documents have been prepared; or revisions are due to other causes not solely within an engineer's control, and the engineer is required to provide additional services, the fees for these additional services should be based on hourly rates or as otherwise negotiated between the engineer and client.

(b) Specialist Consultants and Supplementary Services

Engineers should assist clients with selection of specialist consultants.

Where specialist consultants are engaged and paid directly by clients, clients should pay engineers supplementary coordination fees.

For any supplementary services provided by or through the engineer, the client and engineer should agree in advance on the extent of the services and on the method of payment.

Construction Cost for the Purpose of Calculating Fees

Construction cost of the work means the contract price(s) of all elements of the project designed or specified by, or on behalf of, the engineer, including the general contractor's overheads and profits, and all applicable taxes (whether recoverable or not), except the HST.

Where there is no contract price for any part of the project, the construction cost should be the estimated cost at current market rates, as determined by the engineer.

Construction cost does not include the engineer's compensation or the compensation of the engineer's consultants, the cost of land, or other costs that are solely the client's responsibility.

Construction cost does not include the cost of machinery or equipment related to the specific use of a building, such as machinery or equipment required for production, manufacturing, treatment or processing, where the engineer is not required to design, specify or coordinate its installation.

In the event that labour and/or materials are furnished by the client below market cost, or when old materials are reused, construction cost for the purposes of establishing the fee should be calculated as if the necessary materials and labour to complete the work are new or paid at existing market rates.

The fee paid to the construction manager should be considered part of the cost of the project, and as such should be included in the construction cost for calculating the engineer's fee.

When a lump-sum construction contract is replaced by another form of contract, such as construction management or sequential tendering under the guidance of a construction manager, the percentages shown in the tables should be negotiated and increased to compensate for the additional work.

APPENDIX C – PAYROLL COST & FACTOR

In determining flat rates required to maintain viability of consulting offices, payroll cost and factors are fundamental. Following is a brief description of what goes into determining payroll costs and factors.

Payroll cost

The payroll cost is the sum of the individual's annual salary and employee benefits, divided by annual working hours. The employee benefit portion is a percentage of salary added to cover the employer's share of such employee benefits as, but not limited to: dental, health and medical benefits; professional liability insurance; group life and disability insurance; the direct-cost component of professional development training; legislated severance pay; company and Canada pensions; Workplace Health and Safety Insurance, payroll taxes and Employment Insurance; it excludes bonuses and profit sharing. Annual working hours are defined as 1650 working hours a year. This is calculated by deducting hours for vacations, statutory holidays, sick time and professional development from a 1950-hour work year. This is based on 52, five-day weeks and a 7.5-hour work year. Alternatively, annual working hours can be defined as "working hours per week x 52 x 0.85".

Payroll factor

The payroll factor covers overhead costs and profit. Overhead costs relate to a business' general operation and maintenance, including the cost of office accommodation, furnishings and equipment, including computer equipment, errors and omissions insurance, marketing/proposals, bank charges, employee training, write-offs/bad debts, and various & sundry operating costs. The payroll factor is normally 2.75 to 3.25, but can be lower for full-time assignments longer than six months' duration.

Confidentiality

Government regulations prevent consulting firms from publishing or disclosing information which will allow for determination of individual's salaries. Most firms therefore assign staff to specific technical and professional levels within which a range of salaries may exist. Clients will then be invoiced based on a category/level of service as opposed to payroll cost/factor.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