

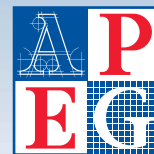
BUDGET GUIDELINES FOR CONSULTING ENGINEERING SERVICES



2009



ASSOCIATION OF CONSULTING
ENGINEERING COMPANIES
BRITISH COLUMBIA



Professional Engineers
and Geoscientists of BC
www.apeg.bc.ca

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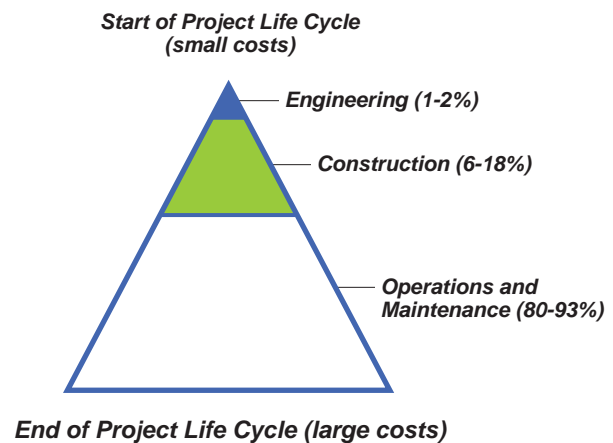
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Foreword

The success of any project depends upon obtaining the most suitable engineering expertise. Selection of the most qualified firm for a specific project will result in a well-planned and designed, economical and successful project. Selecting a consulting engineer is, therefore, one of the most important decisions a client makes.

“It is unwise to pay too much, but it is worse to pay too little. When you pay too little, you sometimes lose everything because the thing you bought was incapable of doing the thing you bought it to do”

**John Ruskin (1819-1900),
Author and Scientist, Oxford University**



The Consulting Engineer is a Professional Engineer in private practice who offers services to the public and private sectors.

Association of Consulting Engineering Companies - British Columbia (ACEC British Columbia) is British Columbia’s provincial association of consulting firms that provide engineering and technology-based services. Recognized as the voice of the consulting engineering business in British Columbia, its member firms are respected for the value of their contributions to society. ACEC British Columbia is called upon by all sectors of society to provide strategic advice on public policy matters and social welfare relating to engineering infrastructure and other technical matters. Member firms are full participants in the activities of ACEC British Columbia and provide their services on the basis of quality, value and fairness to all.

The Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) is the registering and regulatory body for two professions: engineering and geoscience. The Association’s primary duties are to uphold and protect the public interest respecting the practices of professional engineering and professional geoscience; to exercise its powers and functions, and perform its duties, under the *Engineers’ and Geoscientists’ Act*; and to enforce the Act.

A: Basis for Remuneration

1. Purpose of this Document

This document provides a guide for establishing fee budgets for traditional engineering projects in British Columbia. This is both a ACEC British Columbia and an APEGBC document. Its purpose is to provide fee budgets which should normally be appropriate compensation for:

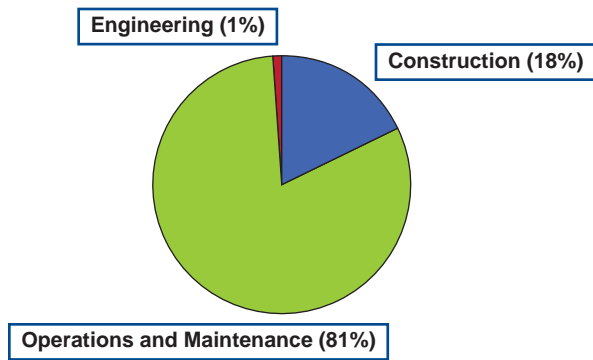
- the professional work required to meet the necessary standards of engineering care and quality;
- the professional's obligations under the *Engineers and Geoscientists Act* and By-laws; and
- continuing professional development and skills training

The fee budgets identified in this document reflect the level of service professional engineers must provide to meet the standard of care identified in the APEGBC practice guidelines. These practice guidelines are available on the APEGBC website (www.apeg.bc.ca). The guidelines identify the level of effort, standard of care and due diligence a member must provide to fulfill their professional obligation under the *Engineers and Geoscientists Act*, By-laws and Code of Ethics.

Additionally, this document is intended to guide the development of adequate budgets that enhance the creation of sustainable, value added engineering services. Sustainability and providing long-term value for stakeholders is only achieved through proper planning and engineering of the entire project lifecycle. Decisions made during the planning and design phases not only determine whether or not the project delivers the intended service to satisfy the original need, but will also directly affect the entire service life — and hence cost — of the project. Reducing investment at the design stage can result in significantly higher capital, operating and maintenance costs throughout the life of the project.

Both engineers and geoscientists may use this document, since the concepts are generally relevant to both professions providing professional services on engineering and environmental projects. Aspects of this document may also be a useful reference for professional geoscientists providing services in a wide range of other fields.

2. Selection and Appointment of a Consulting Engineer



A successful project is one which meets the requirements of the client at the lowest sustainable project lifecycle cost. Lifecycle cost must be understood within a meaningful context.

The long term operation and maintenance of infrastructure or building assets costs are in the order of 80 to 93 percent of the asset's life time costs. At 1 to 2 percent of total costs, the cost of engineering is a relatively small percentage. However, the role of the engineer is pivotal in meeting the client's objectives because it is during the

design process that construction, operations and maintenance cost savings are most easily achieved. Selecting engineering services for the apparent least cost is often false economy, and can be a disservice to the project and the Client.

ACEC British Columbia and APEGBC recommend a Qualifications-Based Selection (QBS) process for selecting the most competent and qualified consultant for a specific project. When the consultant with the best understanding of the project and best qualifications to implement it is appointed, their role becomes one of a "trusted advisor", who shares their client's priorities and interest in achieving the best outcomes for the project.

The QBS selection process is outlined in the InfraGuide's *Best Practice for Selecting a Professional Consultant* on ACEC British Columbia's web site at www.acec-bc.ca. This process is supported by the Federation of Canadian Municipalities, and is also available from their web site at www.fcm.ca.

ACEC British Columbia and APEGBC recommend appointing a consulting engineer using a formal agreement that protects the rights of the client and the consultant, identifies the scope of the project, and lays out the terms and rules of engagement. The complexity of the agreement depends on the size, complexity, risk, duration and other aspects of the assignment, such as site characteristics.

A simple project may require only a simple agreement while a large project will require documentation reviewed by legal counsel. Standard consulting agreements are available in British Columbia. Two that are endorsed by ACEC British Columbia and APEGBC and a variety of client organizations include:

- Association of Consulting Engineering Companies - Canada (ACEC) – *Document 31, Engineering Agreement between Client and Engineer*
- Master Municipal Contract Documents (MMCD) – *Client/Consultant Agreement*

3. Quality Assurance and Field Reviews

Consulting Engineers who work in British Columbia must be registered with APEGBC. APEGBC's By-laws require that all professional engineers must establish quality management processes for their practices which include, as a minimum:

- retention of all design and review files for their projects for a minimum period of 10 years;
- in-house checks of their designs as a standard procedure;
- concept reviews of their structural engineering designs by members not originally involved in the design; and
- field reviews of their projects during construction.

Quality control services are a necessary part of the consulting engineer's scope of work and must be provided for in fee arrangements.

For building projects, both the BC Building Code and the National Building Code mandate that registered professionals, who include professional engineers and geoscientists, take responsibility for design and field reviews through completing and submitting various schedules stipulated in the codes.

Each registered professional is required to attest that the project complies with these codes and that there have been sufficient field reviews for the registered professional to be able to state that it substantially complies with the design documents. Registered professionals in each discipline must be provided with the opportunity to carry out field reviews for the items for which they have responsibility.¹ For all fields of engineering, the process entails providing a full range of services throughout the project.

Involving one consulting engineer on all categories of services of the project is encouraged. Specifically with respect to field review services, for the purposes of continuity of understanding, responsibility, accountability, coordination and ease of administration, it is desirable that the design and field review responsibility be undertaken by the same professional engineer.

Both ACEC British Columbia and APEGBC discourage the practice of hiring consulting engineers for only one category of service of the project and engaging other engineers – either internal or external – to complete other categories of service of the project. An example of this practice is when a client engages different engineering resources to undertake initial planning and design, construction administration and field review activities.

¹Please refer to the latest applicable code for the full requirements.

4. Typical Services Offered by Consulting Engineers

Establishing fee budgets is highly specific to a project, site, time and circumstances. Tables 1A – *Categories of Service Offered by Consulting Engineers for Building Projects* and 1B – *Categories of Service Offered by Consulting Engineers for Transportation and Infrastructure Projects* provide a checklist of typical services offered by consulting engineers.

The nature of the individual project determines the scope of the required services and the necessary form of agreement. Projects of higher complexity, in particular those with complex geotechnical and environmental components, require a higher level of service and subsequently higher fees. A suitable engineering fee budget is based on a well defined scope or work program and clearly defined parameters.

5. Methods of Remuneration

Engineering fee budgets for a project can be based on one or more of the three following methods of calculation:

- Method 1 – Time Basis
- Method 2 – Percentage Cost of Construction
- Method 3 – Fixed Fee or Lump Sum

The method selected depends largely on the stage of the project, its complexity, and how well it is defined. The following Schedule shows the preferred method of remuneration associated with the category of service described in Tables 1A (pages 16 and 17) and 1B (pages 18 and 19).

Schedule of Preferred Method of Remuneration for Building Engineering

Category of Service	Building Engineering
1. Advisory	Time Basis
2. Preliminary Design	Time Basis
3. Design Development and Contract Documents – Final Design	Fixed Fee or % of Cost of Construction
4. Tender Services	Fixed Fee or % of Cost of Construction
5. Construction	Fixed Fee or % of Cost of Construction
6. Resident Engineering Services	Time Basis
7. Project Management Services	Time Basis
8. Construction Management	Time Basis

The following Schedule shows the preferred method of remuneration associated with the category of service described in Tables 1A (pages 16 and 17) and 1B (pages 18 and 19).

Schedule of Preferred Method of Remuneration for Transportation and Infrastructure Engineering

Category of Service	Building Engineering
1. Advisory	Time Basis
2. Preliminary Design	Time Basis
3. Final Design and Tendering	Fixed Fee or % of Cost of Construction
4. Construction	Fixed Fee or % of Cost of Construction
5. Resident Engineering	Time Basis
6. Project Management	Time Basis
7. Construction Management	Time Basis

Disbursements are not included in the above tables and should be determined as outlined in ACEC British Columbia's *Fee Guideline* document. This is found on ACEC British Columbia's website at www.acec-bc.ca.

The accuracy of capital cost estimates can vary and are classified as being Class A, B, C or D. Information regarding the definition of these classes is provided in Appendix A.

a) Method 1 – Time Basis

ACEC British Columbia and APEGBC recommend using the Time Basis method when the scope of engineering services is difficult to determine, cannot be determined, is not well defined, or when the consultant is not in total control of the required time and disbursements at any stage of the project.

All time expended on the assignment is billable, including travel, time in the consulting engineer's office and time on the client's premises or elsewhere. This billable time also applies to technical and clerical services including, but not limited to, scheduling, and clerical staff engaged in producing correspondence and documents such as reports and specifications.

The consultant can be expected to closely monitor progress and provide regular status reports on the project.

A variation to the Time Basis method is to include an "upset limit" on the time-related fee budgets. To develop the "upset limit", assumptions are made based on very little information. ACEC British Columbia and APEGBC discourage the use of "upset limits", as it does not promote optimal solutions because it results in the consultant defining tasks prior to proper planning and prior to a clear definition of the project. In addition, the method leads to the consultant closely monitoring changes to their originally-defined scope, which can promote an adversarial relationship with the client.

Time Basis method fees should be invoiced in accordance with the current ACEC British Columbia *Consulting Engineers Fee Guidelines*.

Special Expertise

Fees for senior personnel rendering specialized or expert service or testimony for which they are eminently qualified should be twice the hourly rates.

Salary Adjustments

Salary adjustments during the life of a project are normally reflected in adjustments to charge out rates unless noted otherwise by agreement.

b) Method 2 – Percentage of Cost of Construction

Fee based on the percentage of Cost of Construction may be suitable for engineering services where the cost of the consulting engineering service is a function of the construction or installation costs, and where the project scope and construction or installation budgets are well defined. Where the cost of construction for an individual discipline within an overall project is under \$1,000,000 methods other than Method 2 should be used for those components.

Client Agreements should clearly define whether the cost of construction is based on an estimate established at commencement of a project or on the completed actual construction cost.

Fees for full time resident engineering are in addition to fees determined under Method 2. For full time resident engineering, Method 1 – Time Basis is recommended.

Tables 2 through 5 are the recommended tables for determining the fee budget as a percentage of the cost of construction. Section B – *Remuneration for Building Engineering Services* and Section C – *Remuneration for Transportation and Infrastructure Engineering Services* describe in more detail the use of these tables for each of the sections.

Cost of Construction for Engineering Projects

The cost of construction includes the following:

- The total cost of all materials, equipment and labour (including duty, taxes, grants-in-aid and subcontractors' and general contractors' overhead and profit) necessary to complete the work for which the consulting engineer prepares drawings and specifications or for which the consulting engineer is responsible to the client.
- In the event that the client furnishes material, equipment, services or other labour that is incorporated in the work, the cost of construction includes the fair market value of those materials or equipment as if newly purchased. In addition, the cost of construction includes the current prices of labour or other services at the time of construction. In the event construction does not proceed, market prices at the estimated time of construction shall prevail.
- In the event that the client or contractor furnishes used material or equipment at the client's request, the cost of construction includes the fair market value of those materials or equipment as if newly purchased.

Fee budgets are based on the cost of construction including all extras to the construction contract. No deduction may be made from the consulting engineer's fee because of penalties or damages claimed by the client from the contractor or other sums withheld from the contractor. The cost of construction does not include professional fees and reimbursements payable to the consulting engineer.

c) Method 3– Fixed Fee or Lump Sum Contract

A Fixed Fee or Lump Sum Contract is suitable if the scope and schedule of the project are sufficiently defined to allow the consulting engineer to accurately estimate the effort required. This type of contract is frequently developed from time-based projections or specific service requirements for particular tasks. It is also often derived from the appropriate percentage fee method. Disbursements may or may not be included in the lump sum.

This method provides cost certainty for clients, and encourages innovation and efficiency by the consultant.

6. Disbursements, Special Conditions and Taxes

Disbursements

Unless otherwise agreed between the consulting engineer and the client and properly reflected in the fee, separate charges are made for disbursements borne by the consulting engineer. Disbursements shall be in accordance with the Consulting Engineers Fee Guideline published by ACEC British Columbia.

Disbursements are not included in the percentage fees in Tables 2 through 5 and are to be charged in addition to those fees calculated.

Assurance of Professional Design and Field Review

Consulting engineers undertaking building design services are required to provide professional designs and field reviews stipulated by the British Columbia Building Code and/or Municipal Building By-laws. The consulting engineer shall submit the necessary letters for the requirements of assurance of professional designs and field reviews as part of the basic services.

Ownership of Drawings and Copyright

The parameters of this document are based on the ownership and copyright of all engineering drawings, specifications and other documentation remaining with the consulting engineer. Ownership is frequently confused with copyright. Ownership of the drawings is governed by the agreement, while copyright is the ownership of the idea embodied in the drawings and the right to reproduce that idea. Drawings, specifications and other documents are instruments of service for the execution of the project. The client's right to the use of the documents is contingent upon the payment of the engineer's fee.

This process is further explained on ACEC British Columbia's website at www.acec-bc.ca in the document *Intellectual Property Guidelines*.

Taxes

Any and all federal and provincial taxes, recoverable or not by the client, are additional and are also applicable to both fees and disbursements.

Professional Liability Insurance

APEGBC has By-laws that professional engineers are required to follow. APEGBC recommends that consulting engineers carry professional liability insurance. Should a client require the consulting engineer to carry additional coverage, this would be at the client's cost, as a disbursement. Alternatively, the client may carry a single project-specific professional liability policy.

7. Risk Shared Consulting Assignments

Risk-shared consulting assignments include alternate delivery arrangements such as Design Build or Public Private Partnership (P3) processes.

Undertaking the necessary design work to assist with proposal preparation within a Design Build or P3 project involves a significant level of effort and risk on the part of the consultant. For that reason the consultant should be provided full remuneration for those services.

B: Remuneration for Building Engineering Services

Method 1: Time Basis

This method may be used for all categories of service in Table 1A, on pages 16 and 17. This method is described in detail in Section A on page 5.

Method 2: Percentage of Cost of Construction

This method is described in detail in Section A5(b) on page 6. Method 1 – Time Basis, should be used for additional services listed in Table 1A on pages 16 and 17.

Table 2 on pages 20 and 21 contains a minimum net percentage fee scale for basic engineering services (defined on Table 1A) for new building construction by building types and categories. Basic Services are those included in the fee tables. Additional Services are those services which are negotiated separately and are not included in the fee tables. Table 3 on page 22 provides an index of building types and categories. As shown on Table 1A this method is suitable for category 3: Design Development and Contract Documents – Final Design, category 4: Tender Services and category 5: Construction Related Services. Disbursements are charged in addition to the fee budgets charged in the tables.

ACEC British Columbia and APEGBC recommend the following schedule for the purposes of staged payments and for establishing the fee budget represented by each category.

Category	Description	Not Less Than	Cumulative Total
Category 3	Design Development	30%	30%
Category 3	Contract Documents	45%	75%
Category 4	Tender Call Services	5%	80%
Category 5	Construction Related Services	20%	100%

The cost of construction is defined in Section A on page 6. The following is a more detailed description of construction items related to building engineering services which are to be included in the cost of construction for a building.

Items Specific to Structural, Mechanical and Electrical Cost of Construction

Structural

- Site preloading for structures
- Structural steel, including supply, fabrication, erection and painting by structural steel contractor
- Open web steel joist with bridging, welding and bracing
- Steel floor or roof deck
- Reinforced concrete, including reinforcing steel, forms, shoring, stripping, finishing, heating and protection, expansion joints, etc.
- Plain concrete or block foundation and basement walls, including footings
- Slabs over steel joist and steel floor and roof decks, including metal pan or other forms and reinforcing
- Asbestos, gypsum and other structural units for room and flooring decking
- Foundation piling (timber, steel or concrete), including pile caps and timber, steel or concrete sheet piling
- Laminated T and G or splined structural timber roof deck and floors
- Structural timber joist, beams, girders, trusses and columns
- Structural glulam, plywood and built-up members
- Steel or cast iron hardware with bolts, washers, etc for timber or precast concrete framing
- Cast iron and aluminum structural members
- Window, door or curtain-wall framing that has to be designed or checked for structural adequacy
- Brick or concrete masonry reinforced similar to concrete
- Underpinning, including excavation for same
- Concrete floors on earth
- Excavation and backfilling for structural work
- A portion of all masonry-bearing walls
- Steel, precast, poured or placed concrete and reinforced block lintels
- Masonry chimneys
- A portion of all exterior wall framing, including timber and steel studs that have to be designed or checked for structural adequacy
- Site shoring, including related excavation and backfill
- Cladding, including precast panels, brick panels, insulated or built-up metal panels or other, that has to be designed or checked for structural adequacy, including all related connections
- Mechanical and electrical equipment supports that have to be designed or checked for structural adequacy
- Precast concrete structures, including supply, fabrication, erection and finishes by structural precast fabricator
- Any other special structural items shown and detailed

Mechanical

- Basic categories of mechanical work, including plumbing, heating, ventilation and sheet metal, refrigeration, HVAC controls, fire protection, insulation, medical gas, compressed air and all standard items associated with these categories
- Cost of fair new market value of all mechanical equipment supplied by the client
- Equipment specified or provided by others, such as lubrication systems, air, etc, for which the mechanical consultant has provided services
- All excavation and backfill pertaining to mechanical work
- Specialized mechanical systems such as rain water collection and storage, grey and black water systems, alternate energy systems, etc.
- Integrated assemblies including patient service modules containing medical gases.
- Cost of all installation carried out by the municipality or by utility companies when designed and inspected by the mechanical consultant
- Weeping subsoil tile systems designed by the mechanical consultant
- All plain and reinforced concrete in place and structural steel pertaining to mechanical work that is not designed by the structural consultant
- Cost of architectural grilles, diffusers, louvers, etc. when specified by mechanical consultant.
- Cost of documentation, testing, balancing and commissioning when specified by the mechanical consultant

Electrical

- Basic categories of electrical work, including normal and emergency power distribution, lighting, communication distribution and interfacing, security systems, life safety systems, audio and video systems, electric heating, specialized grounding systems and all standard items associated with these categories
- Cost of fair new market value of all electrical equipment supplied by the client; eg., lighting fixtures and lamps, lighting standards, transformers, motor control, switch gear and standby power plants
- Integrated assemblies, including patient service modules containing electrical outlets, lighting and communication systems
- Scoreboards for sports facilities
- All excavation and backfill pertaining to electrical construction
- Cost of all installation carried out by the municipality or by utility companies when the work has been designed and/or inspected by the electrical consultant
- All plain and reinforced concrete in place and structural steel pertaining to electrical work that is not designed by the structural consultant
- Cost of all documentation, testing, adjusting and commissioning when specified by the electrical consultant

Note on GST and Other Value-Added Taxes

Before the introduction of the Goods and Services Tax (GST), manufacturers' and federal sales taxes were included in the costs of materials paid by contractors and clients and were therefore included in the cost of construction as defined above. Since the introduction of the GST, taxes payable have been identified separately from the net construction cost but remain an integral component of project costs. For this reason, the recommended fee budgets assume the inclusion of GST or similar value added taxes in the cost of construction.

Where a client wishes to base percentage of cost of construction fees on construction cost before taxes, a proportional increase in the fees quoted is necessary.

Method 3: Fixed Fee or Lump Sum Contract

Method 3 is described in Section A on page 7.

C: Remuneration for Transportation and Infrastructure Engineering Services

Method 1: Time Basis

This method may be used for all categories of service in Table 1B located on pages 18 and 19. This method is described in detail in Section A on page 5.

Method 2: Percentage of Cost of Construction

Tables 4 and 5 on pages 23 and 24 provide the minimum net percentage fee scale for Basic Services (defined on Table 1B) services for Transportation and Infrastructure Projects. This method is suitable for the Basic Services outlined in Category 3: Final Design and Category 4: Tender Services as shown on Table 1B on pages 18 and 19. CADD fees have been factored into Tables 4 and 5. Disbursements are to be charged in addition to the fees outlined in the tables.

Method 1, Time Basis, should be used for services other than Basic Services listed in Table 1B on pages 18 and 19.

The cost of construction is defined in Section A on page 7.

Method 3: Fixed Fee or Lump Sum

Method 3 is described in Section A on page 7.

Tables and Appendices

TABLE 1A
CATEGORIES OF SERVICE OFFERED BY CONSULTING ENGINEERS FOR BUILDING PROJECTS

■ Basic Services ○ Additional Services

1. ADVISORY SERVICES	2. PRELIMINARY DESIGN SERVICES	3. DESIGN DEVELOPMENT AND CONTRACT DOCUMENTS – FINAL DESIGN	4. TENDER SERVICES
<ul style="list-style-type: none"> ○ Preparation or review of engineering program ○ Expert testimony ○ Appraisals, valuations, studies, reports ○ Feasibility analysis ○ Accident investigations ○ Preliminary concept sketch ○ Preliminary specification notes ○ Development of work estimate ○ Litigation/ Claims/ Insurance assistance ○ Detailed analysis of owning and operating costs ○ Special grants and loans ○ Translation and interpretation ○ Project management scheduling assistance ○ Assistance in preparing purchase enquiries ○ Value engineering ○ Quality assurance 	<ul style="list-style-type: none"> ○ Scope of project ○ Statement of probable cost ○ Preliminary design reports, alternative conceptual proposals, sketches, schematics, specifications ○ Scheduling ○ Documents for financing ○ Investigative surveys, geotechnical ○ Permits and licences ○ Environmental assessments ○ Revision of existing designs ○ Lifecycle costing ○ Detailed cost estimates ○ Engineering surveys, profiles and cross-sections ○ Sustainability Studies ○ Energy and other forms of modelling services ○ Sustainability cherettes ○ Quality assurance 	<ul style="list-style-type: none"> ■ Detailed design ■ Working drawings ■ Specifications and tender documents ■ Statement of probable cost ■ Letters of Assurance, Schedule B (Building Code) ○ Detailed cost estimates ○ Reinforcing bar schedules ○ Design and documentation not in contract ○ Provision for Client supplied equipment not in contract ○ Demolition documents ○ Tenant improvements ○ Fast-track construction or sequential tendering ○ Preparation of shop drawings ○ Environmental design ○ Quality assurance ○ Energy and other forms of modelling services ○ LEED® Documentation 	<ul style="list-style-type: none"> ■ Preparing Tender Call Documents ■ Reviewing tenders submitted and advising ○ Alternative conceptual proposals ○ Prequalification of contractors ○ Coordinating other consultants' documents ○ Non-tender construction contracts ○ Bills, materials, detailed cost estimates ○ Tender advertisement

When remuneration Method 2 – Percentage of Cost of Construction is used, the services indicated ■ Basic Services for categories 3, 4 and 5 and should be used as part of the percentage fee to be used with Tables 2 and 3. Services indicated ○ are considered Additional Services.

TABLE 1A (continued)
CATEGORIES OF SERVICE OFFERED BY CONSULTING ENGINEERS FOR BUILDING PROJECTS

■ Basic Services ○ Additional Services

5. CONSTRUCTION RELATED SERVICES	6. RESIDENT ENGINEERING SERVICES	7. PROJECT MANAGEMENT SERVICES	8. CONSTRUCTION MANAGEMENT SERVICES
<ul style="list-style-type: none"> ■ Assisting in the preparation of contract ■ Review of shop drawings ■ Field review ■ Progress review ■ Quality assurance ■ Testing monitoring ■ Change order costing ■ Document interpretation ■ Payment recommendation ■ Substantial performance review ■ Advising Client and contractor of continuing or newly observed defects or deficiencies ■ Letters of assurance, Schedule C (Building Code) ■ Year end warranty review ○ System start-up and documentation ○ Post-warranty period follow-up ○ Fast-track construction or sequential tendering ○ Maintenance manuals and drawings ○ Certification and testing of systems ○ Commissioning/training ○ Environmental monitoring ○ Record drawings ○ Contract Administration ○ Quality Assurance ○ Commissioning ○ LEED® Documentation and Certification Services ○ LEED® Compliance Energy Model 	<ul style="list-style-type: none"> ○ Supplying resident staff on the project to determine if the contractor is carrying out his work in general conformance with the contract documents. ○ Quality Assurance 	<ul style="list-style-type: none"> ○ Consultant selection ○ Conceptual studies ○ Economic feasibility ○ Planning/ scheduling/ monitoring and controlling ○ Estimating/ budgeting and cost control ○ Arranging financing ○ Procurement ○ Risk management ○ Commissioning ○ Quality assurance 	<ul style="list-style-type: none"> ○ Contract strategy, administration and expediting ○ Construction logistics, planning, scheduling and manpower forecasts ○ Labour relations, safety ○ Field office management, temporary facilities ○ Materials receiving and warehousing ○ Progress monitoring, trending and reporting ○ Cost performance monitoring, trending and claims processing ○ Quality assurance

When remuneration Method 2 – Percentage of Cost of Construction is used, the services indicated ■ Basic Services for categories 3, 4 and 5 and should be used as part of the percentage fee to be used with Tables 2 and 3. Services indicated ○ are considered Additional Services.

TABLE 1B
CATEGORIES OF SERVICE OFFERED BY CONSULTING ENGINEERS FOR TRANSPORTATION AND INFRASTRUCTURE PROJECTS

■ Basic Services ○ Additional Services

1. ADVISORY SERVICES	2. PRELIMINARY DESIGN SERVICES	3. FINAL DESIGN	4. TENDER SERVICES
<ul style="list-style-type: none"> ○ Preparation or review of engineering program ○ Expert testimony ○ Appraisals, valuations, studies, reports ○ Feasibility analysis ○ Accident investigations ○ Preliminary concept sketch ○ Preliminary specification notes ○ Development of work estimate ○ Litigation/ Claims/ Insurance assistance ○ Detailed analysis of owning and operating costs ○ Special grants and loans ○ Translation and interpretation ○ Project management scheduling assistance ○ Assistance in preparing purchase enquiries ○ Value engineering ○ Quality assurance 	<ul style="list-style-type: none"> ○ Scope of project ○ Statement of probable cost ○ Preliminary design reports, alternative conceptual proposals, sketches, schematics, specifications ○ Scheduling ○ Documents for financing ○ Investigative surveys, geotechnical ○ Permits and licences ○ Environmental assessments ○ Revision of existing designs ○ Lifecycle costing ○ Detailed cost estimates ○ Engineering surveys, profiles and cross-sections ○ Quality assurance 	<ul style="list-style-type: none"> ■ Detailed design ■ Working drawings ■ Specifications and tender documents ■ Statement of probable cost ○ Detailed cost estimates ○ Reinforcing bar schedules ○ Design and documentation not in contract ○ Provision for Client supplied equipment not in contract ○ Demolition documents ○ Tenant improvements ○ Fast-track construction or sequential tendering ○ Preparation of shop drawings ○ Environmental design ○ Quality assurance ○ LEED® documentation 	<ul style="list-style-type: none"> ■ Preparing Tender Call Documents ■ Reviewing tenders submitted and advising ○ Alternative conceptual proposals ○ Prequalification of contractors ○ Coordinating other consultants' documents ○ Non-tender construction contracts ○ Bills, materials, detailed cost estimates ○ Tender advertisement

When remuneration Method 2 – Percentage of Cost of Construction is used, the services indicated ■ Basic Services for categories 3 and 4 are the services covered by the fees in Tables 4 and 5. Services indicated ○ are considered Additional Services.

TABLE 1B (continued)
CATEGORIES OF SERVICE OFFERED BY CONSULTING ENGINEERS FOR TRANSPORTATION AND INFRASTRUCTURE PROJECTS

■ Basic Services ○ Additional Services

5. CONSTRUCTION RELATED SERVICES	6. RESIDENT ENGINEERING SERVICES	7. PROJECT MANAGEMENT SERVICES	8. CONSTRUCTION MANAGEMENT SERVICES
<ul style="list-style-type: none"> ○ Assisting in the preparation of contract ○ Review of shop drawings ○ Field review ○ Progress review ○ Quality assurance ○ Testing monitoring ○ Change order costing ○ Document interpretation ○ Payment recommendation ○ Substantial performance review ○ Advising Client and contractor of continuing or newly observed defects or deficiencies ○ Year end warranty review ○ System start-up and documentation ○ Post-warranty period follow-up ○ Fast-track construction or sequential tendering ○ Maintenance manuals and drawings ○ Certification and testing of systems ○ Commissioning/ training ○ Environmental monitoring ○ Record drawings ○ Contract Administration ○ Quality assurance ○ LEED® documentation and certification service ○ LEED® compliance energy model 	<ul style="list-style-type: none"> ○ Supplying resident staff on the project to determine if the contractor is carrying out his work in general conformance with the contract documents. ○ Quality assurance 	<ul style="list-style-type: none"> ○ Consultant selection ○ Conceptual studies ○ Economic feasibility ○ Planning/ scheduling/ monitoring and controlling ○ Estimating/ budgeting and cost control ○ Arranging financing ○ Procurement ○ Risk management ○ Commissioning ○ Quality assurance 	<ul style="list-style-type: none"> ○ Contract strategy, administration and expediting ○ Construction logistics, planning, scheduling and manpower forecasts ○ Labour relations, safety ○ Field office management, temporary facilities ○ Materials receiving and warehousing ○ Progress monitoring, trending and reporting ○ Cost performance monitoring, trending and claims processing ○ Quality assurance

When remuneration Method 2 – Percentage of Cost of Construction is used, the services indicated ■ Basic Services for categories 3 and 4 are the services covered by the fees in Tables 4 and 5. Services indicated ○ are considered Additional Services.

TABLE 2
PERCENTAGE FEE SCALE FOR BASIC SERVICES FOR NEW BUILDING CONSTRUCTION

BUILDING CATEGORIES (defined in Table 3, page 21)		MINIMUM NET PERCENTAGE FEE SCALE FOR BASIC SERVICES											
		NEW CONSTRUCTION											
		AREA: 0 – 2000 m ²			AREA: 2000 – 5000 m ²			AREA: OVER 5000 m ²					
		Struct	Mech	Elect	Struct	Mech	Elect	Struct	Mech	Elect	Struct	Mech	Elect
1 SIMPLE		6.0	6.25	6.75	5.0	5.5	6.0	4.0	5.0	5.5	4.0	5.0	5.5
2 CONVENTIONAL		6.0	6.75	7.25	5.0	6.0	6.5	4.5	5.5	6.0	4.5	5.5	6.0
3 ADVANCED		6.5	7.25	7.75	6.0	6.5	7.0	5.5	6.0	6.5	5.5	6.0	6.5
4 COMPLEX		7.5	7.75	8.25	6.5	7.0	7.5	6.0	6.5	7.0	6.0	6.5	7.5
5 SPECIALIZED		8.0	8.75	9.25	7.5	8.0	8.5	7.0	7.5	8.0	7.0	7.5	8.0
6 HEALTH CARE FACILITIES		7.5	8.25	8.75	6.5	7.5	8.0	6.0	7.0	7.5	6.0	7.0	7.5
7 COMMERCIAL PROJECTS	(1) low-rise office/retail	6.0	5.75	6.25	5.0	5.0	5.5	4.0	4.5	5.0	4.0	4.5	5.0
	(2) high-rise office (4+ storeys)	6.5	6.25	6.75	5.5	5.5	6.0	4.5	5.0	5.5	4.5	5.0	5.5
	(3) shopping centre	6.0	5.75	6.25	5.25	5.0	5.5	4.5	4.5	5.0	4.5	4.5	5.0
	(4) tenant improvement	6.5	6.25	6.75	5.75	5.5	6.0	5.0	5.0	5.5	5.0	5.0	5.5
	(5) motor hotel	6.0	5.75	6.25	5.0	5.0	5.5	4.0	4.0	4.5	4.0	4.5	5.0
	(6) hotel	6.5	6.25	6.75	5.5	5.5	6.0	4.5	4.5	5.0	4.5	5.0	5.5
8 CUSTOM/INDIVIDUAL	(a) market	6.0	6.25	6.75	5.0	5.5	6.0	4.0	5.0	5.5	4.0	5.0	5.5
	(b) non-market	6.5	6.5	7.0	5.5	6.0	6.5	4.5	5.5	6.0	4.5	5.5	6.0
	(a) simple	6.0	6.75	7.25	5.25	6.0	6.5	4.5	5.5	6.0	4.5	5.5	6.0
	(b) non-market	6.5	7.25	7.75	5.75	6.5	7.0	5.0	5.0	5.5	5.0	6.0	6.5
	(a) simple	6.0	6.75	7.25	5.25	6.0	6.5	4.5	5.5	6.0	4.5	5.5	6.0
	(b) complex	6.5	7.25	7.75	5.75	6.5	7.0	5.0	5.0	5.5	5.0	6.0	6.5
Single Family (1) Structural drawings on architectural sepias or by others; no detail specifications; no contract administration.	(a) market	6.0	6.25	6.75	5.0	5.5	6.0	4.0	5.0	5.5	4.0	5.0	5.5
	(b) non-market	6.5	6.5	7.0	5.5	6.0	6.5	4.5	5.5	6.0	4.5	5.5	6.0
	(a) simple	6.0	6.75	7.25	5.25	6.0	6.5	4.5	5.5	6.0	4.5	5.5	6.0
	(b) non-market	6.5	7.25	7.75	5.75	6.5	7.0	5.0	5.0	5.5	5.0	6.0	6.5
	(a) simple	6.0	6.75	7.25	5.25	6.0	6.5	4.5	5.5	6.0	4.5	5.5	6.0
	(b) complex	6.5	7.25	7.75	5.75	6.5	7.0	5.0	5.0	5.5	5.0	6.0	6.5
Day Care		8.0	10.0	12.0	9.0	8.0	10.0	10.0	7.0	8.0	10.0	7.0	8.0
Restoration/ Decoration		8.0	10.0	12.0	9.0	8.0	10.0	10.0	7.0	8.0	10.0	7.0	8.0
Interior/ Tenant Improvements		8.0	10.0	12.0	9.0	8.0	10.0	10.0	7.0	8.0	10.0	7.0	8.0
Clinics		8.0	10.0	12.0	9.0	8.0	10.0	10.0	7.0	8.0	10.0	7.0	8.0

TABLE 2 (continued)

9 MULTIPLE HOUSING		MINIMUM NET PERCENTAGE FEE SCALE FOR BASIC SERVICES				
		NEW CONSTRUCTION				
		Duplex/ Townhouse (slab on grade)	Low-Rise 1-4 storeys (reinforced concrete garage)	Mid-Rise 5-6 storeys (non-combustible)	High-Rise 7-15 storeys	High-Rise over 15 storeys
(a) Market		10% of structural cost on each type designed and drawn. Inspection additional.	5% structural cost of concrete elements (including inspection). 10% of structural cost of one of each stacking wood frame element designed and drawn; 20% for non-stacking elements. Wood frame inspections additional.	4.5	4.0	3.5
(b) Non-market:	Senior Citizens & Social Housing	as above 12%		market plus 0.25%		
(a) Market	NUMBER OF SUITES			MECHANICAL FEES		
	(i) 1 - 10	6.25	6.0	5.5	5.25	5.0
	(ii) 10 - 40	5.75	5.5	5.25	4.75	4.5
	(iii) 40 - 100	5.25	5.0	4.75	4.5	4.25
	(iv) 100 - 150	4.75	4.5	4.5	4.0	3.75
	(v) over 150	4.5	4.25	4.25	3.75	3.5
(b) Non-market:	Senior Citizens & Social Housing			market plus 0.25%		
(a) Market	NUMBER OF SUITES			ELECTRICAL FEES		
	(i) 1 - 10	6.75	6.5	6.0	5.75	5.5
	(ii) 10 - 40	6.25	6.0	5.5	5.25	5.0
	(iii) 40 - 100	6.0	5.75	5.25	5.0	4.75
	(iv) 100 - 150	5.5	5.25	4.75	4.5	4.25
	(v) over 150	5.0	4.75	4.5	4.0	3.75
(b) Non-market:	Senior Citizens & Social Housing			market plus 0.50%		
10 SEISMIC UPGRADE	(a) Evaluation	Time or Lump Sum basis				
	(b) Design/ Construction	Time or Lump Sum basis				

Notes

- The sliding scale for building projects reflects their size and complexity.
- For alterations, renovations or projects of low construction costs, use either Method 2 x 1.7 or Method 1.
- For projects involving other than a single construction contract (i.e., fast-track or sequential tendering) where Method 2 is used, fees should be 25% higher than those indicated in the above table.
- Civil sitework associated with buildings, building envelope science, acoustic engineering and sustainability consulting, geotechnical engineering and environmental, etc., considerations are additional services for which fees are not included in the above, for these, use Method 1 – Time Basis.
- These fees apply where the structural, mechanical or electrical consultant is a sub-contractor to a managing consultant; where the structural, mechanical or electrical consultant acts as the prime consultant, refer to Method 1 – Time Basis.

TABLE 3
INDEX OF BUILDING TYPES AND CATEGORIES

(S=Structural M=Mechanical E=Electrical)

	<u>S</u>	<u>M</u>	<u>E</u>		<u>S</u>	<u>M</u>	<u>E</u>		<u>S</u>	<u>M</u>	<u>E</u>
Administrative Offices	3	3	3	Freight Terminal	3	4	4	Radiology	6	6	6
Agricultural	1	1	1	Funeral Home	4	4	4	Radio Station	5	5	5
Air Terminal	4	4	4	Gas Station	2	3	3	Rail Terminal	4	4	4
Aircraft Hangar	2	2	2	Grandstand	3	3	3	Recreation	4	4	4
Amusement Park	4	4	4	Health Care Centre	6	6	6	Reformatory	3	5	5
Apartment	9	9	9	Health Club	4	3	3	Research	5	5	5
Aquarium	4	5	5	Heritage	8	8	8	Research Hospital	6	5/6	5/6
Archives	4	4	4	Hospital	6	5/6	5/6	Residence (student)	9	9	9
Arena	4	4	4	Hotel	7	7	7	Restaurant	3	4	4
Armed Forces Base	3	2	2	Housing (custom)	8	8	8	Restoration	8	8	8
Armoury	2	2	2	Housing (multiple)	9	9	9	Retail	7	7	7
Art Gallery	5	5	5	Housing (single family)	8	8	8	Rink (covered)	3	4	4
Auditorium	4	4	4	Inpatient Accommodation	6	6	6	School (elementary)	3	3	3
Bank	3	3	3	Intermediate Care Unit	6	6	6	School (secondary)	4	4	4
Bar	4	4	4	Jail	4	5	5	Scientific	5	5	5
Cemetery Chapel	4	4	4	Legation	4	4	4	Senior Citizens Housing	9	9	9
Church	4	4	4	Library	4	4	4	Service Garage	2	2	2
City Hall	4	4	4	Lounge	4	4	4	Settlement House	9	8	8
Clinic (diagnosis and treatment)	6/8	6/8	6/8	Maintenance	2	2	2	Shopping Centre	7	7	7
Club	4	3	3	Manufacturing Plant	3	4	4	Social Housing	9	9	9
College	4	4	4	Mausoleum	4	4	4	Sports Club	4	3	3
Commercial	7	7	7	Medical/Dental Offices	7	6	6	Stadium	4	3	3
Communications	5	5	5	Medical Research	5	5	5	Stock Exchange	3	3	3
Community Centre	4	4	4	Mint	4	4	4	Storage Plant (specialized)	3	3	3
Computing Centre	3	5	5	Monastery	4	4	4	Synagogue	4	4	4
Consulate	4	4	4	Mosque	4	4	4	Teaching Hospital	6	5/6	5/6
Convalescent Home	6	6	6	Motor Hotel	7	7	7	Telephone Equipment	3	3	3
Convent	4	4	4	Museum	4	3	3	Television Facility	5	5	5
Convention Hall	3	3	3	Nursing Home	6	6	6	Temple	4	4	4
Correctional Facility	4	5	5	Observatory	5	4	4	Tenant Improvements	7/8	7/8	7/8
Country Club	4	3	3	Offices (commercial)	7	7	7	Terminal (transport)	4	4	4
Courthouse	4	4	4	Offices (owner occupied)	7	3	3	Theatre	4	4	4
Credit Union	3	3	3	Opera House	4	5	5	Town Hall	4	4	4
Crematorium	4	5	5	Operating Room	6	6	6	Townhouse	9	9	9
Customs/Immigration	3	2	2	Parking Garage/Structure	2	2	2	Treasury	4	4	4
Day Care Centre	8	8	8	Parliament Building	4	4	4	Trust Company	3	3	3
Decorative Work	8	8	8	Passenger Terminal	4	4	4	Undertaking Establishment	4	4	4
Dental	8	8	8	Penitentiary	4	5	5	University	4	5	5
Duplex	9	9	9	Phys Ed Complex	4	4	4	Warehouse	2	1	1
Embassy	4	4	4	Planetarium	5	4	4	(max 10% offices)			
Emergency Department	6	6	6	Plant	3	3	3	Worship	4	4	4
Exhibition Building	3	3	3	Police Station	4	3	3	“Y” Residence Facility	7	3	3
Exhibition Display	5	6	6	Pool (swimming)	4	4	4	“Y” Sports Facility	4	4	4
Extended Care Unit	6	6	6	Post Office	4	4	4	Zoo	4	4	4
Fire Station	3	3	3	Prison	4	5	5				
				Processing Plant	3	3	3				

- | | | |
|---|-------------------------|---|
| 1 | Simple: | Simple, utilitarian character without complication of design; a minimum of finish, structural, mechanical and electrical design. |
| 2 | Conventional: | Conventional character requiring normal detail, structural, mechanical and electrical design. |
| 3 | Advanced: | Moderate complexity of design requiring advanced structural, mechanical and electrical design. |
| 4 | Complex: | Exceptional character and complexity of design requiring comparatively large extent of structural, mechanical and electrical design. |
| 5 | Specialized: | Specialized buildings and other facilities requiring special design skills or expertise, much precise detailing and intensive coordination. |
| 6 | Health Care Facilities: | Self-explanatory/building type specific. |
| 7 | Commercial Projects: | Non-market office refers to special use tenancies (e.g. government or public agencies). |
| 8 | Custom/Individual: | Highly particular or personalized requirements; extreme extent of design, coordination and service for size of facility. |
| 9 | Multiple Housing: | Self-explanatory/building type specific. |

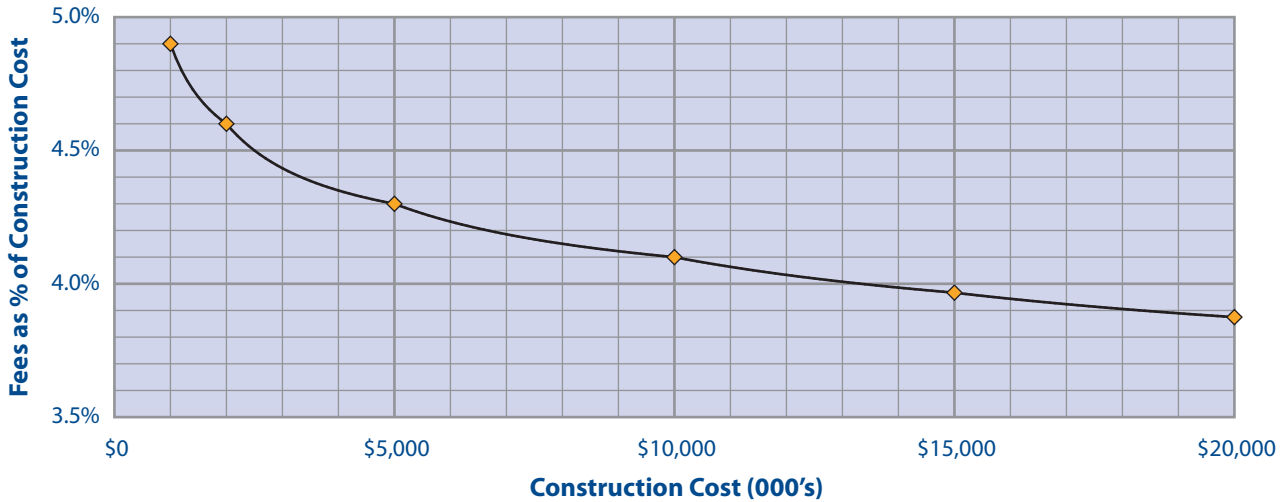
Table 4
Recommended Minimum Percentage Fee Budget Scale for Basic Services for Transportation and Infrastructure Engineering Projects of Average Complexity

<u>Cost of Construction</u>	<u>Fee</u>		
<small>(For less than \$1,000,000 use other methods)</small>			
\$ 1,000,000 - 2,000,000	\$ 49,000 on first	\$ 1,000,000 plus 4.3% on next	\$ 1,000,000
2,000,000 - 5,000,000	92,000 on first	2,000,000 plus 4.1% on next	3,000,000
5,000,000 - 10,000,000	215,000 on first	5,000,000 plus 3.9% on next	5,000,000
10,000,000 - 15,000,000	410,000 on first	10,000,000 plus 3.7% on next	5,000,000
15,000,000 - \$20,000,000	595,000 on first	15,000,000 plus 3.6% on next	5,000,000
Over \$20,000,000	775,000 on first	20,000,000 plus 3.6% on balance	

Examples of projects of average complexity

- Bridges and other structures of conventional design, simple waterfront facilities
- Railways, roads and streets
- Conventional levees, flood walls and retaining walls, small dams
- Site development
- Sewer and water tunnels (free air), storm sewers and drains, irrigation works (except pumping plants) sanitary sewer lines 600 mm and larger, water distribution lines 400 mm and larger
- Airports with small facilities

Recommended Minimum Detailed Design as a % of Cost of Construction for Transportation and Infrastructure Engineering Projects of Average Complexity



Note These fees are the minimum fees to be charged for the Basic Services shown in Categories 3 and 4 in Table 1B.

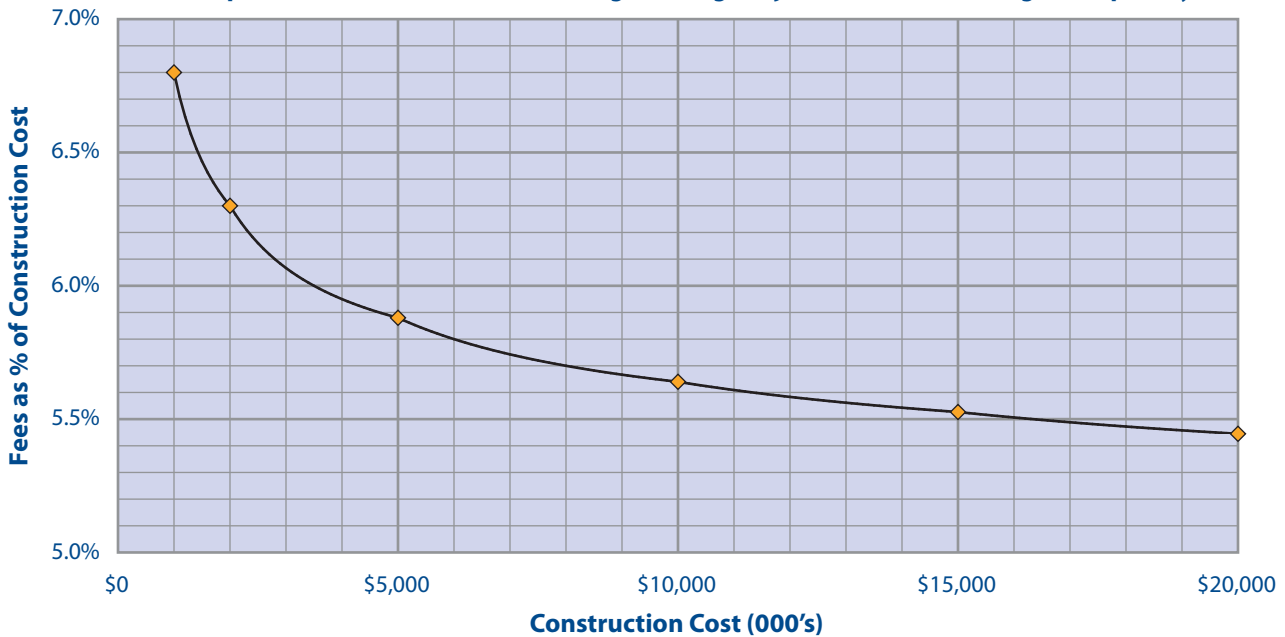
Table 5
Recommended Minimum Percentage Fee Budget Scale for Basic Services for
Transportation and Infrastructure Engineering Projects of Above Average Complexity

Cost of Construction	Fee		
(For less than \$1,000,000 use other methods)			
\$ 1,000,000 - 2,000,000	\$ 68,000 on first	\$ 1,000,000 plus 5.8% on next	\$ 1,000,000
2,000,000 - 5,000,000	126,000 on first	2,000,000 plus 5.6% on next	3,000,000
5,000,000 - 10,000,000	294,000 on first	5,000,000 plus 5.4% on next	5,000,000
10,000,000 - 15,000,000	564,000 on first	10,000,000 plus 5.3% on next	5,000,000
15,000,000 - \$20,000,000	829,000 on first	15,000,000 plus 5.2% on next	5,000,000
Over \$20,000,000	1,089,000 on first	20,000,000 plus 5.2% on balance	

Examples of projects of above average complexity

- Water, waste water, and industrial waste treatment plants
- Bridges which are asymmetric or are otherwise complicated, large dams or complicated small dams
- Highways, urban and suburban arterial streets, grade crossing eliminations, highway and railway tunnels
- Pumping stations, incinerators, intercepting and relief sewer, sanitary sewer lines under 600 mm in diameter, water distribution lines under 400 mm in diameter
- Complex foundations, additions to or reconstruction of projects, power plants and distribution systems, airports with complex facilities and infrastructure

Recommended Minimum Detailed Design as a % of Cost of Construction for
Transportation and Infrastructure Engineering Projects of Above Average Complexity



Note These fees are the minimum fees to be charged for the Basic Services shown in Categories 3 and 4 in Table 1B.

Appendix A

Cost Estimate Classification Definitions

It is important to recognize that, until a project is actually constructed, a cost estimate represents the best judgement of the professional engineer in the light of their experience and knowledge and the information available at the time. Its completeness and accuracy is influenced by many factors, including the project status and development stage.

Estimates have a limited life, and are subject to inflation and fluctuating market conditions.

The following estimates and their classification definitions are suggested for engineering projects.

Class A estimate ($\pm 10-15\%$): A detailed estimate based on quantity take-off from final drawings and specifications. It is used to evaluate tenders or as a basis of cost control during day-labour construction.

Class B estimate ($\pm 15-25\%$): An estimate prepared after site investigations and studies have been completed and the major systems defined. It is based on a project brief and preliminary design. It is used for obtaining effective project approval and for budgetary control.

Class C estimate ($\pm 25-40\%$): An estimate prepared with limited site information and based on probable conditions affecting the project. It represents the summation of all identifiable project elemental costs and is used for program planning, to establish a more specific definition of client needs and to obtain preliminary project approval.

Class D estimate ($\pm 50\%$): A preliminary estimate which, due to little or no site information, indicates the approximate magnitude of cost of the proposed project, based on the client's broad requirements. This overall cost estimate may be derived from lump sum or unit costs for a similar project. It may be used in developing long term capital plans and for preliminary discussion of proposed capital projects.

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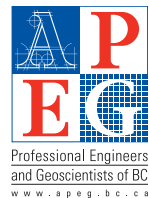
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