

Consultant Fees for Geotechnical and Materials Engineering Assignments

A Guideline

This Guideline was prepared by a subcommittee of the Practice Standards Committee whose mandate is “to enhance the quality and value of professional service provided to the public”. Practicing engineers representing Clients and Consultants participated directly in developing the contents of the Guideline. It was approved for publication by the Council of the Association in February 1989.

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FOREWORD

Members of APEGGA are authorized to offer professional services to Clients, either as individual Consultants or as corporations. They are expected to undertake only those assignments in which they are fully competent and to otherwise comply with the requirements of the Engineering, Geological and Geophysical Professions Act, Regulations, By-laws and Code of Ethics.

The principles outlined in this Consultant Fee Guideline represent what APEGGA believes to be an appropriate basis of remuneration for competent engineering services. It is a guide for APEGGA members when acting as Prime Consultants, Subconsultants or Owner employees; but is also intended to be used by Client representatives who are not members of APEGGA.

This Publication is intended to be a fee GUIDE for both the seller of engineering services and the buyer. It is intended to represent a practical approach to fee remuneration based on normal circumstances and average working conditions. Notwithstanding the foregoing, members may, in their discretion, fix rates which may vary from those suggested.

This Guideline applies to Geotechnical and/or Materials Engineering assignments. Geotechnical Engineering, for purposes of this Guideline, is defined as the engineering application of scientific methods and engineering principles to the acquisition, interpretation and use of knowledge of materials of the earth's crust to the solution of engineering problems. Similarly, Materials Engineering is defined as the engineering application of scientific methods and engineering principles to the acquisition, interpretation and use of knowledge of materials normally used in the construction industry. The specific materials referred to in this Guideline are concrete, asphalt, aggregates, soils, masonry, metal and plastic sheet materials.

This guideline is a discretionary document and is not intended to supersede or replace contractual arrangements that are designed to satisfy specific situations.

SECTION 1

CATEGORIES OF SERVICE

1.0 INTRODUCTION

Professional services in all areas of engineering practice are commonly categorized according to the nature of services and stages of a project. The following categories have been selected to facilitate the selection of an appropriate fee basis for geotechnical and materials engineering assignments:

1. Consultative and Advisory Services
2. Pre-Design Services
3. Design Services
4. Contract Administration and Review During Construction
5. Resident Services During Construction
6. Special Services

1.1 CATEGORY 1 — CONSULTATIVE AND ADVISORY SERVICES

Examples of this category are:

1. Expert testimony;
2. Surface and subsurface assessments;
3. Investigations (groundwater, drainage, stability, etc.);
4. Inspection, testing or other services concerning the collection, analysis, evaluation and interpretation of data and information leading to specialized conclusions and recommendations;
5. Feasibility studies including monitoring site conditions;
6. Failure investigations.

1.2 CATEGORY 2 — PRE-DESIGN SERVICES

These consist of services to establish requirements for preliminary design, including, but not limited to:

1. Determination of Scope of Project;
2. Preliminary surface and subsurface investigation of sites and aspects of location that may affect the design;
3. Preliminary surveys, geotechnical investigations and other site specific reviews for preliminary design decisions;
4. Preparation of Pre-design Report covering siting alternatives, conceptual sketches, specification notes, probable construction cost and schedule.

1.3 CATEGORY 3 — DESIGN SERVICES

These services follow the establishment of project requirements described in Category 2 and consist of the preparation of designs, drawings, specifications and contract documents. They generally include the following:

- a) Preliminary Design
 - i) Preparation of preliminary sketches and outline specifications illustrating and defining the design concept in terms of siting, surface and subsurface characteristics.
 - ii) Detailed surveys, geotechnical investigations and other site specific evaluations for detailed design decisions.
 - iii) Preparation of Preliminary Design Report covering preliminary sketches, outline specifications, alternates, estimated construction cost and schedule.
 - iv) Advise and/or assistance in obtaining approval from the Authorities.
- b) Detailed Design
 - i) Preparation of design drawings and specifications, material mix designs and detailed calculations.
 - ii) Preparation of estimates of the cost of the work including design and construction schedules.

- iii) Review and coordination with other design disciplines.
- iv) Assistance in obtaining approval from Authorities for the total project or specific aspects of it.

1.4 CATEGORY 4 — CONTRACT ADMINISTRATION AND REVIEW DURING CONSTRUCTION

These services consist of contract administration and periodic field visits by the Geotechnical or Materials Engineering Consultant during the construction period following contract award. They include the following:

1. Administration of the geotechnical aspects of the contract.
- *2. Visits to the construction site to review the geotechnical aspects of the project for progress, quality and conformance to the drawings and specifications.
3. Review and approval of change orders.
4. Preparation of construction progress reports to the Client.
5. Interpretation of the geotechnical and materials engineering aspects of the contract documents as required by the Contractor or Client.
6. Examination of progress claims for the purpose of approving progress payments.
7. Preparation of Construction Completion Certificate following final review of construction.

These services are distinct and separate from those described in Category 5 Resident Services During Construction and should not in any way be considered a substitute for them. The two categories of services are complementary, however, and this should be taken into account when the scope of services for geotechnical and materials engineering is established on a project.

If there is requirement for field services by the Geotechnical and Materials Engineering Consultant, which necessitates attendance at the site for periods of varying duration during construction, this should be reflected in the Category 5 scope of services.

- * See the APEGGA Guideline on Review During Construction on Building Projects.

1.5 CATEGORY 5 — RESIDENT SERVICES DURING CONSTRUCTION

This category consists of supplying resident staff on the project to provide specific geotechnical or materials engineering services described in the scope of assignment. The services usually include activities which are designed to assist the Consultant in administering the contract and in determining if the work is being performed in accordance with the contract documents.

Resident services may include items such as:

1. Materials testing, quality control and review for conformance with the contract documents;
2. Informing the Contractor regarding quality control testing results;
3. Informing the Consultant representative responsible for Contract Administration and Review During Construction regarding quality assurance, workmanship and progress.

The services described above do not include the direction of Contractor personnel in methods, scheduling or equipment selection except as may be specifically prescribed in the contract documents, since these are normally a Contractor responsibility.

1.6 CATEGORY 6 — SPECIAL SERVICES

The services in this Category vary in scope and detail according to the needs of the Client and should be described in the scope of the assignment.

They include, but are not limited to:

1. Preparation of record drawings (As Built).
2. Consultation on special problems during warranty period.
3. Alternative Designs requested by the Client following completion of a normal design process in which various alternate materials and layouts are considered.
4. Redesign arising from circumstances beyond the Geotechnical and Materials Engineering Consultant's control.
5. Technical specialist input including any special services involved in the coordination of specialist subconsultants.

SECTION 2

FEE BASIS OPTIONS

2.0 INTRODUCTION

The cost of professional services in geotechnical and materials engineering is typically a small percentage of the total cost of engineering for a project. Care should be taken not only to select a qualified Consultant but also to select a basis of compensation that complements the services required to meet the needs and quality of the project.

There are three concepts on which fees for professional services in geotechnical and materials engineering are commonly based:

1. Time Basis
2. Fixed Fee Basis
3. Combination of Time Basis and Fixed Fee Basis

Each has distinct applications and frequently combinations of the concepts are applied to different stages of a project.

In negotiating a Prime Consultant and/or Subconsultant fee on a specific project, care should be taken to establish the categories of service required to properly represent the needs of the Client. When the categories of service have been established, the appropriate basis of fee for each category should be determined. Projects which require a full scope of professional services commonly use a combination of Time Basis and Fixed Fee Basis.

2.1 TIME BASIS

This fee basis is particularly applicable in circumstances where the scope of assignment is not well defined or where the Consultant may not have control over manhours and disbursements required on specific stages of a project. It should normally be used for Categories of Service 1,2,5 and 6 described in Section 1:

1. Consultative and Advisory Services
2. Predesign Services
5. Resident Services During Construction

6. Special Services

It is also appropriate for Categories of Service 3 and 4 when the scope of services is not definitively established:

3. Design Services

4. Contract Administration and Review During Construction

All Categories of Service can be supplemented with a target or upset fee when circumstances warrant. Such an arrangement should not, however, be allowed to negatively influence the quality of services.

The Total Cost of Professional Services when the Consultant fee is on a Time Basis is determined by multiplying the number of hours each member of the Consultant's staff expends on the project by their respective hourly billing rates and adding disbursements marked up by an appropriate disbursement factor.

The formula for the Total Cost of Professional Services using the Time Basis is:

$$\text{TOTAL COST OF PROFESSIONAL SERVICES} = \text{CONSULTANT FEE (HOURLY BILLING RATES} \times \text{HOURS EXPENDED) + DISBURSEMENTS (DISBURSEMENTS} \times \text{FACTOR)}$$

Note: See Appendix A for explanatory details.

2.2 FIXED FEE BASIS

This fee basis is applicable only to projects or components of projects where the scope of the work is clearly defined. The Fixed Fee for such assignments should be negotiated following preparation of a comprehensive estimate of the manhours and overhead costs. The key assumptions made in developing the estimate must be identified and agreed to in the negotiation process.

Some of the laboratory and field tests conducted for quality control during construction are relatively routine and the cost of performing them is quite predictable. The suggested rates listed in Appendix B are typical for a **single laboratory test** based on the use of prescribed equipment under average working conditions, all of which satisfies appropriate test designations and are intended to serve as a basis of negotiation for assignments in which larger numbers of tests are contemplated.

An agreement, describing in detail the services to be provided and all categories of cost included in the Fixed Fee, is essential. The agreement should cover schedule, personnel

classification, overtime, time limits, inflation and other identifiable items that influence costs. Changes in the scope of work, after the Fixed Fee has been established, should be compensated for a Time Basis or by a negotiated Fixed Fee adjustment for each change.

The formula for Total Cost of Professional Services using a Fixed Fee Basis is:

$$\text{TOTAL COST OF PROFESSIONAL SERVICES} = \text{CONSULTANT FEE (NEGOTIATED FIXED FEE)} + \text{DISBURSEMENTS (DISBURSEMENTS} \times \text{FACTOR)}$$

Note: See Appendix A for explanatory details.

2.3 COMBINATION TIME BASIS AND FIXED FEE BASIS

Projects frequently require several Categories of Services; some can be accurately quantified at the commencement of the project and others vary with schedule and conditions that cannot be predicted. In these circumstances, the services that can be accurately described and quantified can be appropriately covered by a Fix Fee and those that are unpredictable should be on a Time Basis.

A judicious combination of the Time Basis and Fixed Fee Basis for different phases of a project permit a variety of innovative fee concepts that encourage execution efficiency without sacrificing quality of service. These concepts include targets, bonuses, cost plus fixed fee and other variations.

SECTION 3

SPECIAL SERVICES AND CONDITIONS

3.0 INTRODUCTION

For all special services and conditions, the Geotechnical and Materials Engineering Consultant and Client should mutually determine the appropriate fee basis to be used. The following statements reflect the principle described in Section 2 that the Time Basis should be used in circumstances where the scope of the assignment is not well defined. In circumstances where the amount of work involved in the special service can be accurately predicted, the Fixed Fee Basis is also appropriate.

3.1 CONTRACT ADMINISTRATION AND REVIEW DURING CONSTRUCTION WHEN PERFORMED BY SOMEONE OTHER THAN THE PROJECT DESIGNER

The Consultant responsible for the geotechnical or materials engineering design of a project should normally be retained to provide Contract Administration and Review During Construction on behalf of the Owner or Prime Consultant as applicable. In circumstances where a Geotechnical and Materials Engineering Consultant is retained to perform these services on a project for which the drawings and specifications were prepared by others, it is recommended the fee be on a Time Basis.

3.2 EXTRA WORK OR SERVICES

Services required beyond the agreed scope of assignment, or services beyond those normally provided by geotechnical and materials engineers (ie. specialized equipment rentals), regardless of the original basis of fee, should be negotiated on a Time Basis and/or Fixed Fee Basis as appropriate.

3.3 RE-USE OF DRAWINGS AND SPECIFICATIONS

Fees for the use of a design prepared by or under the supervision and control of a Professional Engineer or Architect are intended to cover one project only. Re-use of the design on subsequent projects by the same Client or by another Client requires permission by the professional member and Permit Holder who stamped the drawings (see Appendix E). Modifications to a design to accommodate different conditions encountered on subsequent projects should normally be undertaken on a Time Basis fee.

Professional liability resulting from re-use of design documents should be considered in negotiating fees for each re-use.

3.4 DELAYS

In circumstances where the fee is on a basis other than a Time Basis and delays beyond the Geotechnical and Materials Engineering Consultant's control cause an increase in the cost of services provided by the Consultant, the additional fee should be on a Time Basis.

3.5 ABANDONMENT OF PROJECT

If the project is abandoned or suspended, through no fault of the Geotechnical and Materials Engineering Consultant, the value of the service supplied by the Consultant should be determined on a Time Basis and should include an appropriate allowance for costs resulting from the suspension.

3.6 TRAVEL TIME

Payment for Travel Time should be negotiated taking into account the variations in circumstances from one project to another, and included in the agreement.

3.7 AGREEMENT

A written agreement should be prepared which covers a minimum the scope of assignment, schedule of execution, basis of fee and payment conditions. A guideline for such a Client/Consultant Agreement is included in Appendix F.

SECTION 4

DISBURSEMENTS

4.0 INTRODUCTION

Unless otherwise agreed between the Geotechnical and Materials Engineering Consultant and the Client, disbursements incurred by the Consultant in completing an assignment are properly chargeable to the Client.

4.1 REIMBURSABLE EXPENSES

Following are examples of expenses that are reimbursable in all Fee Basis options at disbursement cost plus an agreed mark up:

1. Reproduction of drawings and documents
2. Travel expenses
3. Telecommunications expenses
4. Living expenses for personnel
5. Advertising for tenders on the Client's behalf
6. Equipment detailed in the Agreement which is not included in normal overhead costs.
7. Messenger Service
8. Any other proper expense paid out by the Geotechnical and Materials Engineering Consultant on the Client's behalf, and not covered by the agreed fee, eg. drilling or coring subcontracts, chemical analysis, etc.
9. Other similar expenses for items consumed on the project such as survey stakes, containers, patching materials, sample molds, etc.

COST OF PROFESSIONAL SERVICES

1. FORMULA

$$\text{TOTAL COST OF PROFESSIONAL SERVICES} = \text{CONSULTANT FEE (HOURLY BILLING RATES} \times \text{HOURS EXPENDED OR NEGOTIATED FIXED FEE) + DISBURSEMENTS (DISBURSEMENTS} \times \text{FACTOR)}$$

where:

~	Hourly Billing Rates	—	* hourly payroll cost × payroll factor (The hourly payroll cost may be calculated for each individual employee engaged on a project or rates may be established for each of the various employee classifications.)
~	Hours Expended	—	the actual number of hours that each member of the project staff expends on the project.
~	Disbursements	—	reimbursable expenses incurred on the project. (See Section 4.)
~	Disbursement Factor	—	Typically 10% but subject to negotiation for special circumstances and conditions.
*	Hourly Payroll Cost	=	<u>Annual Salary+Fringe Benefits</u> Annual Working Hours (52 weeks × regular working hours/week)
**	Payroll Factor	—	covers Overhead Costs and Profit and typically ranges from 2.0 to 2.5 depending on the number of manhours and the continuity of the manhour commitment to the project. (The Payroll Factor should be based on an estimate of total manhours for all services and agreed to at the commencement of the project.)

2. HOURLY BILLING RATES

Hourly billing rates are comprised of three basic elements in a Professional Practice; direct costs, overhead costs and profit. **For purpose of uniformity and practical use, they are**

based on actual hourly payroll costs with a payroll factor multiplier to cost overhead costs and profit.

2.1 Direct Costs

This category of cost represents payroll costs and disbursements incurred by staff while engaged on the assignment.

1. Hourly Payroll Costs

Hourly payroll costs are typically expressed as an hourly rate based on a 37½ hour work week using the following formula:

$$\text{HOURLY PAYROLL COST} = \frac{\text{ANNUAL SALARY} + \text{FRINGE BENEFITS}}{1950 \text{ HOURS } 52 \times 37\frac{1}{2}}$$

in which fringe benefits **including** annual vacation and statutory holidays are typically 20% to 30% of salary. They include the employer's share of;

- UIC charges
- Workers' Compensation levies
- Medical and Hospitalization insurance
- Life, Dental and other insurance premiums
- Statutory holiday provisions
- Sick leave provisions
- Vacation pay
- Canada Pension and Company Pension

Note: It is intended that the actual cost of fringe benefits and the actual annual working hours be used to calculate the hourly payroll cost. Annual working hours are defined as the regular working hours per week multiplied by 52.

2. Disbursements

These costs are those incurred by staff engaged on the assignment and chargeable directly to the project.

2.2 Overhead Costs

This category of cost relates to the general operations and maintenance of a Consultant's practice and include:

1. Physical Plant

- office rental and operating costs
- furnishings
- usual tools and equipment (excluding specialized equipment covered by negotiated rates)

2. Operating Costs

- financing including interest on shareholder loans but not dividends on equity
- business and professional licenses
- professional and general liability insurance
- stationery and office supplies
- technical library and periodicals
- staff recruitment and training
- audit and legal fees
- bad debts
- administrative salaries
- accountants and clerks
 - receptionists
 - librarians
- secretaries whose time is not directly chargeable to client projects
- non-chargeable time by professional and technical staff in updating procedures, attending technical seminars and other activities which are not chargeable to projects
- business development
- safety training

Overhead costs vary according to the size of operation, location of office and the nature of services provided. They vary also with the efficiency of the Consultant's organization, but are typically approximately equal to the payroll costs (salary + fringe benefits) incurred by staff engaged on the assignment.

2.3 Profit

The balance after direct costs and overhead costs are deducted from total revenue represents the before-tax, before dividend and before-bonus profit. The level of profit on a specific project should reflect the Consultant's exposure to risk on the project. The Client should expect competent and efficient services at a fee that provides an appropriate profit to the Consultant.

3. PAYROLL FACTOR

The payroll factor multiplier to cover overhead costs and profit will vary according to conditions which affect the efficiency of the organization or which affect overhead costs directly. Following are guidelines for selecting an appropriate Payroll Factor:

- projects regardless of size, which have distinctly intermittent manhour demands
Payroll Factor - 2.5
- projects in which all services (excepting Category 5) involves less than 2,000 manhours
Payroll Factor - 2.5
- projects in which all services (excepting Category 5) involves between 2,00 and 10,000 manhours
Payroll Factor - 2.3
- projects in which all services (excepting Category 5) involves more than 10,000 manhours
Payroll Factor - 2.0
- services in Category 5 (Resident Services During Construction) — normally attract a factor of 2.0 regardless of size when these services are a continuation of other Categories of Service provided by the same Consultant. A larger factor is appropriate for very small projects or when manhour demands are intermittent.
- The above Payroll Factors are based on cost records for projects with varying manhour requirements and represent what APEGGA believes are required to sustain a mature and competent consulting practice capable of providing a high standard of professional services on an on-going continuous basis. **They are based on normal conditions where the overhead cost items described elsewhere in this appendix are borne by the Consultant.** In circumstances where some of the overhead items are provided by the Client, or where contract employees are used instead of regular full time employees, this should be taken into account in negotiating the Payroll Factor.

4. TYPICAL HOURLY BILLING RATES BASED ON APEGGA SALARY SURVEY, JUNE 1997.

POSITION			Hourly Billing Rate using Payroll Factors of 2.0 and 2.5
*Responsibility Level	Typical Title	Typical Experience	\$
B	Junior Engineer	2-5 yrs.	59 to 74
C	Intermediate Engineer	4-10 yrs.	72 to 90
D	Senior Engineer	10 + yrs.	88 to 110
E	Senior Engineer	15 + yrs.	105 to 131
	**Principal	Hourly billing rates vary according to individual qualifications and level of experience. They should reflect the additional authority and responsibility associated with this position.	

* Abstracted from APEGGA publication titled "Value of Professional Services".

** Principal is defined as a professional engineer who undertakes to provide responsible direction, both technically and organizationally, to the professional practice performed by a Consultant and who represents that professional practice to Clients.

UNIT RATE GUIDELINE FOR CONCRETE, ASPHALT, SOILS, MASONRY, METALS AND PLASTIC MATERIALS LABORATORY TESTING

This Appendix of Rates apply to Laboratory Testing Services conducted in support of Geotechnical or Materials Engineering assignments. The rate structure includes the validation of the Laboratory Test result(s) by a Professional Engineer. The reporting of these results will present all data in a manner consistent with the requirements of the generally accepted testing designations (ie. ASTM, ACI, CSA, ASME, etc.) and follow formats currently being utilized by the consulting industry. Where a specialized format, presentation or interpretation is required, fee remuneration different than those listed in this schedule may be applicable. Where consulting services are provided by a Professional Engineer at the request of a Client, these services are typically performed on a time basis as described previously in this Guideline. Good practice would dictate that the Consultant so advise the Client when this occurs.

The unit rate guideline is intended to specify the rate for a single Laboratory Test for a single sample received at the Testing Laboratory. It follows that the rates for multiple Laboratory Testing and/or larger sample lots can be negotiated in such a manner that there would be no effect on the level of service or quality.

This Appendix is specifically intended to be a fee GUIDE for both the seller of engineering services and the buyer. It is intended to represent a practical rate for each test based on normal circumstances and average working conditions.

This unit rate guideline recognizes specific testing procedures as per generally accepted Standards. For each test, the Professional Engineering component, the technical classification and the time element is defined such that the required level and/or quality of service can be accomplished. This Appendix lists some Laboratory Test items that cannot be so defined and these testing services would be conducted on a time basis plus disbursements as previously outlined.

The use of the unit rate guideline is discretionary and is applicable to the 1989 and 1990 calendar years. It does not attempt to provide for unusual circumstances such as short-term assignments or difficult sample or testing instances. Members may adjust rates in accordance with the specific circumstance or contractual arrangement.

CATEGORIES OF SERVICE

I. CONCRETE MATERIALS

A. Concrete, CSA A23.2

1. Compressive strength of concrete cylinders (samples delivered to laboratorian, CSA A23.2-9C, ASTM C39 — per cylinder (with moist room condition equivalent) \$26.00
2. Field Testing and Sampling Concrete (includes sampling concrete for testing and preparing test cylinders, standby, travel and measuring quality of concrete, such as temperature, air content and slump. Also includes Field Testing of zero slump concrete), CSA A23.3-1C,3C,4C and 5C Time Basis
+ disbursements
3. Trip to Site Time basis
+ disbursements
4. Compressive Strength of Concrete Cores (based on 100 mm diameter core), CSA A23.2, ASTM C42
 - a) Trimming cores — per cut..... \$13.00
 - b) Testing cores — per core..... \$25.00
5. Coring and Sampling Portland Cement Concrete, CSA A23.2-14C..... Time basis
+ disbursements
6. Concrete mix design and review Time basis
+ disbursements
7. Concrete Trail Mix, CSA A23.2-2C..... Time basis
+ disbursements
8. Flexural strength of concrete beams, (2 tests per beam), CSA A23.2-8C and ASTM C78 \$ 81.00/beam
9. Test beam preparation (includes sampling of concrete for testing and preparing test cylinders, measuring quality of concrete, such as temperature, air content and slump, standby and travel), CSA A23.2-1C,3C,4C and 5C..... Time basis+
disbursements

10. Laboratory Density of Hardened Concrete (per specimen), ASTM C642	\$ 26.00
11. Yield Analysis of plastic concrete, CSA A23.2-6C.....	Time basis + disbursements
12. Linear Traverse, ASTM C457 (Coring in accordance with I.A.5) sample preparation included — per surface	\$294.00

B. Aggregates, CSA A23.2

1. Sieve analysis, CSA A23.2-2A, ASTM C136	
a) 75 mm maximum size to 5 mm.....	\$ 75.00
b) 40 mm maximum size to 5 mm.....	\$ 66.00
c) 5 mm maximum size (sand)	\$ 56.00
2. Materials finer than 0.08 mm sieve by washing, CSA A23.2-5A, ASTM C117	\$ 44.00
3. Surface moisture in fine aggregate, CSA A23.2-11A, ASTM C70.....	\$ 22.00
4. Relative Density and Absorption	
a) Fine aggregate, CSA A23.2-6A, ASTM C128.....	\$ 94.00
b) Coarse aggregate, CSA A23.2-12A, ASTM C127.....	\$ 66.00
5. Lightweight pieces in aggregate, CSA A23.2-4A, ASTM C123 using a liquid with specific gravity of 2.0.....	\$102.00
6. Los Angeles Abrasion, CSA A23.2-16A or 17A, ASTM C131 (per charge)	\$139.00
7. Unit weight of aggregate, CSA A23.2-15A, ASTM C29 (per test).....	\$ 27.00
8. Petrographic Analysis, CSA A23.2-10A ASTM C295	Time basis + disbursements
9. Percentage Crush Coarse Aggregate (1 face) — per sample.....	\$ 43.00
10. Stain test for lightweight aggregate, ASTM C641	\$119.00
11. Sand Equivalent Value, ASTM D2419.....	\$ 81.00
12. Organic impurities in fine aggregate for Concrete, CSA A23.2-7A,	

ASTM C40	\$ 18.00
13. Effects of organic impurities in fine aggregate, CSA A23.2-8A, ASTM C87 — for 2 sets of six 50 mm cubes	\$357.00
14. Soundness of Aggregates, CSA A23.2-9A, ASTM C88 (sieve analysis extra)	
a) Fine Aggregate — per size	\$284.00
b) Coarse Aggregate — per size	\$257.00
15. Potential Alkali Reactivity of Cement Aggregate Combinations (Concrete Prism Method, CSA A23.2-14A and/or Mortar-Bar Method, ASTM C227).....	Time basis + disbursements

C. Cement, CSA A5, ASTM C150

1. Fineness by Air Permeability Apparatus, ASTM C204	\$ 59.00
2. Fineness by Turbidimeter, ASTM C115	\$ 59.00
3. Fineness by Sieving, CSA A5 (0.045 mm).....	\$ 73.00
4. Compressive Strength of 50 mm cubes, CSA A5, ASTM C109	
a) Set of 6 cubes — per set.....	\$132.00
b) Set of 9 cubes — per set.....	\$160.00
5. Air Content Mortar, ASTM C185	\$ 90.00
6. Autoclave Expansion, CSA A5, ASTM C151	\$175.00
7. Normal consistency, CSA A5, ASTM C187	\$ 48.00
8. Time of Set, CSA A5	
a) Gillmore Apparatus, ASTM C266	\$ 74.00
b) Vicat, ASTM C191.....	\$101.00
9. Specific Gravity, ASTM C188.....	\$ 74.00
10. Sampling of cement, CSA A5, ASTM C150	Time basis + disbursements

D. Pozzolans & Fly Ash, CSA A 23.5, ASTM C331

1. Specific Gravity, ASTM C311.....	\$ 74.00
2. Percent Retained on 0.045 mm Sieve, CSA A5, ASTM C311.....	\$ 73.00
3. Pozzolanic Activity Index with cement (for 2 mixes), ASTM C311	
a) Compressive Strength of Mortar Cubes (for 2 sets of six 50 mm cubes).....	\$264.00
4. Amount of Air-Entraining Admixture (for 2 mixes), ASTM C311	\$175.00
5. Drying Shrinkage of Mortar Bars (for 2 mixes), ASTM C311.....	\$285.00
6. Soundness by Autoclave, ASTM C311	\$175.00
7. Loss on Ignition (per test), ASTM C311	\$ 45.00
8. Sampling of Fly Ash, CSA A23,5, ASTM C311.....	Time basis + disbursements

E. Soil Cement

1. Mix design, ASTM C136, D558, D1632, D1633, D560 and D559	Time basis + disbursements
2. Mix design by short-cut test procedure	Time basis + disbursements
3. Atterberg Limits	
Plastic and Liquid Limit — 1 point, ASTM D4318.....	\$ 61.00
Plastic and Liquid Limit — 3 points, ASTM D4318	\$ 79.00
Shrinkage Limit, ASTM D427	\$ 55.00
4. Moisture/Density Relationship, ASTM D559, including cement — per test	\$195.00
5. Compressive Strength of Cores on Laboratory prepared samples — per test	\$ 25.00
6. Core Preparation.....	Time basis + disbursements

- | | |
|---|-------------------------------|
| 7. Cement content of soil-cement mixtures | Time basis
+ disbursements |
| 8. Coring and Sampling Soil-Cement Pavement | Time basis
+ disbursements |

II. ASPHALT MATERIALS

A. Hot Mix and Cold Mix Asphalt

- | | |
|---|-------------------------------|
| 1. Trial Mix & Design by Marshall Method, ASTM D1559—5 point curve | Time basis
+ disbursement |
| 2. Tests on Hot Mix or Cold Mix Samples & Cores | |
| a) Marshall Stability and Flow including Molding of Samples, ASTM D1559 — per mold..... | \$ 48.00 |
| b) Unit Weight, ASTM D1188 or D2726 — per mold | \$ 25.00 |
| c) Bitumen Content by extraction, ASTM D2172 or by Radio-Isotope method (calibrations extra) — per test | \$ 81.00 |
| d) • Sieve Analysis of Extracted Aggregates, ASTM C136 | \$ 82.00 |
| • Material finer than 0.075 mm sieve, by washing, ASTM C117 | \$ 42.00 |
| e) Air Voids by Calculation (Specific Gravity and Absorption Extra) — per test | \$ 25.00 |
| f) Bulk Specific Gravity of Bituminous Mix, (Rice Method) — per test | \$127.00 |
| 3. Coring & Sampling Asphaltic Concrete..... | Time basis
+ disbursements |
| 4. Field Density of Bituminous Concrete in Place by Nuclear Method, ASTM D2950-71T | Time basis+
disbursements |
| 5. Trip to Site | Time basis
+ disbursements |

B Aggregates

- | |
|---|
| 1. Sieve Analysis, CSA A23.2-A, ASTM C136 |
|---|

a)	75 mm maximum size to 5 mm.....	\$ 75.00
b)	40 mm maximum size to 5 mm.....	\$ 66.00
c)	5 mm maximum size (sand)	\$ 56.00
2.	Materials finer than 0.075 mm sieve by washing, ASTM C117	\$ 44.00
3.	Specific Gravity & Absorption (Water)	
a)	Fine Aggregate, ASTM C128.....	\$ 94.00
b)	Coarse Aggregate, ASTM C127.....	\$ 66.00
4.	Bitumen Absorption (duplicate determinations on each size) — each size.....	\$127.00
5.	Los Angeles Abrasion, ASTM C131 — per charge	\$139.00
6.	Coating & stripping test of Asphalt on Aggregate, ASTM C1664.....	\$127.00

C. Slurry Seal Coats

1.	Trial Mix.....	Time basis + disbursements
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D. Asphalt Cement, Cut-Back Asphalt & Other Asphalts

1.	Penetration, ASTM D5	\$ 69.00
2.	Loss on Heating, ASTM D6	\$ 76.00
3.	Specific Gravity, ASTM D70	\$ 59.00
4.	Viscosity S.U.S. or S.F.S., ASTM D88	\$ 84.00
5.	Viscosity, Kinematic, ASTM D2170.....	\$110.00
6.	Viscosity, Absolute, ASTM D2171	\$115.00
7.	Flash Point	
a)	Cleveland Open Cup, ASTM D92	\$ 59.00
b)	Pensky-Martins Closed Tester, ASTM D93	\$ 59.00

8. Solubility in CCl ₄ , ASTM D2042.....	\$ 62.00
9. Ash, ASTM D482.....	\$ 45.00
10. Ductility, ASTM D113 — for 3 samples.....	\$232.00
11. Softening Point, Ring & Ball, ASTM E28,D36	\$ 66.00
12. Water in Petroleum Products, ASTM D95	\$ 76.00
13. Thin Film Oven Test, ASTM D1754 (includes penetration test on residue)	\$118.00
14. Asphalt Recovery from Solution by Abson Method, ASTM D1856	\$171.00
15. Distillation of Cut-Back Asphaltic Products, ASTM D402	\$110.00

III SOILS

1. Visual classification, ASTM D2488 (per classification).....	\$ 20.00
2. Visual description (per description).....	\$ 6.00
3. Moisture Content (per test).....	\$ 5.00
4. Atterberg Limits	
a) Plastic & Liquid Limit, 1 point, ASTM D4318	\$ 61.00
b) Plastic & Liquid Limit, 3 points ASTM D4318.....	\$ 79.00
c) Shrinkage Limit, ASTM D427	\$ 55.00
5. Sieve Analysis, ASTM C136	
a) 150 mm maximum size to 0.075 mm.....	\$124.00
b) 75 mm maximum size to 0.075 mm.....	\$ 95.00
c) 40 mm maximum size to 0.075	\$ 75.00
d) 5 mm maximum size to 0.075	\$ 56.00
6. Material finer than 0.075 mm sieve by washing, ASTM C117.....	\$ 44.00
7. Hydrometer Analysis — ASTM D422 (sieve analysis extra)	\$ 81.00
8. Specific Gravity, ASTM D854	\$103.00

9. Unit Weight of Undisturbed Samples	
a) Tube Sample.....	\$ 30.00
b) Chunk Sample	\$ 42.00
10. Unconfined Compressive Strength — including moisture content and unit weight	
a) Maximum Value	\$ 61.00
b) With Stress-Strain curve.....	\$ 89.00
11. Confined Compression Test (Cohesive Material) including moisture content and unit weight	
a) Maximum Value (quick test).....	\$ 89.00
b) With Stress-Strain Curve.....	\$116.00
12. Direct Shear Strength.....	Time basis + disbursements
13. Triaxial Tests	Time basis + disbursements
14. Consolidation.....	Time basis + disbursements
15. Permeability.....	Time basis + disbursements
16. Water Soluble Sulphate Content — per test	\$ 32.00
17. pH — per test.....	\$ 13.00
18. Laboratory Vane Shear Testing (excluding moisture content).....	\$ 25.00
19. Organic Content (burning with hydrogen peroxide or loss on ignition).	\$ 55.00
20. California Bearing Ratio, ASTM D1883, Laboratory Test on remolded sample (soaked or unsoaked) Standard Proctor included — per test.....	\$307.00
21. Moisture/Density Relationship	
a) Standard, ASTM D698.....	\$171.00

b) Modified, ASTM D1557	\$210.00
c) Single Mold at Field Moisture Content.....	\$ 45.00
22. Relative Density Measurement, ASTM D4253 and D4254	
a) Minimum Density.....	\$ 30.00
b) Maximum Density.....	\$150.00
23. Field Testing California Bearing Ratio.....	Time basis + disbursements
24. Field Density by Sand Cone, Volumeter or Radio-Isotope Method, ASTM D1556, D2167, D2922	Time basis + disbursements
25. Trip to Site.....	Time basis + disbursements

IV MASONRY MATERIALS (Laboratory Testing Only)

A. Concrete Block, ASTM C140

1. Compressive Strength — per set of 3 blocks	\$ 87.00
2. Absorption and Unit Weight — per set of 3 blocks.....	\$ 90.00
3. Moisture Content — per set of 3 blocks.....	\$ 51.00
4. Linear Shrinkage — per set of 3 blocks	\$465.00

B. Clay Brick, ASTM C67

1. Compressive Strength — per set of 5 bricks	\$140.00
2. Absorption (5 hr. boiling) — per set of 5 bricks	\$130.00
3. Saturation Coefficient — per set of 5 bricks	\$165.00
4. Efflorescence — per set of 5 bricks.....	\$ 81.00
5. Initial Rate of Absorption — per set of 5 bricks	\$100.00

C. Masonry Mortar and Grout, CSA A179, ASTM C109

1. Compressive strength test
 - a) Set of 3 specimens (minimum)..... \$ 36.00
 - b) Set of 6 specimens..... \$ 72.00

V METALLURGICAL TESTING SERVICES

(Includes sample preparation in the laboratory, machining and reporting)

A. Physical Analysis

1. Tensile Test, ASTM E8, CSA Z245.1
 - a) Ultimate Tensile Strength only..... \$ 73.00
 - b) Tensile Strength, Yield Strength % Elongation, Reduction in Area
(Drop of Beam Method) \$ 90.00
 - c) As above with 0.2% Offset Method \$128.00
2. Weight per Lineal 300 mm \$ 44.00
3. Bend Test, ASTM A 370, CSA Z245.1 \$ 20.00
4. Nick Break, CSA Z183 or Z184 \$ 29.00
5. Notched Bar Impact, ASTM E23 \$ 50.00

B. Chemical Analysis (per element), ASTM A751

1. C, S, P, Mn, Si, Cr, Mo, Ni, Cu, V, Al \$ 20.00
2. Sr, Ti, Pb, Zn..... \$ 23.00
3. As, Sb, B, Nb..... \$ 62.00

VI PLASTIC SHEET TESTING

1. Base Material Tensile, (YS, UTS, Elongation) — per strip, ASTM
D638 \$ 25.00
2. Bonded Seam Strength, ASTM D882 \$ 20.00

3. Peel Strength, ASTM D413..... \$ 16.00
4. Carbon Black, ASTM D1506..... \$ 24.00
5. Melt Index, ASTM D1238..... \$ 31.00

OWNERSHIP OF DRAWINGS AND OWNERSHIP OF COPYRIGHT

Ownership of drawings, specifications and other documents used in the construction of a project is frequently confused with ownership of copyright. The ownership of drawings and related documents refers to the ownership of the drawings themselves and is governed by the contract between the Engineer or Architect and the Client. The ownership of copyright, on the other hand, refers to the ownership of the idea embodied in the drawings and the right to reproduce that idea.

1. LEGAL ASPECTS

The following are summary statements which have been derived from an article in "The Canadian Law of Architecture and Engineering" by Beverley M. McLachlin and Wilfred J. Wallace, 1987:

- a) The Engineer or Architect who creates the idea or copyrighted work retains it unless it is expressly assigned to another or is allowed to enter the public domain (ie. by publication in magazines or journals) without reservation of copyright.
- b) the drawings, specifications and other documents produced by an Engineer or Architect are the property of the Client once they have been paid for unless the Client/Consultant agreement contains provisions to the contrary.
- c) Documents produced by an Engineer or Architect while acting as a certifier or as an independent administrator of a contract between his Client and a Contractor or Supplier are the property of the Engineer or Architect.
- d) Documents, such as design notes, calculations and communication records, which are produced by an Engineer, or Architect for the sole purpose of assisting him in carrying out an assignment for a Client are the property of the Engineer or Architect.

2. PRACTICE CONSIDERATIONS

Engineers or Architects employed by either Clients or Consultants should give consideration to the above legal aspects in the drafting of the Client/Consultant agreement for a particular project. Following are summary statements of the primary considerations:

- a) To prevent re-use of drawings, specifications and other documents prepared by an Engineer or Architect acting as an agent for a Client, an appropriate clause should be inserted in the Client/Consultant agreement stating that the documents are the

property of the Engineer or Architect and are not to be used on any other project without prior written consent.

- b) If a Client wishes to prevent the re-use of an idea (innovative technical feature or specific architectural appearance) that has been developed by an Engineer or Architect while acting as an agent to the Client, an appropriate clause should be inserted in the Client/Consultant agreement stating the specific elements of the design that are not to be used on other projects without prior written consent.
- c) Originals or reproducible copies of stamped documents prepared by an Engineer or Architect while acting as an agent to a Client should be provided to the Client for use on that specific project if requested. The Engineer or Architect should retain with the originals or reproducible copies for his records.
- d) With or without contractual restrictions on the re-use of **drawings and related documents OR the idea embodied in the documents**, Engineers or Architects should be guided by their respective Codes of Ethics in their conduct with respect to re-use of drawings or the idea embodied in them.
- e) APEGGA members are encouraged to properly notify other professional members if they intend to use documents produced by the other member as reference material. In circumstances where a member intends to extract or copy documents produced by another professional member, permission should be obtained before doing so and full credit should be given to the original author.

CLIENT/PRIME CONSULTANT/SUBCONSULTANT AGREEMENTS

Standard forms of agreement are available from a number of sources including The Association of Consulting Engineers of Canada, documents ACEC 31 and 32. Many clients who deal with consultants on a regular basis have also developed their own standard forms which reflect their particular needs. Consultants and Clients using these standard forms should ensure that all of the elements of the agreement outlined in the attached format are included.

The attached format is intended as a guide to APEGGA members in drafting Client/Prime Consultant/Subconsultant agreements. It covers the four primary elements of an agreement - scope, schedule, fee basis and payment. Other items included are those that are commonly required in agreements but are not intended to represent a comprehensive list. Each assignment must be considered specifically for its own special requirements.

**CLIENT/PRIME CONSULTANT
OR
PRIME CONSULTANT/SUBCONSULTANT
AGREEMENT**

THIS AGREEMENT made this _____ day _____ 19 _____.

BY AND BETWEEN

_____ Client

and

_____ Consultant

WHEREAS the Client intends to engage the services of the Consultant in connection with the provision of _____ services for the _____ *name of project* project.

NOW THEREFORE THIS AGREEMENT WITNESSES that the parties hereby agree as follows:

[Note: If space provided under each of the articles is inadequate, indicate by notation that numbered schedules are attached as appendices.]

ARTICLE I

SCOPE OF SERVICES

1.01 Professional Services

concise but comprehensive description of services to be provided

1.02 Supplementary Services

concise but comprehensive description of support service and subcontracts

ARTICLE II

SCHEDULE

Work will commence no later than _____ 19 _____ and the services described in Article I will be performed in accordance with the following schedule:

Concise description of the schedule including dates of significant stages of the work

ARTICLE III

CLIENT RESPONSIBILITIES

3.01 Information

The Client shall provide the Consultant with a written description of the project and provide all background plans, reports and records that will be required to completed the Consulting Services.

3.02 Authority

The Client shall provide the Consultant with the authority to act as his agent, to gain entrance to property or to seek information from government and other authorities as required in the performance of the Consulting Services.

3.03 Other

Describe specific items.

ARTICLE IV

CONSULTANT RESPONSIBILITIES

4.01 Work Schedule

Describe the schedule for the main elements of the assignment

4.02 Progress Report

Describe scope and frequency

4.03 Cost Estimate

Define the type and quality of estimate to be provided and any specific limitations in schedule or quality

4.04 Other

Describe specific items

ARTICLE V

FEE BASIS

5.01 Professional Services

The Client agrees to compensate the Consultant on the following basis:

Description of services in Time Basis

Description of services in Fixed Fee Basis

5.02 Disbursements

The Client agrees to reimburse the Consultant for disbursements as described below:

*Description including mark-ups if applicable and rates for equipment or
vehicles as applicable*

5.03 Additional Services

Describe additional services and basis of fee recovery

ARTICLE VI

PAYMENT

Invoices including documentation for professional services and disbursements will be submitted to the Client by the Consultant at the end of each month. Invoices are due and payable on receipt by the Client and are overdue days later.

Describe documentation including format and interest on overdue accounts if applicable

ARTICLE VII

TERMINATION OF AGREEMENT

7.01 By Client

Concise description of circumstances and procedures including responsibility and payment

7.02 By Consultant

Concise description of circumstances and procedures including responsibility and payment

ARTICLE VIII

OWNERSHIP OF DOCUMENTS

Describe ownership of originals and schedule for transmittal in relation to completion of the assignment

ARTICLE IX

INSURANCE

Detailed description of insurance coverage to be provided

ARTICLE X

CONFIDENTIALITY

*Describe the specific undertaking, if any, to maintain confidentiality
of information associated with the assignment*

ARTICLE XI

OTHER

Describe specific items such as special requirements for Arbitration

ARTICLE XII

GOVERNING LAW

This Agreement shall be governed by the laws of _____

IN WITNESS WHEREOF the parties hereto have executed this Agreement all as of the day and year first above written.

[Client]

Per: _____

Per: _____

[Consultant]

Per: _____

Per: _____