Guideline on the *Briefing & Engagement* for Consulting Engineering Services

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GUIDELINE ON THE BRIEFING & ENGAGEMENT FOR CONSULTING ENGINEERING SERVICES

Contents

Foreword

This guideline has been published to assist commercial clients in considering the principal issues involved in briefing, selecting and engaging consulting engineers. Information is provided specifically on:

- services available from the consultant [1];
- briefing, selecting and engaging the consultant;
- risks inherent in development projects;
- insurances available to address these risks.

Companion booklets refer to:

- best practice documentation [2];
- fee guidelines covering a variety of consultants' services [3];
- the contract agreement(s) [4] under which the consultant will provide the services.

It is important for the client and the consultant to clearly establish what is required of the professional services which are being engaged.

Often a client will need help to establish the brief. This guideline will assist in describing and defining the items in the range of services, which may be required or offered. It discusses major issues to be considered and worked through by the client and the consultant.

A well-defined, and well-understood brief is critical to the success of a project.The information set out in this document seeks to define the components of a good brief, drawing on New Zealand and international experience. Research indicates that substantial savings over the total project cost can be achieved by better definition of the project at the briefing stage (AISC 2000).

If the issues are properly considered and agreed at the start of the project, there is greater likelihood that relationships will be developed positively, and greater assurance that the client's expectations can be satisfied throughout the project, to a successful conclusion for all parties.

If there is no existing Client:Consultant relationship, through a retainer or direct referral, this document outlines a variety of transparent methods used to select Consulting Services. Finally, it outlines, with reference to current practice, ways of establishing fees for such services.

When to use this Guideline

The principles of clearly defining a brief, establishing where risks fall and who can best manage those risks, plus project management apply to all projects. Whilst this Guideline is more likely to be useful for larger projects (capital value over $500,000) these principles also apply to smaller projects. Standard Contracts are available in New Zealand which take into account the principles worked through here, for both large and small jobs. These are compatible with standard contracts used and promoted internationally by the International Federation of Consulting Engineers (FIDIC) [5].

This Guideline is based on "The Briefing and Engagement of Consultants"(1997) and its predecessors, but is updated to include current legislation and common practice.

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[1] For the sake of brevity "the consultant" refers to the person or firm providing Consulting Engineering Services. A Glossary of terms is given as Appendix 1.

[2] Design Documentation Guidelines (2002).

[3] Fee Guidelines for Consulting Engineering Services (2004).

[4] Conditions of Contract for Consultancy Services (2000). A full list of References is given as Appendix 2.

[5] See References.

1 Range Of Consultancy Services

1.1 Introduction

Services provided by a consultant include the preliminary study of a problem, through the development of design concepts, the preparation of a design solution for the preferred option, and the calling and evaluation of tenders, to completion and subsequent maintenance and operation of the works.

The range of work will consist of one or more of:

Table A
PROFESSIONAL SERVICES

- Project planning and feasibility studies;
- Project assessment studies including financial analysis;
- Environmental studies and impact assessments;
- Sustainability studies;
- Geological and soils investigations, maps;
- Architectural/Engineering design;
- Preparation of tender documents;
- Evaluation of bids;
- Construction supervision;
- Project management;
- Quality management;
- Construction management;
- Cost management;
- Contract management;
- Consultancy for commissioning and decommissioning;
- Valuation services;
- Failure investigation;
- Forensic services;
- Technical training;
- Risk analysis and management;
- Operation and maintenance;
- Research and development.

Consultant services begin with the assessment of functional requirements in relation to the **Brief** (Chapter 2) including, where necessary, development of detailed requirements for the work in consultation with the client. Clients unfamiliar with engineering projects may need the advice of a consultant in determining which services should apply to a specific project.

Preliminary investigation and reporting services are required when the **Feasibility** of the project needs to be established, or where there are a number of possible alternatives for the characteristics, performance and location, etc., of the project. Establishment of the project's financial viability and preparation of submissions to funding agencies are often involved in this phase. Risk assessments for each alternative may be undertaken for major projects. This phase may include the investigation, application for and obtaining of resource consents and any other initial permits or consents necessary before the project can be implemented.

Design and **Implementation** services usually follow such preliminary studies. For projects involving civil or building works the consultant will usually be nominated as Engineer to the contract between the client and a contractor. As such, the consultant will have additional duties to carry out during the construction phase and these will be defined in the Construction Contract. Following construction the consultant's role, where appropriate, may extend to the **Commissioning** and operation of the project.

Special circumstances surrounding the project may involve the consultant in a range of services other than design and implementation. If possible, these other services should be identified and included at the outset of the commission, or otherwise as they become necessary during progress of the commission. Arrangements should be agreed concerning the consultant's involvement and the conditions of engagement appropriate to any such extension to the commission.

Specialist advice in fields other than engineering, such as quantity surveying, architecture, landscape design, land planning, and resource management, may be necessary for the project. These services may involve the consultant in co operating with or co ordinating other consultants during the project. Many firms offer clients a broad range of services.

The scope of services to be provided by the consultant must be agreed and clearly documented so that there is full understanding by both parties.

The services which follow may be grouped into three categories:

The following sections define what is covered by Technical Services, Management Services or Associated Services. For a detailed list and explanation, refer to Appendix 3.

TECHNICAL SERVICES

- Investigation
- Design
- Implementation
- General

MANAGEMENT SERVICES

- Progress
- Cost
- Quality

ASSOCIATED SERVICES

- Contract Related
- Existing Works
- Financial and Legal

1.2 Technical Services

1.2.1 Investigation

Investigation services include the obtaining and processing of technical information during the pre-design phase of a project.

1.2.2 Design

Design services may be required during the preparation of project documentation and prior to project implementation.

1.2.3 Implementation

Services offered during the implementation and commissioning phase may include administration of the tendering process, contract administration and independent assessment of construction standards.

1.3 Management Services

The management of the consultant's services with respect to progress, cost and quality during the feasibility, design and implementation stages forms an integral part of the consultants service. Management services relate to the management and co-ordination of **Progress**, **Cost** and **Quality** of the work of other parties involved in the project (refer details in Appendix 3).

1.4 Associated Services

1.4.1 Contract Related

The following services may be necessary with multiple or unusual contracts:

Co ordination Of Contractors: Where the works consist of multiple contracts, the consultant's services may involve preparing a programme of works and acting as co-ordinator for the duration of the contracts. This may require preparation of documents for sections of the work which, undertaken together, comprise the complete works, calling multiple tenders and/or negotiating and administering contracts for each section of the work. The responsibilities of the consultant undertaking such services will be dependent on the detailed definition of the consultant's role.

Special Forms of Contract: The documentation and/or administration of a project governed by special contract conditions, and any additional work incurred as a result.

1.4.2 Existing Works

A number of miscellaneous services relate to the operation, maintenance and upgrading of existing premises or works. These are outlined in Appendix 3.

1.4.3 Financial and Legal

The need for various **Financial** and/or **Legal** services may arise when the contract is disrupted through financial or other reasons, disputes arise or the principal requests additional financial information for internal accounting or insurance purposes.

FINANCIAL / LEGAL SERVICES	EXAMPLES
Bankruptcy, Obstruction, Acts of God, and Delays	Services arising out of bankruptcy, obstruction by the parties, Acts of God or delays in the construction work.
Cost apportionment	Preparation, analysis and apportionment of costs for taxation and accounting purposes.
Cost of Replacement	Inspections and surveys and preparation of estimates for the replacement or reinstatement of facilities and plant.
Litigation and Arbitration	Preparation of evidence, submission of proofs, conferring with solicitors and counsel, attendance at court, arbitration and inquiries, appearance before tribunals, acting as arbitrator.

1.5 Roading Projects

1.5.1 Design Phases

A separate section under Selection (3.4.1) discusses some of the selection (pricing) criteria for engagement of professional services on roading projects.

Although civil and structural design engineering principles are similar to building projects, the phasing of road and road bridging design is slightly different.

The design of roading projects generally involves three phases: Project Feasibility Reporting; Investigating and Reporting; and the Detailed and Construction Design phases. This is in comparison with the five phases of professional service for design of building projects (refer section 2.2.2):

BUILDING PROJECTS	ROADING PROJECTS
Concept Design	Project Feasibility Report
Preliminary Design	Investigating & Reporting
Development Design	
Detailed Design	Detailed & Construction Design
Construction Design	
Construction Monitoring	Construction Monitoring(high level)

1.5.2 Construction Monitoring

For roading projects the construction monitoring work is a larger component of the total professional services than for building projects. The management supervision and quality assurance phase often involves the consulting engineer in the Engineer to the Contract role, which, in building contracts, is normally undertaken by the architect or project manager.

Construction monitoring of roading projects is generally to either CM3 (for urban or rural projects) or CM4 (for most highway and motorway projects) (refer Appendix 4 and Fee Guidelines).

1.5.3 Additional Services

Additional services may also include one or more of the following items: property access and acquisition; risk analysis; environmental monitoring; and public relations. Specialist consultants such as Noise Attenuation Consultants may also be called in.

2 Preparation Of Consultant Brief

2.1 Introduction

The brief is a vital document, as it defines the relationship between client and consultant in terms of scope of work, deliverables, programme and contractual relationship.

All consultant commissions, even those that do not involve a formal selection process, require a well-defined brief.

A brief can be used for the calling of competitive proposals. However, selection on price alone does not always result in the lowest overall cost for a project.

A well-prepared brief will enable the consultant to submit relevant information on a range of attributes (skills, relevant experience, personnel etc) that will then allow the client to make a selection based on quality (refer to Chapter 3).

2.2 Scope of Services

In broad terms, the scope of professional services can take two forms.

In the first form, a client may have a problem, or at least may require a solution, the nature of which is not known or defined at the time a consultant is engaged. In this situation, a client and consultant need to work together to define the scope and likely deliverables before fees are agreed. In this scenario, any attempt to select solely on fees is unlikely to result in the optimum solution.

In the second form, the client is usually able to quite precisely define the scope, services and deliverables required from a consultant. In this situation, if the client can identify a consultant or a number of consultants who will meet the requirements and expectation, then it might be appropriate to select on price, providing that the scope of services and deliverables is well defined. An informed client will appreciate that full service includes consideration of alternatives and refined design to achieve the optimum solution.

It should be noted that consultants who vary significantly from fee guidelines in current usage are unlikely to be providing a full service (refer Fee Guidelines).

2.2.1 Key Requirements of a Brief

Table B [6] lists the key requirements of a brief. The level of detail will generally increase with the complexity of the project.

Table B **KEY REQUIREMENTS FOR A BRIEF**	
Client Details	• Client contact details; • Nature of client's business;· • Vision/objectives that the client has for the project; • Tenant/end user details (if different from client); • Requirements for stakeholder consultation; • Confidentiality requirements.
Project Detail	• Description of project; • Details of location, size, estimated cost or budget; • Required outcomes; • Levels of quality required; • Clearly defined scope of services for each consultant.

[6] This table is also available to download from the ACENZ Website for ready reference in your project – see References.

Table B (continued) KEY REQUIREMENTS FOR A BRIEF	
Project Team Makeup	• List of team members (e.g. client, project manager, other consultants, contractors); • Organisation chart; • Responsibility matrix; • Likely method of contractor procurement.
Technical Brief	• The relevant standards to be used; • Particular requirements for loading, services, future flexibility etc.; • Particular requirement for durability, plant processes; • Requirements for internal/external peer reviews; • Particular or unusual site conditions; • ESD* requirements; • Relevant statutory requirements (if not obvious); • Requirement to reuse existing plant/equipment/materials.

Project Staging & Programme	• Breakdown of "design" stages
	  • pre-design studies,
	  • schematic design,
	  • developed design,
	  • tender documentation etc.;
	• Timetable for delivery of documentation;
	• Expected timing/programme of physical works;
	• Requirements for early occupation, partial completion etc.;
	• Impact on existing operations/occupants;
	• Programme for consents and approvals.

Attendance & Reporting by Consultant	• Requirements for attendance at and reporting to meetings (project control, design co-ordination, construction/site etc.); • Requirements for attendance at workshops (design review, risk assessment, project procedures, value management etc.).
Deliverables	• Comprehensive lists of deliverables (e.g. reports, drawings, specification etc.); • List to include frequency/number of issues and number of sets per issue; • For structures - guidelines for quality of documentation [7].
Construction Monitoring	• Level /intensity of monitoring required [8]
Cost Control (Budget)	• Method by which cost control will be measured and managed; • Relative priority of capital expenditure versus operating costs; • Cost reporting procedures.
Information to be Supplied by Client	• Pre-project studies; • Survey/title information; • Geotechnical information; • Existing drawings.

[7] Refer to Design Documentation Guidelines (see References)

[8] Refer Construction Monitoring Guideline in Appendix 4 or in Fee Guideline (see References)

Table B (continued) KEY REQUIREMENTS FOR A BRIEF	
Client Approval Process	• Process by which client will progressively approve design during the documentation stages.
Scope/Design Variation	• Process by which variations in consultant's scope of work will be handled in terms of fee and programme.
Risk Management	• How risks will be identified; • How risk will be managed and mitigated. *See also Chapter 5*
Quality Assurance	• Level of quality assurance required; • Is a project-specific quality plan required? *See also Chapter 5*
Contractual Issues	• Conditions of engagement to be used (Refer Chapter 4: e.g. CCCS, Short Form); • Level of Professional Liability to be carried by consultant; • Level of Public Liability cover to be held by consultant.
Health & Safety Issues	• Detail of site access and Health & Safety issues during the design stages of the project; • Required involvement by the consultant in Health & Safety during the construction stages.
Selection Criteria	*See Chapter 3*
Levels of Service	• Determine the level of service (design options); • Determine what design drawings are required. *Refer Design Documentation Guidelines*

* ESD = Environmentally sustainable design (see Glossary)

2.2.2 Design Documentation Guidelines – an Industry Standard

As the provision of design drawings is a common component of any consulting engagement, it needs to be established early on what level of service (i.e. what design options) might be appropriate for a particular project.

The New Zealand Construction Industry Council has produced a clear set of guidelines on the process, with the process separated into five phases listed below. These guidelines can assist in defining the level of services required:

- concept design;
- preliminary design;
- developed design;
- detailed design;
- construction design.

These are explained in more detail in the Design Documentation Guideline (see References). They relate primarily to building projects but can be extrapolated for other projects.

3 Selecting A Consultant

3.1 Introduction

The client should select an appropriately skilled and experienced consultant to undertake the work. Many clients have a long established and satisfactory relationship with their consultants and have no need to look for alternatives. In some cases, word-of-mouth recommendations may be satisfactory.

Some clients have well proven procedures but may want (or for a particular project need) to take a fresh approach.

This section sets out a number of methods for selecting the most suitable consultant for the project when the client wishes to adopt a formal selection process.

Competent advice in the early stages of a project, coupled with innovative design and project management, can make much larger savings in the overall cost of the project than the cost of the advice. Typically, the cost of consultancy services for larger projects is less than 10% of the capital cost of a construction project and about 1% to 2% of the project's lifetime cost. For smaller projects, these percentages are often higher. More importantly, most of the decisions which will determine a project's life cycle costs, savings and success are made at the conceptual and design stages. It is therefore important to select the consultant who will contribute most to the overall success of the project.

Apart from direct engagement, the most frequently used method of selection employs some variation of "Qualification Based Selection" (QBS) such as Brooks' Law, Two Envelope, Cost Weighted, Budget etc. These, and Price Competition, are described in the following sections. Whichever method is used for the final selection process, it should be carried out after the services required have been described in a detailed brief, a short list of suitable consultant firms has been prepared and detailed proposals have been obtained from each of those short-listed. FIDIC advocates the use of QBS as the only means of ensuring that high quality advice is procured without that process being compromised by cost issues. The FIDIC Guide to Consultant Selection (2003 – see References) provides extensive guidance on the selection processes that follow.

3.2 Obtaining Proposals

3.2.1 Short-listing

Short-listing enables the client to avoid the costs and time taken in evaluating consultants who have no real prospect of selection.

Sources of information about consultants include IPENZ and ACENZ registers and databases of consultants[9], telephone directories or previous dealings with consultants (especially those known to have undertaken similar projects). Consultants may also be sought by advertising.

Consultants with appropriate qualifications should be invited to submit a brief statement of interest, experience and qualifications.

In drawing up the short-list, the client should consider a consultant's:

- relevant experience;
- availability;
- access to support resources;
- capacity to complete the work;
- past performance on client contracts;
- reputation for completing projects on time and to budget.

[9] ACENZ, IPENZ and other Professional Bodies hold on-line Directories of Members. See References.

3.2.2 Detailed Proposals

Three to five consultants should be invited to submit detailed proposals. The invitation should consist of:

(i) the brief (refer 2.2); and

(ii) a request for the consultant to provide the following information:

- a proposal that meets the requirements of the brief;
- details and organisation of the firm;
- qualifications, technical and managerial abilities of key personnel;
- the consultant's understanding of the overall requirements and nature of the project;
- past experience with projects of a similar size and nature to that proposed;
- knowledge and experience of local conditions;
- type of organisation, managerial methods and staff deployment envisaged for executing the work;
- technical approach to the project (methodology);
- the availability of resources and ability to complete the project in the time available.

It is important that all submissions be treated in confidence, and that all bidders are treated in the same way, and that the "rules" are not changed during the selection process.

3.3 Evaluation Of Proposals

Proposals should be evaluated with respect to attributes which are appropriate for the particular project. Depending on the size and nature of the project consideration should be given to:

Qualifications of the Consultant

- experience in similar projects;
- expertise of assigned staff.

Approach and Methodology

- understanding of the context, requirements and objectives of the project;
- methodology;
- support facilities;
- innovation;
- presentation of proposal.

To rank the proposals in order of merit a system of weighting of each attribute should be established. Each attribute is then assigned a score by multiplying the weight by the rating where the rating is a percentage value. The sum of the scores provides the means of ranking the proposals.

The evaluation process may also include information gathered from an interview with each consultant.

3.4 Selection

Selection of the consultant may be based solely on the basis of the ranking with respect to qualifications, approach and methodology.

Where price is important it can be incorporated as an attribute in the ranking process (appropriately but not excessively weighted) or the final price can be negotiated with the consultant whose proposal is ranked highest.

The following recognised selection procedures are in use in New Zealand.

Selection by Referral

Possibly the most commonly used situation is where a relationship already exists and no formal selection process is necessary.

Brooks' Law

Brooks' Law is a system used by federal and state authorities in the United States of America. Price competition is barred and selection is on the basis of technical merit and negotiation of a "reasonable or market price". The highest ranked consultant is invited to discuss the proposal, contract, terms and fees. The terms of reference and the contractual and legal requirements are reviewed to ensure a mutual understanding. When agreement on fees is reached, the consultant is appointed. If no agreement on fees is reached the second ranked consultant is invited for negotiation and the process continues until a satisfactory agreement is negotiated. A consultant, once rejected, should not be recalled for further negotiations.

Two Envelope System

The Two Envelope system is commonly used by international banks and at times by some large institutional clients within New Zealand. The consultant submits a proposal in two envelopes. The first envelope contains the technical proposal for evaluation, the second envelope contains the proposed price for the services. The client analyses the technical proposals and establishes an order of ranking. Negotiations are undertaken with the consultant with the highest ranking and the second envelope is opened in the presence of the client and consultant, forming the basis for contract negotiations. If agreement is reached, all other envelopes are returned unopened to the respective bidders. If agreement is not reached the next highest ranked consultant is invited for negotiations.

Cost Weighted Method

This method is similar to a procedure used by some large institutional clients in New Zealand. Price is included as one of the criteria in the ranking process. For technically demanding projects, the weighted value of price should not exceed 10% to ensure technical attributes are appropriately recognised.

Budget Method (Target Price)

The client supplies a budget for professional fees to short-listed consultants, accompanied by terms of reference for the required services. Selection is then made on the basis of the best technical proposals and standards of service offered within the budget.

Price Competition

Competitive price bidding for the procurement of engineering services is appropriate only when the brief is complete and tightly defined, the task is relatively routine and the work content can be forecast with precision. It is not well suited to projects requiring professional judgement, complex designs, uncertain conditions (e.g., geotechnical), the formulation and consideration of alternative solutions, or advanced technical skills.

3.4.1 Selection Criteria for Transfund Projects

At the present time, professional fees for most roading projects are awarded under Transfund Competitive Pricing Procedure (CPP). A number of Competitive Pricing Procedures are currently used for roading projects, depending on complexity. All involve weighted assessment of non-price attributes such as track record, skills and methodology. Weighting is also given to price for services, although, in the case of Brooks' Law, this is provided in a second envelope. Under Price Quality Method, there is flexibility to negotiate on the fee component if additional value to the project can be clearly demonstrated.

For professional services contracts up to $50,000 under Competitive Pricing Procedure, the Roading Authority can use any procedure it chooses including negotiation, that minimises administration costs and effort, but which still assures a satisfactory and competitive contract price.

As an example of this method, a project with a $100,000 construction cost may have an estimated professional services fee of $10,000 based on estimates of time and cost to perform the work. This fee is demonstrated as being well within the $50,000 amount and the award of the project would likely then be agreed on a negotiated fee basis.

Typically for projects with a fee value below $50,000, the fee curves would only be used for final comparison purposes of lump sum and time cost estimates.

3.5 Notification Of Selection

The client should notify the preferred consultant of the result of the bid and reach agreement with regard to any outstanding matters, including remuneration and method of payment.

After agreement has been reached, the client should send a letter of acceptance (refer Chapter 4) to the preferred consultant and then notify all consultants who submitted a bid, of the:

- name of the successful consultant;
- names of unsuccessful consultants;
- list of scores for each attribute for all consultants;
- individual consultants attribute scores;
- list of prices submitted.

4 Engaging A Consultant

4.1 Introduction

Once agreement has been reached, a contract should be established between a client and a consultant by means of an exchange of letters or by both parties signing a formal document such as The Conditions of Contract for Consultancy Services (2000), or the Short Form Model Conditions of Engagement (2003).

4.2 Letter Of Acceptance

It is recommended practice for the client to write formally to the selected consultant advising of the award of the contract. This letter is often referred to as a Letter of Acceptance, indicating that the client has accepted the consultant's proposal. What has been accepted may not be the consultant's original proposal, but something that has been modified by a process of negotiation. It is therefore important that the Letter of Acceptance indicate clearly what has finally been accepted, both in terms of scope of services and remuneration, as well as the legal framework for the Agreement. The industry standard contract Conditions of Contract for Consultancy Services (CCCS) and its specific provisions is recommended. Reference should be made to documentary records, including minutes of any negotiation meetings.

The Letter of Acceptance is normally regarded as the instruction for the consultant to proceed. If the wording of the letter indicates that this is the intention, it must be remembered that an enforceable contract now exists between the parties, even if the formal Agreement has not yet been completed. It is therefore in everyone's interests to have the formal Agreement drawn up and signed as soon as possible after the issue of the Letter of Acceptance. This will then finally confirm the understanding of all parties about what is to be done, and for how much.

Whichever way the contract is made it is important that all of the issues be fully documented.

These include:

- the names of the contracting parties;
- the name and scope of the project;
- the scope and timing of the consultant services;
- remuneration;
- information or services to be provided by the client;
- general conditions of engagement;
- conditions of engagement that are specific to the project;
- any additional documents required to define the contract.

The use of a standard agreement form is recommended as a means of formalising a contract because of its consistent and well established format.

4.3 Formal Agreement

The formal Agreement is the complete written contract between the client and consultant. It will comprise at least a formal statement of agreement, signed by both parties, along with the scope of services to be supplied, the remuneration to be paid and the legal framework within which the contract will be carried out.

When using the CCCS, the documentation will comprise the completed Agreement for Consultant Engagement, the CCCS document, the completed Specific Provisions, the Appendices and any additional documents required.

Conditions of Contract for Consultancy Services is based on sound and proven legal principles. For larger or more complex projects, it may be wise for both parties to have the completed formal agreement checked by their legal advisers prior to signature.

The Agreement for Consultant Engagement contained in CCCS provides for a simple signature by the representatives of the two parties. The requirements for witnessing or sealing the Agreement form should be checked with legal advisers.

Other Standard Contracts commonly used in New Zealand are referenced in the References List (Appendix 2).

5 Risk And Insurance

5.1 Introduction

The expected outcome of engineering services is often the implementation of physical projects or operation of complex processes. Each project is normally unique and it is rarely feasible to construct and test prototypes prior to implementation. Exposure to climatic, environmental, political or commercial factors may result in the expected outcomes not being achieved in the manner intended. Consequently there are risks that unexpected difficulties will be encountered during implementation.

This section describes risks associated with development projects and considers insurances available for protection against the worst effects of such risks.

5.2 Risk

5.2.1 General

For engineering projects, emphasis is placed on the consideration of risks or hazards detrimental to the project.

The perception of risk may require changes to construction methods, materials or extended time for completion of the work. In the worst instances, the work may have to be postponed or abandoned. Often the eventuation of a risk will expose at least one party to unexpected expenditure, which may have significant financial implications for the project as a whole.

Even such commonplace events as weather, delay in supply of materials, or interruption in the supply of labour or other resources can cause a project to fail to meet its time, cost or performance requirements, and should be considered as a risk.

In dealing with the risks associated with the physical creation of the project, the best results will be obtained by appropriate allocation of the risks among the parties, with the party best able to manage the adverse effects of the risks eventuating, accepting responsibility for their management, mitigation and costs. Where it is not practicable for any other party to manage a risk, it is appropriate that the client retain it. In other instances it may be possible to obtain insurance to cover the risk.

Requiring either the client or the consultant to accept unreasonable risk will either inflate the price excessively or expose the party concerned to financial hardship, the effect of which may prevent that party effectively completing the work. Sound project management, commencing from the beginning of the project, and prior to the investigation and design phases, should identify and seek to minimise the risks involved in the project.

5.2.2 Responsibilities

The consultant should discuss with the client, preferably during the negotiation phase, the perceived risks likely to be encountered during the implementation of the project, and suggest how the risk of these hazards eventuating can be minimised and contained. Responsibilities of the contractor, consultant and principal under legislation such as the Health and Safety in Employment Act (1991 and 2002 amendment) should be considered. The client and consultant should agree who is to be responsible for accepting the financial cost of each perceived risk eventuating.

The consultant and or contractor should not be expected to take responsibility for aspects of the project that are properly the client's responsibility, or for the commercial performance of the client's project .

The consultant will normally decline to accept responsibility for work being undertaken by people who are not employed or controlled by the consultant, either directly or as a sub contractor. This is an area

where particular care must be taken in defining responsibilities, since the consultant may have been engaged to monitor the activities of, for example, the contractor on site. In this case, the role of the consultant is to reduce the risk, faced by the client, of the contractor failing to meet the requirements of the documents. It remains the contractor's responsibility to "get it right" and to carry the financial risk of any mistakes.

5.3 Project Insurance

The purpose of insurance is to spread risk. The insured transfers all or part of the risk to the insurer on the basis that it is more prudent to accept a known cost (the premium), than the possibility that a much higher cost will be incurred if the insured "risks" eventuate during the implementation of the project.

On major projects consideration should be given to Project Insurance [10] which is a comprehensive policy for the insurance of the works. Project Insurance should where possible be taken out in the names of the client, contractor and consultant to ensure that the insurer responds to a loss. Parties should refer to their insurance advisers for information on the availability of such a policy and its appropriateness to the proposed works.

5.4 Professional Indemnity Insurance

Consulting Engineers carry Professional Indemnity insurance (sometimes known as Civil Liabilities insurance) which indemnifies the consultant in respect of liabilities arising from professional activities.

These are liability, not material damage, insurances. They do not protect the client or the client's project, except indirectly, and then only if it can be shown that the client's loss arises from an act or omission of the consultant which the law holds to be negligent. In this event, the insurance will provide money, to the limit of the cover, for the consultant to meet the costs agreed between the parties or awarded by the court.

Professional indemnity policies are issued annually and operate on a "claims made" basis. "Claims made" policies cover only claims where the circumstances of the loss are identified and notified during the period of the policy. The simplest policies cover only work undertaken by the consultant during the currency of the policy. To provide cover for losses arising from acts or omissions which took place prior to the policy period, and which are identified during the currency of the policy, the policy needs to include a retroactive provision. A retroactive policy is necessary if the client wishes to ensure that the insurer will respond in the event that the consequences of a negligent act are detected in a subsequent policy period.

As the cover lapses if the policy is not renewed, the conditions of engagement should define the period, if any, for which the client requires the consultant to undertake to carry professional indemnity insurance beyond the completion date of the consultant's contract engagement.

Professional indemnity insurance is charged at a variable rate on the turnover of the consultant, the rate increasing with the increasing level of nominated cover. The cost of increasing the consultant's insurance cover for the duration of the project can be considerable. Changes in the insurance market may also result in the cost of the insurance increasing during the period for which cover is required. Agreement needs to be reached on the amount of extra cover, the number of years for which such additional cover is to be maintained (subject to it being available on a continuing basis) and the party who is to meet the cost of such additional insurance. Policies of professional liability insurance are normally available in multiples of $100,000 and may be limited to the sum insured, subject to one reinstatement or to automatic reinstatement. Where the policy is limited to the sum insured, this amount is the total payable under the policy for all claims notified in the policy period. Alternatively, a policy with reinstatement provisions

[10] Insurance terms are defined in the Glossary, Appendix 1.

limits the amount payable in respect of one claim to the limit of the policy nominated sum but allows one or more reinstatements of the policy, as appropriate, in respect of cover for other claims notified.

An appropriate level of liability should be selected following consideration of the size of the project, the nature of the work and the potential for consequential losses. Both the CCCS and the Short Form Conditions of Engagement stipulate default options limiting liabilities for the consultant.

ACENZ has also produced some interpretive guidelines on the desirability of limiting liability and sharing risk appropriately (see References).

The client is entitled to be satisfied with the liability insurance arrangements of the consultant.

6 The Fees

6.1 Basis For Establishing Fees

The consultant expects to be paid a fee which reflects the qualifications, training, skill and experience being brought to the job, plus an allowance for risk exposure and a reasonable profit. The client expects value for money. The fee level must therefore be seen to be fair and equitable to both parties. Where the exact fee is uncertain, the basis for setting it must be clearly understood by both the client and the consultant before work commences.

Possible fee arrangements that have been used in the past to achieve fair results are set out below, and elaborated on in the Fee Guideline document.

Where appropriate, the fees for different portions of a project may be assessed on a different basis. It is agreement on a suitable and appropriate overall fee for the project that is important.

It is emphasised that, if for no other reason than being up front with fee estimates, the work to be done is very carefully defined and understood between the parties (refer Chapter 2).

6.2 Basic Fee Types

6.2.1 Time Writing

Time writing is a common method of charging, and often used for smaller jobs, or where the scope of work cannot be clearly defined. The consultant records the time actually spent working on the client's job and invoices the client at an agreed rate per hour, day or other agreed period. It is particularly appropriate for investigation, feasibility studies and research work.

Hourly rate fees are typically related to an employee's salary, escalated by a multiplier that takes into account overheads, training, up-skilling and a profit margin. Multipliers typically range from 2.0 to 3.5. The multiplier is not mandatory, and it can vary from firm to firm for different classes of personnel.

Rates do vary over time. ACENZ publishes current Indicative Rates on its website. The reader is advised to refer to this rather than to published rates that may be out of date (see References).

6.2.2 Percentage Fee

There are many types of project where previous experience can be relied on to establish a fair **Percentage Fee** for the required engineering services. The actual types of project suitable for this type of fee may vary greatly in both character and complexity – the only requirement is that similar work has been carried out in the past and that the cost of the engineering services for such works has been reasonably stable from project to project when expressed as a percentage of the construction cost. In practice percentage fees are more common for civil and structural/building type work than for other projects.

This method has the advantage that the overall cost of the professional services can be estimated at an early stage based on the initial estimates of the cost of the project obtained during the feasibility study. This fee system is also usually self-adjusting if the scope of the work changes during the design and construction phases, unless the scope or nature of the project is reduced at a late stage. Extra engineering costs may then be incurred and the percentage fee increased to cover this on a smaller construction cost base.

Percentage Fees are often presented as curves relating the percentage fee to the total cost of the project. ACENZ has prepared a series of such curves, relating to different types and/or stages of projects that summarise current practice in setting fees. These are available for reference from the ACENZ website (see References). People using such curves should first check that the date is reasonably current, as these curves are updated periodically in response to the current economic and political climate.

Although only indicative, the curves show that the percentage fee reduces as the cost of the project increases; and the fee increases as engineering complexity increases. Some major projects are broken down into many small contracts and, while there may be good reasons for doing this, it does tend to keep the percentage fee for each contract at a higher level and add further costs of co-ordination. These are all matters for consideration when fixing the appropriate fee percentage.

6.2.3 Cost Plus Fixed Fee

For **Cost Plus Fixed** Fee engagements the fees are in two parts: the payment of actual costs incurred (based usually on hours worked at an agreed rate, which should cover the direct costs associated with the staff employed, plus reimbursables, but excluding profit); plus a fixed additional fee, being the consultant's agreed profit for the project and such share of overheads as is agreed between the parties. The rate for direct costs may or may not include full overheads.

This method shares the risk between the client and the consultant. The client is carrying some of the risk while the consultant has an incentive to complete the work expeditiously.

The fixed fee might be expected to range between about 3% of the total value of the part of the works forming the consultant's engagement for work of up to about $1 million, and 2% for works of about $10 million in value.

6.2.4 Lump Sum

Lump Sum pricing may be appropriate when the scope of work can be accurately defined. The major benefit of this method is that the end cost is known at the outset. The brief must therefore fully define the nature and extent of the services.

If the brief is altered the Lump Sum price will also need to be adjusted.

6.2.5 Target Price

A **Target Price** may be used in conjunction with time writing to provide control of the total expenditure. The consultant is asked to quote on a time writing basis and a target maximum sum is nominated. If the work is completed within that sum, then the client simply pays for the time worked, plus reimbursables. If it is apparent that the work will not be completed within the sum, the parties should negotiate a continuing basis for the work.

A variation of this method is for the target price to be a **Maximum Price** for the work and for the consultant to be required to complete the service without further charge should the cost exceed this maximum sum.

Although the option of renegotiating an extension to the contract does not appear to offer any protection to the client, the discipline of having a target price can assist in monitoring progress of the work against the target and encourage early discussion between the parties if it appears that the target may be exceeded.

6.2.6 Retainer

There are two main variations in the way a **Retainer Fee** can be structured, depending on whether the retainer provides for priority of service from the consultant, or whether it also purchases a basic service provision, perhaps in the form of a pre determined number of hours of work.

The cost of any work beyond the basic provisions of the retainer is normally charged at unit rates.

6.3 Sundry Fees

6.3.1 Measurement of Works

Charges for the preparation of schedules of quantities are normally in the range of 0.5% to 1.5% of the value of the works. The figure of 0.5% would normally apply for the schedules required for simple civil engineering projects; while a higher figure would be appropriate for most mechanical and electrical works. If re measurement of the works is required, a charge in the range of 0.25% to 1% would be appropriate.

6.3.2 Valuations

Charges for valuations for insurance and similar purposes and for issuing a certificate are normally based on a sliding percentage scale:

The value to be used for assessing the fee is the total replacement value, including the cost of demolition, removal of debris and the extra cost of reinstatement.

Subsequent valuations and certifications are normally charged at 15% of the charge for the initial valuation.

DOLLAR VALUE	%
on the first $250,000 value	0.125%
on the next $2,250,000	0.065%
above $2,500,000	0.050%

6.4 Escalation

Automatic adjustments can be linked to either the Consumer Price Index or various other published indices. For services on a time writing basis, provision should be made for reasonable staff salary adjustments to be passed on to the client.

6.5 Variations To The Services

Variations to the brief for the project may involve a change in the amount of work being undertaken by the consultant. When fees are charged on a percentage fee basis a fair reward may be achieved by application of the percentage fee to the additional work involved. When the variation causes a reduction in the total value of the project and/or involves the consultant in considerable extra work for little change in the total value of the contract, a fair fee for the work involved in the variation should be negotiated between the consultant and the client at the time the variation is issued.

For fees on a lump sum basis it will be necessary for the parties to negotiate a fair adjustment in the lump sum fee to reflect the altered amount of work required by the variation. This adjustment should be negotiated between the client and the consultant as soon as the extent of the variation is known.

The process may involve considerable extra work in estimating the value of the variation and, if so, the consultant may seek reimbursement for this work.

6.6 Extensions Of Time

Where the responsibility for an extension of time lies outside the consultant's control, and the consultant incurs costs resulting from the extension of time, these costs are normally met by the client.

In any such negotiation, two issues will need to be resolved. Firstly, was the reason for the extension claim outside the control of the consultant? Secondly, if the claim is legitimate, what is the reasonable value of the claim? As in most negotiations, reasonableness on both sides will be crucial to successful resolution.

6.7 Reimbursable Expenses (Disbursements)

Reimbursable expenses relate to costs incurred by the consultant in the course of carrying out the services for the client. These costs are not specifically included within the fee proper, which primarily covers the professional expertise expended on the job. Reimbursable expenses include both external payments by the consultant to a third party and internal costs.

It is important that both client and consultant are aware of which reimbursable expenses are included within the basic fee. Normal practice for time writing or percentage fee projects is indicated in the following paragraphs. In the case of cost plus fee or lump sum contracts, such charges are often covered by the basic fee structure. In order to avoid surprises however, the issue should be discussed between the parties when agreeing the fee structure and reimbursable items identified in the Agreement.

Typical reimbursable expenses include:

Advertising

Communications: toll calls, facsimile charges, courier and postal charges, and freight charges

Computing: specialist software charges, where software results in a substantial increase in effectiveness and efficiency of service compared with standard software generally in use.

Credit & other checks

Legal & other Professional Fees

Payments made on behalf of the client

Photographic Services

Printing & Documentation: expenses incurred in providing documents in addition to those agreed.

Purchased Documents: special and proprietary (copyrighted) documents purchased for the use of the client, or for use by others within the context of the project.

Purchase or Rental of Equipment

Site Establishment: The cost of establishing a site office which might be required, for example, for the consultant to monitor the progress or quality of the work.

Special Presentation Material

Statutory Fees & Charges: made on behalf of the client

Travel: expenses, including accommodation, meals, fares and related costs.

- for private running, based on published IRD rates;
- travel time, up to a maximum of eight hours in any one working day;
- accommodation, meals and out-of-pocket expenses;
- major travel expenditure would normally be approved in advance.

6.8 Handling Fee On Reimbursable Expenses

When additional expenditure is incurred by the consultant in the form of reimbursables, it is normal business practice to charge an additional handling fee to cover both the administrative cost of incurring the expenditure and also the financial cost of carrying the charge from when it is incurred until the client reimburses the consultant.

The handling fee should be agreed between the client and consultant when establishing the overall fee structure. Typical values range between 5% and 10% of the account.

6.9 Methods Of Payment

The method and periodicity of payment should be agreed between the client and the consultant when negotiating the fee structure. It should be noted, if payment is being made in arrears, that the consultant's basic fee will need to be increased to cover the interest costs of carrying a negative cash flow. It is quite common on large jobs and with small consultancy firms to seek a payment in advance, for example as an establishment fee, in order to avoid this problem.

6.9.1 Progress, milestones etc

It is often possible to identify clear milestones within a project (for example, issue of tender documents, signing of construction contracts, plant commissioning, completion of maintenance guarantee period, etc.) and to arrange for payment to be made in instalments as those milestones are achieved. This is appropriate to percentage fee and lump sum contracts, and to the fee portion of a cost plus fee contract.

If the identifiable milestones are spaced out too widely, the finance charges incurred by the consultant in carrying a negative cash flow for a long period may be out of proportion to the simplicity of payment on milestone completion. In this case, it is often possible to arrange a mechanism for identifying and quantifying interim progress, making payments as the work progresses through those interim stages.

For small projects, irrespective of the fee basis, a variation of this method of payment is to pay against a single invoice issued at the completion of the services.

6.9.2 Periodic invoices

This is a common method of payment, frequently used when the fee basis is time writing. The usual practice is for invoices to be issued monthly for the work undertaken during the period.

Periodic invoices may also be used in conjunction with progress payments when the invoice is issued for all milestones completed and/or measured progress achieved during the period.

6.9.3 Partial payments

Partial payments may be agreed to between the client and consultant as a means of smoothing the cash flow for both parties. A prediction is made, for example, of when milestone payments will be due, and payment is made on a pro rata basis between those due dates. This is simpler than having to measure progress, but it does suffer from the disadvantage that payment is not linked to work completion and hence value earned. Work and financial control is therefore more difficult to manage. Clear records must be kept of what has been paid and when.

Acknowledgements

This document is based on the earlier document "Briefing and Engagement of Consultants"(1997). It refers to preparing contracts with the more recent Conditions of Contract for Consultancy Services (2000) but can be used for preparing briefs and selecting engineering services under any contract. It is recommended that the companion document on Fee Guidelines be discussed with your consultant in order to set an appropriate fee level for the nature and scale of the project to be undertaken.

ACENZ thanks a number of practising engineers, insurance experts and legal professionals who assisted in preparing this document.

Appendix 1: Glossary Of Terms

Agreement	see Contract;
Brief	Definition of the nature and level of work to be done and objectives to be achieved;
Briefing	Refers to a thorough understanding of these needs between the client and the consultant;
CCCS	Refers to document Conditions of Contract for Consultancy Services (ACENZ/IPENZ 2000);
Civil Liabilities Insurance	See Professional Indemnity Insurance;
Claims Made & Notified	Where the policy only responds to claims first made against the Insured and which are notified to the Insurers during the period of the insurance;
Client	The person or organisation funding or commissioning the project;
Consultant	In this document refers to the person or consulting firm providing Professional Services;
Contract	A contract arises when an oral or written instruction is accepted by one party to perform a service for another party for a consideration;
Contractor	Refers to the firm or person undertaking the project work; defined in NZS 3910;
Consulting Services	See Professional Services;
Cost plus Fixed Fee	Refer Section 6.2.3;
Engineer to the Contract	The engineer or professional acting between the client and the contractor – as defined in NZS3910.
Environmentally Sustainable Design	Design which conforms to or exceeds specified environmental standards;
ISO Standards	Defined under International Standards Organisation (ISO) Quality Assurance Procedures. FIDIC has a good booklet explaining their use in consulting practices.
Letter of Acceptance	Refer Section 4.2;
Lump Sum Fee	Refer Section 6.2.4;
Mediation	Common dispute resolution technique where a third party assists two or more parties to reach agreement;
Percentage Fees	Refer Section 6.2.2;
Professional Indemnity Insurance	(also known as Civil Liabilities Insurance) A special type of liability insurance covering loss caused by a legal liability to pay compensation to a client or other third party arising from a breach of professional duty. Such policies are usually underwritten on a "claims made and notified" basis in contrast with the "occurrence" basis of other forms of liability insurance. A policy may be of the

	traditional type responding to legal liabilities caused by "negligent" acts, errors or omissions in the performance of professional duties or a more modern and wider "civil liabilities" contract of insurance.
Professional Services	Including, but not limited to, those services set out and summarised in Appendix 3;
Project Insurance	An especially tailored policy or policies which relate solely to the insurances as may be arranged for a specific project, often covering the collective interests of the various parties involved in the project.
QBS	Qualification Based Selection; Refer Chapter 5. Note that this same acronym and concept may also be known as "Quality Based Selection".
Referral	Where the client selects the consultant by recommendation or by merit of a past or current arrangement;
Risk	Possibility of an adverse incident occurring;
Risk Management	A tool to reduce the probability and severity of risk events;
Target Price Fee	Refer Section 6.2.5;
Time Writing (Fees)	Refer Section 6.2.1.

Note: A list of the types of Professional Services are given in Appendix 3. These are not defined further.

Appendix 2: References And Further Reading

ACENZ/IPENZ 2000	Conditions of Contract for Consultancy Services (1st edition).
ACENZ /IPENZ 2003	Short Form of Agreement for Consultant Engagement – Commercial.
ACENZ /IPENZ 2003	Short Form of Agreement for Consultant Engagement – Domestic.
FIDIC 1999 also:	Conditions of Contract for Construction. 1st edition Conditions of Contract for Plant & Design Build. 1st edition Conditions of Contract for EPC/Turnkey Projects. 1st edition Short Form of Contract.
FIDIC 1998	FIDIC Client / Consultant Model Services Agreement.
FIDIC 2003	FIDIC Guideline for the Selection of Consultants 1st edition.
FIDIC 1995	Quality Based Selection for the Procurement of Consulting Services.
FIDIC 2001	FIDIC Guide to Quality Management in the Consulting Engineering Industry.
FIDIC 1997	Risk Management Manual.
FIDIC 2001	Guidelines for Business Integrity Management in the Consulting Engineering Industry.
NZCLG* 2002	Design Documentation Guidelines. [obtainable from ACENZ or NZCIC websites]. The 2002 version is a working draft; final edition is due mid 2004.
ACENZ 2003a	ACENZ CLIENT INFORMATION SHEET 1: Professional Service Contracts: Why Clients Should Limit the Liability of their Consulting Engineer. [unpublished, available from ACENZ or your consultant]
ACENZ 2003b	ACENZ CLIENT INFORMATION SHEET 2: Professional Service Contracts: Why Clients Should Use Standard Conditions of Contract for Professional Consultants. [unpublished, available from ACENZ or your consultant]
ACENZ 2004a	Fee Guidelines for Consulting Engineering Services, 1st edition, January 2004 [webresource]
ACENZ 2004b	Key Requirements for a Brief [webresource]
ACENZ/IPENZ 1997a	Model Conditions of Engagement (*superseded by CCCS*)
ACENZ/IPENZ 1997b	Briefing & Engagement of Consultants (*superseded by this document*)

* *NZ Construction Industry Council (formerly NZ Construction Liaison Group)*

The above are all available from ACENZ; IPENZ documents also available from IPENZ

NZ Standards	NZS 3910 (2003) Conditions of Contract for Building and Civil Engineering Construction.
NZ Standards	NZS 4202 (1995) Standard Method of Measurement of Building Works.
NZ Standards	NZS 4224 (1983) Code of Practice for Measurement of Civil Engineering Quantities.

NZIA 2000	SCC1 Standard Conditions of Contract. (available from NZ Institute of Architects – see below)
AISC 2000	Tilley, McFallan & Tucker "Design Documentation Quality and its Impact on the Construction Process" in *Journal of Australian Institute of Steel Construction* Vol 34 No 4, Dec 2000 (Special issue on Engineering Documentation Standards).

Relevant Legislation

Resource Management Act 1996 (and amendments)

Building Act 1991 – (Building Bill is before Select Committee, January 2004)

Health & Safety in Employment Amendment Act 2002

Arbitration Act 1996

Copywrite Act 1994 (and amendments)

Internet References

ACENZ Website	**www.acenz.org.nz/onlineframe.htm** = Directory on Line *The Association of Consulting Engineers New Zealand Inc.*
IPENZ Website	**www.ipenz.org.nz/ ipenz/finding/ipenz/** = Membership list *Institution of Professional Engineers New Zealand Inc.*
FIDIC Website	**www.fidic.org.nz** *International Federation of Consulting Engineers (Féderation Internationale des Ingénieurs-Conseils)*
NZCIC	**www.nzcic.co.nz** *NZ Construction Industry Council (formerly Construction Liaison Group)*
NZ Government	**www.legislation.govt.nz** = for text of legislation
NZIA	**www.nzia.co.nz** *New Zealand Institute of Architects*

Appendix 3: Details Of Professional Services Available

Refer to Chapter 1.

Technical Services

Investigation Services

Feasibility and Pre Feasibility Studies

Feasibility and/or pre feasibility studies are necessary to determine the functional and economic viability of the project. They may include the identification and potential use of resources, the technical and economic feasibility of the development, the evaluation of alternatives, the identification of resource shortages and suggestions as to how such shortages may be overcome.

Investigative surveys

Investigative surveys such as aerial, topographical, hydrological, marine or other surveys may be necessary to provide the consultant with essential information for project feasibility studies or project execution.

For surveys incurring high establishment costs, such as marine surveys, consideration should be given at this stage to obtaining any further information necessary for the design phase.

Site investigations

Site investigations are necessary to determine the suitability of the site and evaluate the most appropriate foundation types for construction projects. The determination of soil parameters and the investigation of the availability of suitable soils for major civil engineering projects may also be required.

Site conditions vary considerably and cost escalations frequently occur through unexpected site conditions. The client should discuss the effects that variable site conditions might have on the project with the consultant during the investigation phase and determine an appropriate level of investigation to reduce these risks to an acceptable level. The adequacy of this information for tendering purposes may need to be evaluated.

Preliminary design

A preliminary design may be necessary to determine the functional and economic feasibility of the project. Most sites are unique and cost estimates based upon similar forms of construction on other sites can be misleading.

Economic studies

Some projects may require extensive economic studies for commercial, political, or environmental reasons.

Evaluation of alternatives

A comprehensive study of alternative schemes can produce significant savings in initial costs and in operational costs during the lifetime of the project. Incorporation of innovative concepts can produce substantial savings; however, the risks associated with innovation may be significant and should be analysed. Sufficient time should be allowed for researching and testing the concepts involved.

Progress, cost and quality planning

Progress programming, cost control and quality control are important to the ultimate success of any project. Consideration of project resources, materials, plant, delivery times, etc., all significantly influence construction programmes and costs. Incorporation of appropriate quality control standards at the outset significantly reduces the risk of unacceptably high operating or maintenance costs with

the completed project. Consultants offer a wide range of services for the control of progress, cost and quality.

Environmental impact studies and assessments

All projects for which a resource consent is necessary under the Resource Management Act will require an environmental assessment of the project to be prepared.

The Resource Management Act requires that the use, development and protection of natural and physical resources will recognise and provide for the preservation of the natural character of the coastal environment, wetlands, lakes, rivers, etc.; the protection of outstanding natural features of landscape; the protection of areas of significant indigenous vegetation; the maintenance and enhancement of public access to and along coastal marine areas, lakes and rivers; and recognition of the relationship of Maori, their culture and traditions with their ancestral lands.

Projects which involve environmentally sensitive sites, operations or processes, or which have a visual impact on the environment, will require detailed environmental impact studies and assessments. The extent and cost of services required to obtain resource consents for projects may be significant. It is important therefore that the client make available to the consultant all relevant information at the outset of the project so that all environmentally important aspects of the project will be taken in account in the studies.

Statutory consent processes

Permits and consents necessary to allow the project to proceed should be obtained prior to construction. Consultant services may include advice on the nature and extent of consents, permits or approvals required and the preparation of submissions to obtain these on behalf of the client. The actual extent of services required will be dependent on the nature of the project and should be discussed between the client and the consultant at the outset of the commission.

Design Services

Design development

This involves preparation of any design reports; identification of appropriate standards; developed design of the works; preparation of specifications and other documents as required for the calling of tenders and/or construction of the works; and co ordination of design and documentation provided by other consultants.

When appropriate, the consultant will prepare copies of calculations for lodging with the appropriate authorities, answer queries relating to the design and prepare contract documents for tendering or construction purposes.

In the absence of a feasibility study, the extent to which alternatives are evaluated and the standard of documentation required should be specified.

Statutory approvals

Certain projects may require formal statutory design approvals or confirmation of compliance with consents or permits. It is usual for the consultant undertaking the design, being most familiar with the details, to carry out this work.

Preparation of schedules of quantities

Most projects require detailed schedules of quantities prepared in accordance with recognised methods of measurements such as NZS 4202 : Standard Method of Measurement of Building Works, and NZS 4224: Code of Practice for Measurement of Civil Engineering Quantities, to reduce the cost to the contractor of tendering and to provide for effective cost control during construction.

Preparation of manuals

Projects involving mechanical or electrical equipment, or manufacturing processes, may require manuals for the operation and maintenance of the equipment. The contents of manuals may vary from simple operating instructions to detailed instructions on all aspects of the operation and maintenance of the plant.

Preparation of testing and commissioning procedures

The extent of testing and commissioning services required is dependent on the nature of the project and the extent to which the client requires the consultant's involvement in the testing and commissioning of the completed works.

Close liaison and co operation between the consultant and the client are necessary to ensure that the completed works meet the client's expectations.

Preparation of tender documents

This involves the collation of tender documents, including technical plans and specifications, schedules of quantities, conditions of contract, preparation of bond and agreement forms and conditions of tendering, as appropriate. For complex contracts, legal advice on preparation of the contract documents may be required.

Implementation

Calling and evaluation of tenders

Services may involve the establishment of eligibility to tender for the works by pre-qualification; the advertising of tenders; the preparation or completion of tender dossiers; the conduct of proceedings during the tender period; the comparison and evaluation of tenders received; the submission of reports on the evaluation of tenders and/or recommendations for clarification, negotiation or award of the contract.

Preparation of contract documents for signature

This involves the collation of contract documents; preparation of bonds, agreements and other specific requirements of the contract; and arranging for the signing and forwarding of completed documents to the parties to the contract.

Assisting in negotiations

The services of the consultant may be required where the client elects not to tender the works but to negotiate with a specific contractor or contractors; or where, after tender acceptance, the client wishes to negotiate with the successful tenderer. Care must be taken that the role and responsibilities of the parties, as included in the plans and specifications, are not inadvertently altered and future costs concealed during the negotiation of an apparently lower contract price.

Administration of Contract

The services provided by a consultant to a client may vary according to the nature of the contract the client has entered into with a contractor.

Construction Contracts are commonly administered in accordance with either NZS 3910: 2003: Conditions of Contract for Building Civil Engineering Construction; or NZIA Standard Conditions of Contract.

The services required of a consultant therefore should be clearly identified as:

- those set out in the documents of the contract between the client (often the principal) and the supplier or contractor, and
- the duties and obligation imposed by the engagement between the client and the consultant.

Note that where a consultant is assigned the role of Engineer in accordance with NZS 3910 (or Engineer to the Contract as it is sometimes called) the consultant's dual roles are recognised in the Construction Contract (refer NZS 3910 clause 6.2.1) as:

- expert adviser to and representative of the Principal; and
- independently of either contracting party, fairly and impartially to make the decisions entrusted to him or her under the contract documents, to value the work and to issue certificates at due times.

The actual duties to be undertaken will be defined by the terms of the contract being administered. The consultant's scope of work should include clear instructions as to any degree of authorisation to be exercised by the Engineer, such as the approval of variations. Care should also be taken by both parties to ensure that the scope of work required as Engineer to the Contract is not confused with that of a Client Advocate. While the consultant may well be required to be both, project management is a broader role and is described below under "Management Services".

The issuing of Certificates is a particular feature of the impartial role of the Engineer in administering the contract. Certificates may be required for interim payment, practical completion, maintenance or completion. Payment related certificates are statements by the Engineer that, on the basis of the available evidence, the contractor has completed work to the value of the payment authorised. Issuing such a certificate does not remove the contractor's responsibility for the quality of the construction or plant. Certificates are statements necessary for the administration of the contract and do not constitute a guarantee as to the quality or completeness of the goods or services. Completion related certificates are issued when the Engineer is satisfied, on the available evidence, that the contractor has complied with the requirements of the contract to the extent necessary to issue the certificate.

Testing of materials and plant performance

These services extend to attending the inspection and testing of plant and goods before shipment, or arranging for an independent inspection service to undertake such tests and forward certification.

Construction monitoring

The consultant usually assists in monitoring the quality of work undertaken or goods provided by a contractor. This service may be required in place of, or in addition to, any quality assurance programme provided by the contractor. It provides an independent assessment of the quality of the contractor's output.

The extent of monitoring of the project works significantly affects the risk of under strength materials and/or poor quality workmanship being incorporated into the project. A high level of quality monitoring may be particularly important in reducing the risk of latent defects which may become apparent only at a later stage in the life of the project. Increased levels of quality monitoring usually involve higher cost for the client and there is therefore a need to strike a balance in selecting the appropriate level for the work involved in the project. The degree to which the consultant is engaged will depend on the level of quality monitoring required and also the extent to which the contractor is able to provide or arrange suitable independent monitoring.

The extent and type of service required will also vary, depending on the type of project being undertaken. Definition of five levels of construction monitoring are defined in Appendix 4 [11]. This system can be readily adapted to situations other than construction and provides a starting point for discussions between the client and the consultant in determining the scope of service required from the consultant.

[11] Also elaborated in Fee Guideline – see References.

Any statement or certification given by the consultant in respect of the quality of the completed works will be reliable only to the extent of the consultant's engagement for monitoring of construction.

Shop drawings

Although consultants may prepare detailed shop drawings for the purpose of component manufacture, these are normally prepared by the contractor or subcontractor involved in the construction of the works. These are not normally prepared by the consultant administering the contract.

As built Drawings

Preparation of plans and other documents recording the work as-built is essential for major plant and projects incorporating extensive services and may be beneficial for the maintenance and operation of most projects. The client should advise the purpose for which the documents are required, to ensure an appropriate level of documentation. It should be noted that the responsibility for the accuracy of these normally lies with the contractor.

Technical assistance to contractors

The contractor may require technical assistance during the construction phase of the project. Other than in design build contracts these services are normally not offered to the contractor by the consultant responsible for the design and/or implementation of the project, since to do so might introduce a conflict of interests.

Commissioning and operating services

These may include the performance testing, commissioning, operation and evaluation of completed installations. Commissioning includes the setting up of procedures, recording of data and the training of the client's technical staff. Services may involve attendance during initial start up for testing, adjusting, balancing and assisting with programmes for ongoing operation of the project.

General Services

Client supplied items	Co-ordination of equipment or fittings supplied by the client under a separate contract not under the control of the consultant.
Computer Services	The provision of specialised computer services and associated programming.
Co-ordination of Advisers	Co-ordination of other advisers appointed by the client.
Demolition or Removal	Services in connection with demolition or removal of works.
Design Build Contracts	Assistance to the client, whether employer or contractor, in the execution of a design build contract.
Grant Applications	Provision of information, making applications and conducting negotiations in connection with territorial or regional authorities and/or government grants, special tariffs or concessions.
Land Surveys	Legal surveys, including redefinition of boundaries, registration of land transfer surveys, establishment of easements or rights-of-way, or other work of a similar nature required to be carried out by a registered surveyor.
Omitted Works	Services arising from the deletion of works on the instruction of the client.
Planning Development	Preparing long term master plans for development.

Protracted Service	Protracted servicing as a result of causes beyond the control of the consultant, such as an over run of the specified contract completion date, or the contractor failing to complete the works. Such protracted servicing will be additional to the original scope of services and should be re negotiated between the client and the consultant.
Sites & Property	Advice on the selection and suitability of sites and conducting negotiations concerned with sites and buildings. Services in connection with the purchase, sale or leasing of land or buildings, obtaining easements, and negotiations to enter onto land for construction purposes or similar encroachments.Resource consent services and change of zoning applications.
Special Drawings & Models	Preparation of special drawings, models or technical information for use by the client when seeking financial grants, fund raising, making applications under statutory requirements, or negotiating with third parties.
Special Research & Prototypes	Carrying out special research in connection with a scheme or product design; including the design, construction or testing of prototype structures, materials, models, plant or equipment.
Training	The service includes the education or instruction of the client's personnel on the correct procedures for operating or controlling the works. Unless the project is itself a training project, training should be considered as a separate service.

Management Services

Services relating to Management and Co-ordination of Progress

Programme Preparation

Services include the selection of the appropriate programme management tools and preparation for the project of the design and/or construction programme.

Management of Resources

Services include the co ordination and direction of resources, including labour, for the project. These may include advanced ordering or reservation of materials, obtaining licences and permits, and the submission of returns for labour and materials.

Programme monitoring

Services may include the monitoring of progress of the various parties involved in the project, reporting on progress and recommending actions to correct deviations from programme.

Cost Management Services

Budget preparation

Services range from the preparation of budgets to the detailed estimation of the cost of construction and operation of the project.

Cost estimation may range from use of global historical records and experience, through partial design of the significant elements with appropriate contingencies, to complete design and detailed

assessment. Each of these options will affect the reliability of the cost estimate. The agreement should identify the approach to be adopted.

Budget monitoring

Services may include the monitoring of budgets, cash flow projections, control of expenditure, presentation of regular comparisons of expenditure with budget, and advice on variations between actual cost and budget. The frequency, timing and extent of reporting to the client on the cost control of the project should be agreed.

Payment certification

Assessment of the value of work completed and issue of payment certificates for the purpose of paying the contractor.

Quality Management Services

Services include establishing the appropriate level of quality for the project and designing a quality management system appropriate to the works and to the contractor's standard of quality management.

In engaging the consultant, the client should have confidence that the consultant's outputs and services will meet the client's stated and implied needs. It is desirable for the consultant to have a formalised and verifiable quality system.

Projects vary in complexity and the client should consider the quality requirements and their budgetary implications project by project. For some projects and consultancies, certification and auditing to ISO Standards may be appropriate.

Existing Works

Associated miscellaneous services relating to the operation, maintenance and upgrading of existing premises or works include:

Annual building warrant of fitness	Consultants can assist building owners by co-ordinating and managing the inspection, maintenance and reporting procedures required by the compliance schedule for the annual building warrant of fitness.
Changes to existing works	Services in connection with alterations and repairs to existing works. These can be quite extensive, especially when integrating existing and new works.
Condition of Facilities	Making inspections, preparing reports or giving general advice on the condition of facilities.
Drawings for special purposes	Preparation of drawings for leasing or other special purposes
Energy surveys	Advising on the efficient use of energy in new and existing buildings.
Failure Investigation	Investigating failures of works, facilities, or plant, and administering exploratory work by contractors or specialists.
Insurance	Special insurance surveys, arrangements and reports.
Investigation of Existing Works	Investigating and advising on existing works.
Plant & Machinery	Plant and machinery investigations, including testing and evaluation of installations in operation.

Repairs & Restoration Work	Taking particulars on site, preparing specifications and/or schedules for repairs and restoration work, and inspecting execution of the work.
Risk Assessment for Natural Phenomena	Assessment of risks associated with natural phenomena such as wind, storm, flood, fire, earthquakes, volcanoes, etc.
Safety Inspections & Reports	Advising on safety aspects of works or machinery, including compliance with safety legislation. Preparing safety certificates.
Structural Surveys	Ascertaining whether there are structural defects in those parts of a building which may materially affect its life and value.
Surety Inspections	Examining land, buildings and facilities, etc., drawings and any documents in connection with buildings, plant or equipment submitted for mortgage, surety or other similar purposes.
Tenancy Subdivision	Work in connection with building tenancy subdivision.
Valuation	Services in connection with the valuation of facilities, plant and buildings for insurance or accounting purposes.

Appendix 4: Construction Monitoring

Introduction

Five levels of construction monitoring service are defined in Table A4(i).

The appropriate level will be project dependent, influenced by:

- the size of the project;
- the importance of the project;
- the complexity of the construction works;
- the experience and demonstrated skill in quality management of the contractor.

Table A4(i) sets out the five levels of construction monitoring, describes the types of review and indicates where a particular level of monitoring is appropriate.

Tables A4(ii) and (iii) provide rating values for various aspects of a project to enable an assessment of an appropriate monitoring level to be made.

Details of applying the levels are given in the note on Fee Guidelines.

The level of construction monitoring suitable for a project can be obtained as follows:

Select value of K_A to K_D from Table A4(ii) and sum total.
A value for each K Factor must be included.

TABLE A4 (i): LEVELS OF CONSTRUCTION MONITORING SERVICE

LEVEL	REVIEW	COMMENT
CM1	Monitor the outputs from another party's quality assurance programme against the requirements of the plans and specifications. Visit the works at a frequency agreed with the client to review important materials of construction critical work procedures and/or completed plant or components. Be available to advise the constructor on the technical interpretation of the plans and specifications.	This level is only a secondary service. It may be appropriate: • for the design consultant when another party is engaged to provide a higher level of construction monitoring or review during the period of construction or • when the project works are the subject of a performance based specification and performance testing is undertaken and monitored by others.
CM2	Review, preferably at the earliest opportunity, a sample of *each* important work procedure, material of construction and component for compliance with the requirements of the plans and specifications and review a representative sample of *each* important completed work prior to enclosure or completion as appropriate. Be available to provide the constructor with technical interpretation of the plans and specifications.	This level of service is appropriate for smaller projects of a routine nature being undertaken by an experienced and competent constructor and where a higher than normal risk of non compliance is acceptable. It provides for the review of a representative sample of work procedures and materials of construction. The assurance of compliance of the finished work is dependent upon the constructor completing the work to at least the same standard as the representative sample reviewed.

CM3	Review, to an extent agreed with the client, *random samples* of important work procedures, for compliance with the requirements of the plans and specifications and review *important* completed work prior to enclosure or on completion as appropriate. Be available to provide the constructor with technical interpretation of the plans and specifications.	This level of service is appropriate for medium sized projects of a routine nature being undertaken by an experienced constructor when a normal risk of non compliance is acceptable.
CM4	Review, at a frequency agreed with the client, *regular samples* of work procedures, materials of construction and components for compliance with the requirements of the plans and specifications and review the *majority* of completed work prior to the enclosure or on completion as appropriate.	This level of services is appropriate for projects where a lower than normal risk of non compliance is required.
CM5	Maintain personnel on site to *constantly* review work procedures, materials of construction and components for compliance with the requirements of the plans and specifications and review completed work prior to enclosure or on completion as appropriate.	This level of service is appropriate for: • major projects • projects where the consequences of failure are critical • projects involving innovative or complex construction procedures. The level of service provides the client with the greatest assurance that the completed work complies with the requirements of the plans and specifications.

TABLE A4(ii): ASSESSING THE VALUE OF THE CONSTRUCTION WORK

CRITERIA	K	ASSESSMENT				VALUE
Project Status	K_A	Small **1**	Medium **2**	Large **3**	Major **4**	
Complexity of work procedures	K_B	Routine **2**	Difficult **4**	Complex **6**		
Relevant experience of constructor	K_C	Inexperienced **6**	Experienced **2**	Certified ISO 9000 **1**		
Consequences of non-compliance	K_D	Minor **1**	Moderate **4**	Serious **6**	Critical **12**	
KTOTAL = K_A + K_B + K_C + K_D						

Use K_{TOTAL} to select the level of construction monitoring appropriate from Table A4(iii).

TABLE A4(iii): LEVEL OF CONSTRUCTION MONITORING

K TOTAL	CM1	CM2	CM3	CM4	
5-6		**Sampling only**	-	-	-
7-8		N/A	**Weekly**	-	-
9-10		N/A	**Twice Weekly**	-	-
11-12	Secondary Service	N/A	N/A	**Twice Weekly**	-
13-14		N/A	N/A	**Every second day**	-
15-16		N/A	N/A	**Daily**	-
17 +		N/A	N/A	N/A	**Constant**

N/A = Not Appropriate

Secondary service = This level of service is only appropriate when another party is responsible for undertaking the primary review of construction standards.

Table A4(iii) indicates the frequency of review considered to be appropriate for the project concerned. Frequency of inspection is intended to be indicative of involvement with actual frequency dependent on the rate of progress of the works.