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BOARD NOTICE

NOTICE 243 OF 2013

Engineering Council of South Africa

Guideline for Services and Processes for Estimating Fees for Persons Registered in terms of the Engineering Profession Act, 2000, (Act No.46 of 2000)

The Engineering Council of South Africa, under Section 34(2) of the Engineering Profession Act, 2000 (Act No. 46 of 2000), provides this guideline for determining the services to be provided on projects and to facilitate estimations of appropriate fees that could be used in negotiations between Clients and the Consulting Engineers.

Any amount mentioned in or fee calculated in terms of this Schedule is exclusive of Value Added Tax.

The commencement date shall be 1 January 2014.

ECSA has applied to the Competition Commission for an exemption from the provisions of the Competition Act 89 of 1998, in terms of which the Guideline Fees may be considered to be anti-competitive. The outcome of the exemption application may result in the discontinuation of publishing the Guideline Fees by ECSA and the use thereof by the public or full exemption may be granted.

SCHEDULE

GUIDELINE of Services and Processes for Estimating Fees for Registered Engineering Professionals

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1. PREAMBLE

This document provides an approach for determining fees to be paid for engineering services that are fair and equitable to all parties. This approach serves as a **GUIDELINE** only and any other basis most appropriate to the situation at hand should be used by the Client and the Service Provider to arrive at an agreed professional fee for the service to be provided.

This document envisages four different methods of remuneration, which are not necessarily mutually exclusive, namely:

(i) Percentage fee based on the **cost of works**

(ii) Fees for services that are additional to those provided for in the normal percentage fee based calculation.

(iii) Value based fees

(iv) Time based fees and

In addition to the above, the **consulting engineer** will also be reimbursed for expenses as described in these guidelines.

Where the **scope of work** and services to be rendered are uncertain remuneration will primarily be based on time and reimbursable expenses.

Where the location, size, character, form and function of the **works** has been defined through previous studies and investigations that have either formed part of the **client's** normal business practices or have been the subject of previous separate assignments by the same or another Service Provider, the remuneration can be determined using these guidelines based on the **cost of the works**. This provides a convenient way to express the fee payable if the **cost of the works** and the related extent of the services to be provided is somewhat uncertain.

Once the **client** and **consulting engineer** have agreed on a mutually acceptable definition of the **scope of work**, the required services have been clearly defined and an appropriate total fee has been agreed, then the **Client** and **consulting engineer** should agree on commercial terms that set out the timing of deliverables and related payments as well as the method of payment that seeks to balance consulting engineer cash flow and **client** risk.

This **GUIDELINE** has been produced as a basis for negotiation to assist the **client** and **consulting engineer** in achieving a fair remuneration for the services provided. The intention of this document is also to ensure that the **client** understands the risks associated with agreeing to pay a **consulting engineer** too low or too high a fee. However, it remains the prerogative of the **client** and **consulting engineer** to negotiate a fee for the services to be provided. This guideline should not be seen as a starting point from which to try to discount fees to the extent that the **consulting engineer's** remuneration becomes insufficient to attend to all aspects of the services that are required to the detriment of the **project.** This guideline rather provides an indication of the range of fees that will normally be required to ensure fair remuneration and also gives some indication of factors that would require higher or lower fees that can be negotiated on the basis of mutual trust.

ECSA acknowledges that many **clients** who may appoint **consulting engineers** to undertake certain work, may not have the background and experience on similar engineering projects. This Guideline is intended to assist in such circumstances and to contribute to sound business relationships and mutual confidence and respect between **clients** and **consulting engineers**.

It remains the prerogative of the **client** and **consulting engineer** to utilise this document as a basis for their negotiation or to utilise any another means to reach an agreement on the fee and services offered. The principle is that the parties can, with confidence, agree on a realistic fee that will ensure the **consulting engineer** is paid appropriately to deliver a sound professional service, where the result is appropriately optimized to provide an acceptable life cycle cost that delivers value for money.

The Engineering Council seeks to ensure that, in the interest of public health and safety and the promotion of a healthy and sustainable environment for all citizens of the country, unrealistically low or high fees for professional engineering services are avoided while maintaining free and open competition among professionals with similar skills and competence. In this way the Council seeks to;

1. Avoid unnecessary public and project risks resulting from the cutting of corners in analysis and design effort in infrastructure development in order to meet pressures to reduce costs.
2. Ensure high levels of infrastructure effectiveness by promoting the appropriate professional input in its planning, design, construction, operation and maintenance, the cost of which makes up only around 2% of the total lifecycle cost of infrastructure. Ill-advised savings on consulting engineering services and resulting wasteful expenditure due to higher ultimate project costs are not in the public interest.
3. Promote the realistic attractiveness of the engineering profession to new entrants and the sustained availability of engineering skills that are required to support the socio-economic development of South Africa.
4. Ensure that infrastructure development, that is sorely needed to meet the developmental objectives of South Africa, is not delayed or shelved because of unrealistically high capital costs.
5. Avoid inadequate engineering in the design of infrastructure projects, resulting in high development, maintenance and operating costs as well as high exposure of the public to unnecessary health and safety and environmental risks.

2. GENERAL PROVISIONS

2.1 Repeal and Transition

The Guideline Scope of Services and Tariff of Fees for Persons Registered in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000), published under Government Gazette No. 36529, Board Notice 117 of 3 June 2013, is hereby repealed.

The provision of previous Board Notices including subsequent amendments still apply in respect of services rendered during a stage which has not yet been completed by the date of commencement of this schedule.

2.2 Generality of Terms

In this document, except where the context otherwise requires or indicates:

(i) the masculine includes the feminine,

(ii) the singular includes the plural, and

(iii) any reference to a natural person includes a juristic person

2.3 Definitions

In this Schedule, any word or expression defined in the Act has that meaning, and, unless the context otherwise indicates:

(i) "**the agreement**" means the agreement signed by the **client** and **consulting engineer** that defines their relationship and obligations as well as the **scope of work** and **services** to be provided by the **consulting engineer** and the remuneration of the **consulting engineer** and related commercial terms;

(ii) "**building and multi disciplinary project**" means a project comprising building work or multi-disciplinary work, where the engineer is subject to the authority of another professional acting as the **principal consultant** or **principal agent** while financial and administrative matters may be dealt with by another professional and where the engineer is only paid a fee based on the costs of a portion of the works and has to attend project coordination meetings.

(iii) **"client"**, means any juristic person or organ of the State engaging a **consulting engineer** for **services** on a **project**;

(iv) **"construction monitoring"** means the process of administering the construction contract and over-seeing and/or inspecting the works, to the extent of the **consulting engineer's** engagement, for the purpose of verification that the works are being completed in accordance with the requirements of the contract, that the designs are being correctly interpreted and that appropriate construction techniques are being utilized. **Construction monitoring**, to whatever extent, shall not diminish the contractor's responsibility for executing and completing the works in accordance with his contract;

(v) **"consulting engineer"**, for purposes of these rules only, means any professional person registered in terms of **the Act**, or a juristic person who employs such professional, engaged by a **client** on a **project**;

(vi) **"contractor"** means any person or a juristic person under contract to a **client** to perform the **works** or part of it on a **project**, including a subcontractor under contract to such **contractor**;

(vii) **"cost of the works"** means the total final amount (or a fair estimate thereof), exclusive of value added tax, certified or which would, normally, be certifiable for payment to **contractors** (irrespective of who actually carries out the works) in respect of the **works**

designed, specified or administered by the **consulting engineer**, before deduction of liquidated damages or penalties, including –

- Escalation, assuming continuity of the project through to final completion. Where delays occur in the project cycle the client and consultant should come to an agreement on the escalation that will be applicable to various stages of services.
- a pro-rata portion of all costs related to the Contractor general obligations and overhead (preliminary and general) items applicable to the works;(irrespective of who actually carries out the works) and
- the costs of new materials, goods or equipment, or a fair evaluation, of such material, goods or equipment as if new whether supplied new or otherwise by, or to, the client and including the cost or a fair evaluation of the cost of installation (the sourcing, inspection and testing of such will comprise additional services by the consulting engineer);

(vii) "**electronic engineering services**" means services related to the provision of complex purpose designed electronic systems and detailing the terminations, signals and interconnections of electronic components as distinct from proprietary designed electronic systems and conventional electrical HV, MV and LV systems and related reticulation.

(viii) "**engineering project**" means a project of which the scope comprises mainly engineering work.

(ix) **"industrial engineering services"** means services related to the integration of resources and processes into cohesive strategies, structures and systems for the effective and efficient delivery of quality goods and services.

(x) **"normal services"** means the services set out in clause 3.2;

(xi) "**principal consultant**" means the entity appointed by the **client** to manage and administer the services of all consultants on **multi-disciplinary projects** where more than one professional service provider is appointed on a **project**. In multi-disciplinary engineering projects where these services are provided they are often called "**Engineering Management Services"**.

(xii) "**principal agent**" means the entity, person, or professional services provider named or appointed with full authority and obligation to act in terms of the contract between the **client** and the **contractor**. Depending on the form of contract applicable, the term "agent", or "engineer", or "project manager" shall have the same meaning as "**principal agent**".

(xiii) **"project"** means any total scheme envisaged by a **client**, including all the **works** and **services** concerned;

(xiv) **"quality assurance plan"** is the plan that is put in place that represents the total of the contractor's quality control processes as well as other inspections and acceptance testing processes and related activities that are associated with assuring the **client** that there is an acceptably low risk that the works will not meet the requirements.

(xv) "**scope of work**" means the portion of the **works** for which the consulting engineer is engaged.

(xvi) **"scope of services and/or services"** means the services contemplated in clause 3 on a **project** for which a **consulting engineer** is engaged;

(xvii) **"stage"** means a stage of **normal services** set out in clause 3.1;

(xviii) **"the Act"** means the Engineering Profession Act, 2000 (Act No. 46 of 2000);

(xix) **"total annual cost of employment"** means the total annual cost of employment as defined in clause 4.2(4);

(xx) **"works"** means the activities on a **project** for which **contractors** are under contract to the **client** to perform or are intended to be performed, including the supply of goods and equipment;

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2.4 Short Title

This Schedule is called the ECSA Guideline for Services and Processes for Estimating Fees for Registered Persons 2014.

3. GUIDELINE SCOPE OF SERVICES

The following guidelines are provided to indicate which services would normally be provided and for which the guidelines fees would typically represent reasonable compensation. In agreeing the services and the **scope of work** to be carried out, the **client** and **consulting engineer** should review the services listed and delete or add as applicable and agree the related compensation.

3.1 Planning, Studies, Investigations and Assessments

These typical services relate to carrying out studies and investigations as well as the preparation and submission of reports embodying preliminary proposals or initial feasibility studies and will normally be remunerated on a time and cost basis.

(1) Consultation with the client or client's authorized representative.

(2) Inspection of the site of the project.

(3) Developing a scope of work where required.

(4) Preliminary investigation, route location, planning and a level of design appropriate to allow decisions on feasibility and the selection of the most desirable project option.

(5) Assessments of existing built environment elements with a view to informing the project options, the scope of work and how to refurbish and/or integrate new **works** with existing works.

(6) Consultation with authorities having rights or powers of sanction as well as consultation with the public and stakeholder groups.

(7) Advice to the client as to regulatory and statutory requirements, including environmental management and the need for surveys, analyses, tests and site or other investigations, as well as approvals, where such are required for the completion of the report, and arranging for these to be carried out at the client's expense.

(8) Searching for, obtaining, investigating and collating available data, drawings and plans relating to the works.

(9) Investigating financial and economic implications relating to the proposals or feasibility studies.

(10) Clause (9) does not normally apply to civil and structural services on **Building Projects**, where these services are provided by a Quantity Surveyor, except as far as the interpretation of cost figures in respect of the Engineer's **scope of work** is concerned.

Deliverables will typically include:

- Collation of information.
- Reports on options and technical and financial feasibility and related implications.
- List of consents and approvals.
- Schedule of required surveys, tests, analyses, site and other investigations.

3.2 Normal Services

The services listed below are applicable to projects where the nature, form and function of the **project** has been defined through previous investigations and reports and the engineering services are required to take the **project** through to successful completion of construction.

Note, in **building** or **multi-disciplinary projects** all calculation of quantities and related cost estimates may be the responsibility of the quantity surveyor in which case they are not included as normal services of the consulting engineer. These services are shown in italics in the following lists. An exception normally occurs in the case of Mechanical engineering where bills of quantities are generally drawn up by the mechanical engineer and not the quantity surveyor. .

In other projects where quantity surveyors are not involved these services will be the responsibility of the consulting engineer.

In certain instances on building or multi-disciplinary projects these services are provided with the assistance of the consulting engineers in the respective disciplines and the specific scope should be formulated with care. For example, on building projects the electrical engineer may calculate quantities and related costs and will be compensated for this as an additional service.

In the case where only a single consulting engineer is appointed on a project the services and deliverables of the **principal consultant** listed in 3.3.6 are included as normal services. Where the required services extend through to stage 4, 5 and 6, the services of the **principal agent** defined under paragraph 3.3.8 are also included as normal services and must be agreed between the parties.

3.2.1 Stage 1 – Inception

(Defined as: Establish client requirements and preferences, refine user needs and options, appointment of necessary consultants, establish the project brief including project objectives, priorities, constraints, assumptions aspirations and strategies)

(1) Assist in developing a clear project brief.

(2) Attend project initiation meetings.

(3) Advise on procurement policy for the project.

(4) Advise on the rights, constraints, consents and approvals.

(5) Define the services and scope of work required.

(6) Conclude the terms of **the agreement** with the client.

(7) Inspect the site and advise on the necessary surveys, analyses, tests and site or other investigations where such information will be required for Stage 2 including the availability and location of infrastructure and services.

(8) Determine the availability of data, drawings and plans relating to the project.

(9) Advise on criteria that could influence the project life cycle cost significantly.

(10) Provide necessary information within the agreed scope of the project to other consultants involved.

Deliverables will typically include:

- Agreed services and scope of work.
- Signed agreement.
- Report on project, site and functional requirements.
- Schedule of required surveys, tests, analyses, site and other investigations.
- Schedule of consents and approvals.

3.2.2 Stage 2 – Concept and Viability (Often called Preliminary Design)

(Defined as: Prepare and finalise the project concept in accordance with the brief, including project scope, scale, character, form and function, plus preliminary programme and viability of the project)

(1) Agree documentation programme with principal consultant and other consultants involved.

(2) Attend design and consultants' meetings.

(3) Establish the concept design criteria.

(4) Prepare initial concept design and related documentation.

(5) Advise the client regarding further surveys, analyses, tests and investigations which may be required.

(6) Establish regulatory authorities' requirements and incorporate into the design.

(7) Refine and assess the concept design to ensure conformance with all regulatory requirements and consents.

(8) Establish access, utilities, services and connections required for the design.

(9) Coordinate design interfaces with other consultants involved.

(10) Prepare preliminary process designs, preliminary designs, and related documentation for approval by authorities and client and suitable for costing.

(11) *Provide cost estimates and comment on life cycle costs as required.*

(12) Liaise, co-operate and provide necessary information to the client, principal consultant and other consultants involved.

Typical deliverables will include:

- Concept design.
- Schedule of required surveys, tests and other investigations and related reports.
- Process design.
- Preliminary design.
- *Cost estimates as required.*

3.2.3 Stage 3 – Design Development (also termed Detail Design)

(Defined as: Develop the approved concept to finalise the design, outline specifications, cost plan, financial viability and programme for the project)

(1) Review documentation programme with **principal consultant** and other consultants involved.

(2) Attend design and consultants' meetings.

(3) Incorporate client's and authorities' detailed requirements into the design.

(4) Incorporate other consultant's designs and requirements into the design.

(5) Prepare design development drawings including draft technical details and specifications.

(6) *Review and evaluate design and outline specification and exercise cost control.*

(7) *Prepare detailed estimates of construction cost.*

(8) Liaise, co-operate and provide necessary information to the **principal consultant** and other consultants involved.

(9) Submit the necessary design documentation to local and other authorities for approval.

Typical deliverables will include:

- Design development drawings.
- Outline specifications.
- Local and other authority submission drawings and reports.
- *Detailed estimates of construction costs.*

3.2.4 Stage 4 – Documentation and Procurement

(Defined as: Prepare procurement and construction documentation, confirm and implement the procurement strategies and procedures for effective and timeous procurement of necessary resources for execution of the project.)

(1) Attend design and consultants' meetings.

(2) Prepare specifications and preambles for the works.

(3) Accommodate services design.

(4) *Check cost estimates and adjust designs and documents if necessary to remain within budget.*

(5) *Formulate the procurement strategy for contractors or assist the **principal consultant** where relevant.*

(6) *Prepare documentation for contractor procurement.*

(7) *Review designs, drawings and schedules for compliance with approved budget.*

(8) *Call for tenders and/or negotiation of prices and/or assist the **principal consultant** where relevant.*

(9) Liaise, co-operate and provide necessary information to the **principal consultant** and the other consultants as required.

(10) *Evaluate tenders.*

(11) *Prepare contract documentation for signature*

(12) Assist in pricing, documentation and tender evaluation as required when the detailed services for these activities are provided by others.

(13) Assess samples and products for compliance and design intent.

Typical deliverables will include:

- Specifications.
- Services co-ordination.
- Working drawings.
- *Budget construction cost.*
- *Tender documentation.*
- *Tender evaluation report.*
- *Tender recommendations.*
- *Priced contract documentation.*

3.2.5 Stage 5 – Contract Administration and Inspection

(Defined as: Manage, administer and monitor the construction contracts and processes including preparation and coordination of procedures and documentation to facilitate practical completion of the works)

(1) Attend site handover.

(2) Issue construction documentation in accordance with the documentation schedule including, in the case of structural engineering, reinforcing bending schedules and detailing and specifications of structural steel sections and connections.

(3) Carry out contract administration procedures in terms of the contract.

(4) *Prepare schedules of predicted cash flow.*

(5) *Prepare pro-active estimates of proposed variations for client decision making.*

(6) Attend regular site, technical and progress meetings.

(7) Review the Contractor's quality control programme and advise and agree a **quality assurance plan**.

(8) Inspect the **works** for quality and conformity to contract documentation, on average once every 2 weeks during the course of the **works** as described in more detail in 3.3.2 for Level 1: periodic **construction monitoring.**

(9) Review the outputs of quality assurance procedures and advise the **contractor** and **client** on the adequacy and need for additional controls, inspections and testing.

(10) *Adjudicate and resolve financial claims by contractor(s).*

(11) Assist in the resolution of contractual claims by the **contractor.**

(12) *Establish and maintain a financial control system.*

(13) Clarify details and descriptions during construction as required.

(14) *Prepare valuations for payment certificates to be issued by the principal agent.*

(15) Instruct, witness and review all tests and mock ups carried out both on and off site.

(16) Check and approve contractor drawings for design intent.

(17) Update and issue drawings register.

(18) Issue contract instructions as and when required.

(19) Review and comment on operation and maintenance manuals, guarantee certificates and warranties.

(20) Inspect the works and issue practical completion and defects lists.

(21) Arranging for the delivery of all test certificates, statutory (regulatory) and other approvals, as built drawings and operating manuals

Typical deliverables will include:

- *Schedules of predicted cash flow.*
- Construction documentation.
- Drawing register.
- *Estimates for proposed variations.*
- Contract instructions.
- *Financial control reports.*
- *Valuations for payment certificates.*
- *Progressive and draft final account(s)*
- Practical completion and defects list
- Electrical Certificate of Compliance

3.2.6 Stage 6 – Close-Out

(Defined as: Fulfil and complete the project close-out including necessary documentation to facilitate effective completion, handover and operation of the project)

(1) Inspect and verify the rectification of defects

(2) *Receive, comment and approve relevant payment valuations and completion certificates*

(3) Facilitate and/or procure final operations and maintenance manuals, guarantees and warranties.

(4) Prepare and/or procure as-built drawings and documentation.

(5) *Conclude the final accounts where relevant.*

Typical deliverables will include:

- *Valuations for payment certificates*
- Works and final completion lists
- Operations and maintenance manuals, guarantees and warranties
- As-built drawings and documentation
- *Final accounts*

3.3 Additional Services

The following services are additional to the normal services provided by the **consulting engineer**, unless specifically agreed otherwise between the **consulting engineer** and the **client**. **The agreement** on the services and remuneration shall be in writing and should, if at all possible, be concluded before such services are rendered.

3.3.1 Additional Services pertaining to all Stages of the Project

(1) All services related to defining the scope of work that are normally paid for on a time and cost basis.

(2) Enquiries not directly concerned with the works and its subsequent utilisation.

(3) Valuation for purchase, sale or leasing of plant, equipment, material, systems, land or buildings or arranging for such valuation.

(4) Making arrangements for way leaves, servitudes or expropriations.

(5) Negotiating and arranging for the provision or diversion of services not forming part of the works.

(6) Additional work in obtaining the formal approval of the appropriate Government Departments or Public Authorities, including the making of such revisions as may be required as a result of decisions of such Departments or Authorities arising out of changes in policy, undue delay, or other causes beyond the consulting engineer's control.

(7) Additional work related to monitoring as required by any Government Departments or Authorities in order to facilitate regulatory approvals and certification (e.g. Mines Health and Safety Act 29 of 1996).

(8) Topographical and environmental surveys, analyses, tests and site or foundation or other investigations, model tests, laboratory tests and analyses carried out on behalf of the client.

(9) Setting out or staking out the works and indicating any boundary beacons and other reference marks.

(10) Preparation of drawings for manufacture and installation or detailed checking of such for erection or installation fit.

(11) Detailed inspection, reviewing and checking of designs and drawings not prepared by the consulting engineer and submitted by any contractor or potential contractor as alternative to those embodied in tender or similar documents prepared by the consulting engineer.

(12) Travel and travel time costs related to offsite inspection and testing of materials and plant during manufacture and/or prior to delivery to site.

(13) Preparing and setting out particulars and calculations in a form required by any relevant authority.

(14) Abnormal additional services by, or costs to, the consulting engineer due to the failure of a contractor or others to perform their required duties adequately and on time. For example:

- When the works Contract is extended beyond the awarded contract period due to poor contractor performance or unforeseen circumstances, attendance at meetings and related inspections are considered as additional services. Alternatively, the portion of the fee due for supervision is adjusted pro-rata to the extended duration versus the originally expected duration.
- Where more frequent inspections are required due to poor contractor performance or other extraneous factors these are normally considered to be additional services.

(15) Executing or arranging for the periodic monitoring and adjustment of the works, after final handover and completion of construction and commissioning, in order to optimise or maintain proper functioning of any process or system.

(16) Investigating or reporting on tariffs or charges leviable by or to the client.

(17) Advance ordering or reservation of materials and obtaining licenses and permits.

(18) Preparing detailed operating, operation and maintenance manuals.

(19) Additional services, duties and/or work resulting from project scope changes, alterations and/or instructions by the client, or his duly authorized agents, requiring the consulting engineer to advise upon, review, adapt and/or alter his completed designs and/or any other documentation and/or change the services and/or duties. Such additional services are subject to agreement in writing between the **consulting engineer** and the **client** prior to the execution thereof.

(20) The frequency and extent of site administration and inspections that are required relative to the norm: The frequency and duration of works inspections will depend on many factors, such as the nature, complexity and duration of the project, site location, project programme, contractor competence, important elements of the works being enclosed or covered etc. The norm is that meetings and inspections should occur at an average frequency of once every 2 weeks with more frequent occurrences during critical stages of the works as described for Level 1 Construction Monitoring in 3.3.2. When the frequency of meetings and inspections exceeds this norm then such additional attendance at meetings and related inspections are considered as additional services,

(21) Preparing as-built drawings on designs done by others or related to alterations to existing works.

(22) Work and or services related to targeted procurement that could entail, but is not necessarily limited to any or all of the following:

- incorporation of any targeted participation goals,
- the measuring of key participation indicators,
- the selection, appointment and administration of participation and;
- auditing compliance to the above by any contractors and/or professional consultant.

(23) Exceptional arrangements, communication, facilitation and agreements with any stakeholders other than the client and contractors appointed for the works on which the consulting engineer provides services.

(24) Any other additional services, of whatever nature, specifically agreed to in writing between the consulting engineer and the client.

3.3.2 Construction Monitoring

(1) Quality assurance (QA) during construction refers to the engineering activities that are implemented to assure the client that **works** are highly likely to meet the requirements. This is achieved through a combination of the quality control processes that are **put** in place by the **contractor** to control its outputs and the inspection and acceptance testing that is carried out by the **consulting engineer** to confirm conformance prior to certification. While the **contractor** takes the ultimate responsibility for quality and meeting the design requirements, the purpose of **quality assurance plan** and related **construction monitoring** is to inspect and satisfy the client and the **consulting engineer** that the risk of these requirements not being met, is acceptable.

(2) This means that the **client** and **consulting engineer** should agree a satisfactory arrangement in respect of **construction monitoring** that suits the type of work, the project location and the duration of the critical aspects of the **works.** Disagreement regarding the required level of **construction monitoring** should not be taken lightly and the parties should carefully consider the consequences of non-compliances and related responsibilities, bearing in mind that the **consulting engineer** has a duty of care while the **client** should strive to ensure quality and minimise life-cycle costs.

(3) The level of **construction monitoring** and the frequency and duration of the site visits must be agreed with the **client** prior to commencement of the **works** and should be recorded in **the agreement** with the **client.** The level of **construction monitoring** and activities related to the **quality assurance plan** may change during the course of the **works** to reduce quality related risks and this will require an amendment of **the agreement.**

(4) The stage 5 **construction monitoring** services described in 3.2.5 above will normally suffice for simple projects where more regular inspections are not required other than during critical stages of the **works** with less frequent visits once the portion of the **works** in which the **consulting engineer** is involved has largely been completed. However, there are many other situations where more regular **construction monitoring** is required for quality assurance and certification.

(5) Aspects that need to be considered when determining the degree to which additional **construction monitoring** services are required are:

(a) The type of work.

(b) The discipline of the work (civil, structural, mechanical, electrical etc).

(c) The competency and reputation of the **contractor** and its related quality control system.

(d) The speed with which critical elements of the work are covered.

(e) The consequences of non-compliance.

(f) Timing and ease of subsequent detection and rectification of non-compliances.

(6) Arising from the above, three levels of **construction monitoring** may be defined and described, as follows:

(a) Level 1: Periodic **Construction Monitoring (Normal Services** ie no additional services**)**

The consulting engineer's staff shall:

(i) Visit the **works** at a frequency of once every two weeks on average over the duration of the **works,** with additional visits for completion inspections and inspections for defects lists.

(ii) Review random samples of material and work procedures, for conformity to contract documentation, and review random samples of important completed work prior to covering up, or on completion, as appropriate.

(b) Level 2: Part-time **Construction Monitoring (Normal Services** for **building structures** and additional services involving part-time staff paid for by the client for other disciplines and projects)

The consulting engineer's staff or part time **construction monitoring** staff shall:

(i) Regularly visit the site at a frequency which may vary during the course of the **project**, and such visits may be daily or weekly, according to the demands of the **project**.

(ii) Review regular samples of materials and work procedures, for conformity to contract documentation, and review regular samples of important completed work prior to covering up, or on completion, as appropriate.

(iii) Where the **consulting engineer** is the sole professional service provider or **principal agent**, carry out such administration of the **project** as is necessary on behalf of the **client**.

(c) Level3: Full-time **Construction Monitoring** (Full time staff seconded to the client for the duration of the **works** and paid for by the **client**)

The full time **construction monitoring** staff shall:

(i) Maintain a full time presence on site to constantly review samples of materials and work procedures, for conformity to contract documentation, and review completed work prior to covering **up**, or on completion, as appropriate.

(ii) Assist with the preparation of as-built records and drawings to the extent required in **the agreement** with the **client**

(iii) Where the **consulting engineer** is the sole professional service provider or **principal agent**, carry out such administration of the **project** as is necessary on behalf of the **client**.

(7) Most structural engineering work typically requires at least Level 2 monitoring and the costs associated with this level of monitoring are included in the guideline fee for building projects to facilitate agreements. For example, in structural concrete work the correct position of reinforcing steel may need to be witnessed for all elements of the structure prior to pouring concrete. The **consulting engineer** may also require acceptance testing of the concrete on a regular basis depending on the quality controls instituted by the **contractor** as part of the **quality assurance plan**.

(8) In the case of large civil **works** where all materials and elements are generally regarded as being critical and are covered on a daily basis, work is monitored on a continuous basis for the duration of the **works** and Level 3 monitoring usually applies. This level is also applied to the structural **works** that are included in such projects.

(9) In the case of some mechanical and electrical **works** related to simple routine projects, such as general educational buildings, primary healthcare and some institutional building projects, Level 1 monitoring is usually sufficient. On projects where a significant portion of the work is rapidly covered, such as projects involving underground services and building projects like secondary healthcare, tourism and leisure, commercial, retail and office buildings with complex electrical and mechanical **works**, Level 2 or Level 3 construction monitoring is normally required.

(10) Where Level 2 **construction monitoring** is required as an additional service and the **works** are located close to the **consulting engineer**'s offices, it may be economical to provide the additional service using the consulting engineer's office staff on a time and cost basis. Where the **works** are more remote it may be more cost-effective to second full time or part time staff to the project to carry out the necessary inspections. In all instances the **consulting engineer** will, with prior written approval having been obtained

from the **client**, appoint or make available additional staff for such construction monitoring on site to the extent specifically defined in **the agreement**.

(11) In some instances, staff are made available by the **client** to assist in **construction monitoring** in which cases these persons should report to and take instructions from the **consulting engineer** or an authorized representative of the **consulting engineer** to avoid mixed messages being passed to the **Contractor**.

3.3.3 Occupational Health and Safety Act, 1993 (Act No.85 of 1993).

Should the client require the consulting engineer to undertake duties falling under the above Occupational Health and Safety Act and the Construction Regulations in terms thereof, on behalf of the client, the additional services may include the following:

(1) The consulting engineer must arrange, formally and in writing, for the contractor to provide documentary evidence of compliance with all the requirements of the above Occupational Health and Safety Act.

(2) The consulting engineer must execute the duties of the client, as his appointed agent, as contemplated in the Construction Regulations to the above Occupational Health and Safety Act.

3.3.4 Quality Assurance System

Where the client requires that a quality management system or quality assurance services, over and above construction monitoring services, be applied to the project, these are in addition to normal services provided by the consulting engineer and to be specifically defined and separately agreed in writing prior to commencement thereof.

3.3.5 Lead Consulting Engineer

Should the client require the consulting engineer to assume the leadership of a joint venture, consortium or team of consulting engineers, of the same discipline, prescribed or requested by the client, the additional services may include the following:

(1) Responsibility for the overall administration of all sections of the services, including those portions of the services, which fall within the ambit of the other consulting engineers.

(2) Responsibility for the overall co-ordination, programming of design and financial control of all the works included in the services.

(3) Processing certificates or recommendations for payment of contractors.

3.3.6 Engineering Management Services (Principal Consultant)

Should the client require the consulting engineer to undertake duties of an engineering management nature on behalf of the client, where the project involves (a) multi-disciplinary team(s) the additional services will include the following:

Stage 1 Services

(1) Facilitate development of a clear project brief.

(2) Establish the procurement policy for the project.

(3) Assist the client in the procurement of necessary and appropriate other consultants including the clear definition of their roles and responsibilities.

(4) Establish in conjunction with the client, other consultants and all relevant authorities, the site characteristics, rights and constraints for the proper design of the intended project.

(5) Define the consultant's scope of work and services.

(6) Conclude the terms of **the agreement** with the client.

(7) Facilitate a schedule of the required consents and approvals.

(8) Prepare, co-ordinate and monitor a project initiation programme.

(9) Facilitate **client** approval of all Stage 1 documentation.

Typical deliverables

- Project brief
- Agreed scope of work
- Agreed services
- Project procurement policy
- Signed agreements
- Integrated schedule of consents and approvals
- Project initiation programme
- Record of all meetings

Stage 2 services

(1) Assist the client in procurement of the other consultants.

(2) Advise the client on the requirement to appoint a health and safety consultant.

(3) Communicate the project brief to the other consultants and monitor the development of the concept and viability.

(4) Agree format and procedures for cost control and reporting by the other consultants.

(5) Prepare a documentation programme and indicative construction programme.

(6) Manage and integrate the concept and viability documentation for presentation to the client for approval.

(7) Facilitate approval of the concept and viability by the client.

(8) Facilitate approval of the concept and viability by statutory authorities.

Typical deliverables

- Signed consultant/client agreements
- Indicative documentation programme and construction programme

- Approval by the client to proceed to Stage 3

Stage 3 Services

(1) Agree and implement communication processes and procedures for the design development of the project.

(2) Assist the client in the procurement of the necessary other consultants including the clear definition of their roles and responsibilities.

(3) Prepare, co-ordinate, agree and monitor a detailed design and documentation program.

(4) Conduct and record consultants' and management meetings.

(5) Facilitate input required by health and safety consultant.

(6) Facilitate design reviews for compliance and cost control.

(7) Facilitate timeous technical co-ordination.

(8) Facilitate client approval of all Stage 3 documentation.

Typical deliverables

- Additional signed client/consultant agreements
- Documentation programme
- Record of all meetings
- Approval by the client to proceed to Stage 4

Stage 4 services

(1) Recommend and agree procurement strategy for contractors, subcontractors and suppliers with the client and the other consultants.

(2) Prepare and agree the procurement programme.

(3) Advise the client, in conjunction with the other consultants on the appropriate insurances.

(4) Co-ordinate and monitor preparation of procurement documentation by consultants in accordance with the project procurement programme.

(5) Manage procurement process and recommended contractors for approval by the client.

(6) Agree the format and procedures for monitoring and control by the quantity surveyor of the cost of the works.

(7) Co-ordinate and assemble the contract documentation for signature.

Typical deliverables

- Procurement programme
- Tender/contract conditions
- Record of all meetings
- Obtain approval by the client of tender recommendation(s)
- Contract documentation for signature

Stage 5 services

(1) Arrange site handover to the contractor.

(2) Establish construction documentation issue process.

(3) Agree and monitor issue and distribution of construction documentation.

(4) Instruct the contractor on behalf of the client to appoint subcontractors.

(5) Conduct and record regular site meetings.

(6) Monitor, review and approve the preparation of the construction programme by the contractor.

(7) Regularly monitor performance of the contractor against the construction programme.

(8) Adjudicate entitlements that arise from changes required to the construction programme.

(9) Receive, co-ordinate and monitor approval of all contract documentation provided by contractor(s).

(10) Agree quality assurance procedures and monitor implementation thereof by the other consultants and the contractors.

(11) Monitor preparation and auditing of the contractor's health and safety plan and approval thereof by the health and safety consultant.

(12) Monitor preparation of the environmental management plan by the environmental consultant.

(13) Establish procedures for monitoring scope and cost variations.

(14) Monitor, review, approve and issue certificates.

(15) Receive, review and adjudicate any contractual claims.

(16) Monitor preparation of financial control reports by the other consultants.

(17) Prepare and submit progress reports.

(18) Coordinate, monitor and issue practical completion lists and the certificate of practical completion.

(19) Facilitate and expedite receipt of the occupation certificate where relevant.

Typical deliverables

- Signed contracts
- Approved construction programme
- Construction documentation
- Payment certificates
- Progress reports
- Record of meetings
- Certificate(s) of practical completion

Stage 6 services

(1) Co-ordinate and monitor rectification of defects.

(2) Manage procurement of operations and maintenance manuals, guarantees and warranties.

(3) Manage preparation of as-built drawings and documentation.

(4) Manage procurement of outstanding statutory certificates.

(5) Monitor, review and issue payment certificates.

(6) Issue completion certificates.

(7) Manage agreement of final account(s).

(8) Prepare and present the project close-out report.

Typical deliverables

- Completion certificates
- Record of necessary meetings
- Project close-out report

3.3.7 Mediation, Arbitration and Litigation proceedings and similar Services

Where the client requires the consulting engineer to, on his behalf, perform the services listed hereunder or similar work, the extent thereof and remuneration therefore is subject to agreement between the client and the consulting engineer:

(1) Dealing with matters of law, obtaining parliamentary or other statutory approval, licenses or permits.

(2) Assisting with or participating in contemplated or actual mediation, arbitration or litigation proceedings such as Contractor disputes.

(3) Officiating at or attending courts and commissions of enquiry, select committees and similar bodies convened by statute, regulation or decree.

3.3.8 Principal Agent of the Client

When a **consulting engineer** is, in addition to his normal functions as **consulting engineer**, appointed as the **principal agent** of the client on a **building or multi-disciplinary project** for the purposes of procurement and construction on a **project**, the **consulting engineer** will also be responsible for the following:

Stage 3 services

(1) Prepare, co-ordinate, agree and monitor a detailed design and documentation programme

Typical deliverables

- Detailed design and documentation programme

Stage 4 services

(1) Recommend and agree procurement strategy for contractors, subcontractors and suppliers with the **client** and the other consultants

(2) Prepare and agree the procurement progamme

(3) Advise the **client**, in conjunction with the other consultants on the appropriate insurances

(4) Manage procurement process and recommended contractors for approval by the **client**

(5) Agree the format and procedures for monitoring and control by the quantity surveyor of the **cost of the works**

(6) Co-ordinate and assemble the contract documentation for signature

Typical deliverables

- Procurement programme
- Tender/contract conditions
- Contract documentation for signature

Stage 5 services

(1) Arrange site handover to the contractor

(2) Establish construction documentation issue process

(3) Agree and monitor issue and distribution of construction documentation

(4) Instruct the contractor on behalf of the client to appoint subcontractors

(5) Conduct and record regular site meetings

(6) Review, approve and monitor the preparation of the construction programme by the contractor

(7) Regularly monitor performance of the contractor against the construction programme

(8) Adjudicate entitlements that arise from changes required to the construction programme

(9) Receive, co-ordinate and monitor approval of all contract documentation provided by contractor(s)

(10) Agree quality assurance procedures and monitor implementation thereof by the other consultants and the contractors

(11) Monitor preparation and auditing of the contractor's health and safety plan and approval thereof by the health and safety consultant

(12) Monitor preparation of the environmental management plan by the environmental consultant

(13) Establish procedures for monitoring scope and cost variations

(14) Monitor, review, approve and issue certificates

(15) Receive, review and adjudicate any contractual claims

(16) Monitor preparation of financial control reports by the other consultants

(17) Prepare and submit progress reports

(18) Co-ordinate, monitor and issue practical completion lists and the certificate of practical completion

Typical deliverables

- Signed contracts
- Approved construction programme
- Construction documentation
- Payment certificates
- Progress reports
- Record of meetings
- Certificate(s) of practical completion
- Facilitate and expedite receipt of occupation certificates

Stage 6 services

(1) Co-ordinate and monitor rectification of defects

(2) Manage procurement of operations and maintenance manuals, guarantees and warranties

(3) Manage preparation of as-built drawings and documentation

(4) Manage procurement of outstanding statutory certificates

(5) Monitor, review and issue payment certificates

(6) Issue completion certificates

(7) Manage agreement of final account(s)

(8) Prepare and present the project close-out report

Typical deliverables

- Completion certificates
- Record of necessary meetings
- Project close-out report

4. PROCESSES FOR ESTIMATING FEES

4.1 Application

The recommended method for the procurement of a **consulting engineer** is through a selection process based either on direct negotiation, or via a competitive bidding process where proven competence, qualifications, resources, experience, preferencing and developmental criteria are the primary selection factors and price is a secondary factor. During this process the procuring organisation will receive offers with widely ranging scope and related costs or prices. The range of prices that will be received is largely a function of the definition and perception of the scope of work and related services that are required.

The cost of engineering design services only constitutes a small element (typically around 1-2%) of the total life-cycle costs of the facility being designed, and the **client** needs to be aware that professional fees that are too low can lead to significantly increased costs of the **works** that may overshadow any savings made in the cost of the professional services.

The following paragraphs provide guidance for the use of the Tables in this section and for agreeing a fee and related scope of work and the required services between the parties.

(1) The estimated guideline fees contained in this document applies in respect of the services set out in clause 3.

(2) The **client** should remunerate the **consulting engineer**, for the services rendered, on the basis of an agreed percentage fee and related payment milestones and commercial terms. In cases where the **client** and **consulting engineer** have agreed that a percentage fee is not appropriate, such as for planning services, an arrangement can be made to determine fees on a time and costs basis. Guidelines for this are set out in clause 4.2.

(3) The **client** and **consulting engineer** should agree on reimbursements for all expenses and costs. Clause 4.6 provides guidelines in this regard and these should be paid monthly.

(4) The fee is determined on the information provided at the time of procurement, particularly in respect of the **scope of work**, **scope of services**, **works** budget, and expected project duration. Any subsequent changes, including unforeseen changes to the project situation and engineering effort, may result in adjustment of the fee.

In certain instances the fee may be expressed as a lump sum, in which case the amount will be subject to change as described below.

The **project** budget is relied upon when determining the percentage or lump sum fee, and where the final **cost of the works** varies by more than 15% from the value on which the fee is determined, the fee may be adjusted.

(5) In certain project types the **scope of work** may include full **services** for some elements of the work and limited **services** for other elements. For example, in some situations the **consulting engineer** may be asked to provide advice, design review and **construction monitoring** related to elements designed and detailed by others. The fees for such limited services are subject to agreement between the client and consulting engineer and may be determined on the basis of time and cost or by adding a pro-rata portion of between 15% and 100% of the cost of these elements, depending on the work involved to ensure compatibility, the degree of responsibility and related liabilities that could accrue.

For example, in building work, the consulting engineer is entitled to a full fee for all elements of the work where he is appointed as the competent person in terms of SANS 10400 and he is required to certify and sign off the design, inspection, and/or completion, regardless of who actually designed and detailed elements of the work. Examples of this include piling, lateral support, load bearing brickwork, fire protection, artificial ventilation, stormwater disposal, non-water-borne sanitary disposal or drainage systems.

(6) Where the consulting engineer assumes responsibility for the overall structural system of a building in terms of SANS 10400, but certain elements of the structure are designed, inspected and certified by another competent person, he has to ensure overall functionality and compatibility of these elements with the primary structure as part of his duties. He may also have to coordinate obtaining separate design certificates for these elements so that the responsibility for the elemental designs will rest with other professionals. The consulting engineer that accepts overall responsibility for the structure is normally remunerated for this limited service by adding 1/3 of the **cost of these works** to his **scope of work**.

Such items/elements could include:

- Non-load bearing brickwork
- Sheeting and Cladding
- Glazing and Facade Systems
- Proprietary Timber Roof Trusses
- Sundry steelworks subjected to loads such as balustrades, bulkhead supports, etc)

(7) While these guidelines can be applied to many projects the factors that influence the fees to be paid for **consulting engineering** services are complex and depend on several factors that are expanded upon in 4.3.3 below.

(8) Agreement on any fees should be reached at the time of the engagement of the **consulting engineer** or as soon as possible thereafter, but in all cases prior to the **consulting engineer** rendering services which may be affected by the agreed fee.

(9) Where the normal services required on a project relate to more than one of the disciplines of consulting engineering namely civil, structural, mechanical, electrical or electronic engineering services, a separate fee for the services in each discipline should be agreed.

(10) Where works are undertaken on separate non-contiguous sites or where continuity is interrupted or where the works are unusually fragmented or are constructed as separately documented phases or sections, the fee for **normal services** can be determined and agreed as:

(a) the sum of the fees determined separately for each site, contract, phase or section as if they were separate works; or

(b) a fee agreed to between the **client** and the **consulting engineer** and which fee lies between the fee determined on the total cost of the works and the sum of the fees contemplated in clause (a) above.

(11) The following fees may be claimed after each stage of services or monthly or as agreed between the consulting engineer and the client:

(a) Time based fees applicable when the services were rendered.

(b) Percentage fees determined on the basis of the **cost of the works** prevailing at the time of the fee calculation and pro-rata to the completed **services,** or a portion of the total fee based on completion of the stages along the lines indicated in 4.3.6.

4.2 Time Based Fees

Appointments for time based fees are normally made where the scope of work is not clearly defined at the time of procurement of the **consulting engineer**. This provides an opportunity for both the client and consulting engineer to modify the scope as work proceeds in order to develop confidence in the study and design outputs and to investigate issues that are uncovered as the work progresses. Time based fees are also appropriate on small projects, and for certain types of specialist appointment.

(1) Time based fees are all-inclusive fees, including allowances for overhead charges incurred by the consulting engineer as part of normal business operations, including the cost of management, as well as payments to administrative, clerical and secretarial staff used to support professional and technical staff in general and not on a specific project only.

(a) Time based fees are calculated by multiplying the agreed hourly rate (for which guidelines are provided in clause 4.5), which is applicable to the consulting engineer or any other technical staff employed by the consulting engineer, with the actual time spent by such technical staff in rendering the services required by the client.

(b) Technical staff include all staff performing work directly related to the execution of the services the consulting engineer is engaged for by the client and excludes all administrative, clerical and secretarial staff used to support professional and technical staff in general and not on a specific project only, but includes the typing of letters, minutes, reports and documents for projects.

(2) To determine the time based fee rates the persons concerned are divided into:-

(a) *Category A*, in respect of a private consulting practice in engineering, shall mean a top practitioner whose expertise and relevant experience is nationally or internationally recognized and who provides advice at a level of specialization where such advice is recognized as that of an expert.

(b) *Category B*, in respect of a private consulting practice in engineering, shall mean a partner, a sole proprietor, a director, or a member who, jointly or severally with other partners, co-directors or co-members, bears the risks of the business, or a person that takes responsibility for the projects and related liabilities of such practice and where his/her level of expertise and relevant experience is commensurate with the position, performs work of a conceptual nature in engineering design and development, provides strategic guidance in planning and executing a project and/or carries responsibility for quality management pertaining to a project.

(c) *Category C*, in respect of a private consulting practice in engineering, shall mean all salaried professional staff with adequate expertise and relevant experience performing work of an engineering nature and who carry the direct technical responsibility for one or more specific activities related to a project. A person referred to in Category B may also fall in this category if such person performs work of an engineering nature at this level.

(d) *Category D*, in respect of a private consulting practice in engineering, shall mean all other salaried technical staff with adequate expertise and relevant experience performing work of an engineering nature with direction and control provided by any person contemplated in categories A, B or C.

(3) The guideline time based fee rates are:-

(a) Calculated for a person in category-

(i) A and B at 22, 00 cents per hour;

(ii) C at 17, 5 cents per hour; and

(iii) D at 16, 5 cents per hour,

for each R100 or part thereof of the **total annual cost of employment** of the person concerned, as contemplated in sub-clause (4); or

(b) based on such indicative time based fee rates as are determined from time to time by various bodies such as the Department of Public Services Administration (DPSA) .. Provided that in all cases the client and consulting engineer may agree on a more appropriate fee to take account of the specific services to be rendered or expertise to be applied.

(4) For the purposes of clause 4.2, the **total annual cost of employment** of a person means the total amount borne by an employer in respect of the employment of such a person per year, calculated at the amounts applicable to such a person at the time when the services are rendered, including –

(a) Basic salary or a nominal market related salary, excluding profit share and asset growth;

(b) Fringe benefits not reflected in the basic salary, including:

(i) Normal annual bonus;

(ii) Employer's contribution to medical aid;

(iii) Group life insurance premiums borne by the employer;

(iv) Employer's contribution to a pension or provident fund; and

(v) All other benefits or allowances payable in terms of a letter of appointment, including any transportation allowance or company vehicle benefit, telephone and/or computer allowances, etc; and

(c) Amounts payable in terms of an Act, including:

(i) Contributions to the Compensation Fund in terms of the Compensation for Occupational Injuries and Diseases Act;

(ii) Contributions to unemployment insurance in terms of the Unemployment Insurance Fund Act;

(iii) Levies in terms of the Skills Development Levy Act, and

(iv) Recoverable levies to all spheres of government.

4.3 Fees Based on Cost of the Works

Fees based on **cost of the works** are appropriate when the nature, form and function of the **project** has been defined through previous studies and engineering work primarily involves finalising the size and form of the **project** through the various stages of Normal Services expanded upon in section 3.2 above.

4.3.1 Project Types

The following tables categorise projects according to the typical range of fees that are appropriate.

Table 4-1: Work Types and Fee Categories for Civil, Agricultural and Structural Engineering Services

Project Type	Fee Category
General Agricultural Engineering	D
Pipelines	
Pipelines - Water	A
Pipelines - hazardous substances, submarine pipelines	D
Transport Infrastructure	
Airport Runways, Taxiways and Aprons	A
New and improved unpaved roads	C
New and Improved Urban Roads	C
New Paved Rural Roads	A
New Rural Freeways	B
New Urban Freeways	D
Railway Trackwork	A
Railways (Excluding Cost of Track)	A
Road Rehabilitation	A
Rural Road Expansion	B
Water	
Large Earth Dams	B
Large Concrete Dams	C
Small Dams	D
Stormwater Pipes (Pre-cast Units)	A
Irrigation – Centre Pivot., lateral move and similar	B
Irrigation – Sprinklers and similar	C
Irrigation – Micro, drip and similar	D
Municipal and Building Civils	
Building civils	C
Municipal Services	C
Parking lots	A
Water and Sewage Treatment works	F
Geotechnical	
Underground Structures and Dredging	A
Reinforced Concrete and Structural Steel	
Complex Load Bearing Structures, Quay Walls and Jetties	F
Minor structures	C
Overpasses and Freeway Bridges	E
Powerstation Civil and Buildings	C
River Bridges	F
Stormwater structures, Breakwaters and canals (Designed)	C
Unique structures	E
Water Retaining Structures	D
Water Towers	E
Building Structural	
Iconic and Unique Buildings and Structural Alterations	G
Hospitals, Hotels, Airports, Stadia, Exhibition Halls and Retail Shopping Centres	F
Residential, Offices, Educational and Industrial	E
Warehouses	D

Table 4-2: Work Types and Fee Categories for Mechanical Engineering Services

Project Type	Fee Category
Engineering Services	
Green building design and energy management	F
Specialised fire protection systems such as gas, foam extinguishing, etc.	D
Hazardous material systems	F
HVAC systems	D
Industrial process, piping and instrumentation	E
Mechanical plant and equipment	C
Pressure vessel design	F
Pumping and pipeline systems	D
Refrigeration and cold storage	C
Vertical transportation systems and materials handling	D
Building Services	
Industrial building services and utilities	E
General - Commercial, retail, offices, schools, hostels, clinics, hotels and resorts	E
Specialised - Airport buildings, museums, theatres, libraries, public entertainment, hospitals, research facilities, universities, laboratories, conference facilities, institutional buildings and facilities.	F
Residential – individual luxury housing units and apartment buildings	F
Residential – multiple (>50) standard housing units	C

Table 4-3: Work Types and Fee Categories for Electrical Engineering Services

Project Type	Fee Category
Engineering Services	
Green building design and energy management	F
Communications, data and IT cabling systems	E
Energy generation and transmission	D
Fire protection, security and access control	E
Industrial process, wiring and instrumentation	E
Mining	D
Motor control and electrical installations for machinery and equipment	E
MV and LV Distribution	C
Street, area and sportsfield lighting	D
Building Services	
Industrial building services and utilities	E
General - Commercial, retail, offices, schools, hostels, clinics, hotels and resorts	E
Specialised – Airport buildings, museums, theatres, libraries, public entertainment, hospitals, research facilities, universities, laboratories, conference facilities, institutional buildings and facilities	F
Residential – individual luxury housing units and apartment buildings	F
Residential – multiple (> 50) standard housing units	C

Table 4-4: Work Types and Fee Categories for Miscellaneous Services

Project Type	Fee Category
Electronic Engineering	G
Engineering Management	M
Industrial Engineering	N*

Note : Fee category N projects are not appropriate to determine fees based on the **cost of the works** and fees will be based on value delivered or time and cost as agreed between the **client** and **consulting engineer**.

4.3.2 Fee Range for Project Categories

The fee expressed as a percentage of the **cost of the works** will differ for different types of work due to different amounts of effort and engineering input required of the same **cost of the works**. For some types of projects the input can be high relative to the **cost of the works** while for other project types the input and corresponding percentage can be lower. The fees for a specific type of work can also vary considerably depending on the amount of effort required for a particular project relative to other projects of a similar type. However, an appropriate fee for **full** consultancy services, as set out in Section 3.2 above, should generally lie within the range shown below with the middle of the range representing the norm.

It is convenient to express the guideline professional fee in relation to a fixed works cost to establish a common reference point and to subsequently adjust this fee depending on the **cost of the works**. The Table below shows the typical range of fees appropriate for different categories of **works** with a works cost of R10 million, expressed as a percentage of the **cost of the works**. The table must be read in conjunction with Fig 4-1 in Clause 4.3.4.

Table 4-5: Guideline Fee for different Project Categories for a R10million works value

Fee Category	Typical Lower Limit		Typical Upper Limit
	Based on a R10 million works value		
A	6.0%	to	8.0%
B	7.0%	to	9.0%
C	8.0%	to	10 0%
D	9.0%	to	11.0%
E	10.0%	to	13.0%
F	11.0%	to	14.0%
G	12.0%	to	15.0%
M	2.0%	to	4.0%
N	Not appropriate to estimate fees based on cost of works		

It should be noted that the above fee includes normal services in respect of construction administration and site inspections as described above in 3.2.5. In many other instances where guideline fees are put forward in other countries, these services are excluded.

4.3.3 Project Situation and Engineering Effort

The actual percentage fee that is appropriate will depend on many factors, including general factors applicable to all project types, as outlined below, as well as specific factors applicable to particular project types.

Table 4-6: General Factors Influencing Fees

Project Element	Less Effort	More Effort
Alteration to existing works	Minor alterations with minimal investigation of the existing work required in order to design the works	Major alterations involving extensive assessments and investigations of the existing works which cost has little to do with the **cost of the works**
Business Strategy	No strategy to become involved in this type of work	Price reduced to become involved or lack of work for staff requiring work at minimal and unsustainable rates
Client Requirements	Clear requirements and explicit codes of practice	Unclear requirements with many alternatives being investigated and codes of practice developed during the course of the work
Communication Requirements	Minimal communication other than with direct client	Extensive communication requirements with community and interested and affected parties as well as jurisdictions and authorities.
Duplication and repetitive work	Complete designs can be duplicated and applied to different project or site without alteration to the drawings and/or specifications	Complete design can be duplicated and reused for a different project or site but alteration is required to the drawings and/or specification
Integration with Existing works	Minimal alteration and integration with existing works and involving minimal use of existing works	Extensive integration with many detailed surveys required to facilitate good integration and involving extensive re-use of existing works
Labour Intensity	Conventional construction	Extensive design to suite labour based construction and additional supervision or longer duration due to involvement of labour
Level of Expertise and Experience	Moderate expertise required	Significant specialist expertise and extensive experience required
Level of Risk, Liability and Responsibility	Low levels of responsibility and/or risks	High levels of Responsibility and Risks
Level of Untried and Untested Technologies	No untried and untested technologies	Many untried and untested or new and unusual technologies that need to be assessed before incorporation into the design
Potential Value Add	Minimal opportunity to add value in terms of life-cycle costs	Many opportunities to add value and reduce life cycle costs and sustainability.
Project Administration	Simple Administration with few organisations involved	Many parties involved with complex administration, many meetings, many interfaces and communication
Project Appointment	Immediate appointment	Extensive work at risk and investigations and assessment of design alternatives prior to appointment
Project Complexity	Simple projects where the designs are based on well established, common practices/ industry standards	Complex projects where the works call for the application of new, unusual or untried techniques and systems
Project Definition	Project is clearly defined	Many investigations and assessments required to clarify project definition.
Project Duration	Duration commensurate with value of works	Duration excessive relative to value of works due to drawn out contractual period
Repetition	Elements of a design can be repeated extensively resulting in a substantial reduction in effort	All elements must be designed individually
Value of works vs design effort	Value of the works high relative to the services being rendered and related effort.	Value of works is low relative to value of the services being rendered and the related efforts such as in small or low value projects.

While the above paragraphs show general indicators of why a percentage fee should be higher or lower relative to the **cost of the works**, the tables below provide guidelines as to the situation of different types of project that will make the appropriate fee trend towards the high or low % values shown in the Guideline fee category shown in Table 4-2 above.

Table 4-7: Civil Projects - Influencing Factors

Project Type	Less Effort	More Effort
Airport Runways, Taxiways and Aprons	Extensive available clearways and simple geometry	Complex geometry and clearway assessments and designs
Bridges	Few load cases, uniform foundations, short, straight and rectangular spans	Many load cases, seismic loads, variable foundations and complex geometry
Building civils	Few interfaces and good project management and few uncertainties	Many interfaces and uncertainties that need to be resolved by the consulting engineer
Building Structures	Uniform foundations, uniform and simple architecture and good project information	Variable foundations, seismic loads, complex architecture and many uncertainties
Large Dams	Uniform geology and terrain and simple spillway and outlet structures	Complex geology, seismic loads, terrain and spillway and complex outlet structure(s)
Small Dams	Simple water storage, hydrology, foundations and spillway requirements	Complex water storage, hydrology and spillway requirements
Irrigation	Simple water delivery systems	Complex water delivery systems
Minor structures	Uniform foundations, straight and rectangular	Variable foundations and complex geometry and load calculations
Municipal Services	Greenfield site with few interfaces	Complex existing site with many service interfaces
Parking lots	Few accesses, few stormwater options and few interfaces	Many accesses and routes, many stormwater paths and interfaces
Pipelines	Relatively straight and level pipelines with minimal requirements in respect of removal of air and silt	Complex pipe geometry with many thrust blocks and valves. High wave energy for submarine pipes.
Ports – Quays, Breakwaters etc	Uniform foundations, simple loading good information	Variable foundations, complex load cases and complex bathymetry and geology
Power Stations Civil and Buildings	Uniform foundations, with repetitive layout and known loadings	Variable foundations and complex layouts and load calculations
Railways (Excluding Cost of Track)	Few turnouts and minimal rolling stock requirements	Many turnouts, extensive rolling stock requirements
Road Rehabilitation	Relatively uniform conditions and minimal road furniture and drainage improvements	Variable conditions with many requirements in respect of road furniture and drainage improvements
Roads	Flat topography, few intersections and minimal obstructions and interfaces.	Difficult topography with many accesses, intersections, interchanges and interfaces with existing infrastructure and utilities
Stormwater Pipes	Straight pipelines with minimal inlet and catchment designs	Complex pipe networks with extensive catchment modelling requirements
Stormwater structures and canals (Designed)	Uniform foundations, straight and rectangular	Variable foundations and complex geometry and load calculations
Underground Structures	Uniform geology and hard ground	Complex geology and soft ground
Unique structures	Uniform foundations, straight and rectangular	Variable foundations, seismic loads and complex geometry and load calculations
Water Retaining Structures	Uniform foundations and shape with simple inlet and outlets	Variable foundations and complex shapes as well as complex inlet and outlet works

Table 4-8: Mechanical Projects - Influencing Factors

Project Type	Less Effort	More Effort
Commercial retail and office complexes	Simple architecture with uniform open plan layouts and single tenant or owner-occupier and well defined service requirements and provision	Complex and unique architecture, high rise buildings and multi-tenant buildings. Many uncertainties and interfaces requiring coordination
Educational facilities	Well-established, standard teaching and hostel facilities with well defined simple service requirements	Complex building design with many interfaces and service coordination and involving unusual or new and untried service design
Healthcare facilities	Simple primary healthcare facilities involving uniform, well established building services	Complex secondary and academic facilities involving complex building and services design with many interfaces and coordination and high consequences of failure
Industrial building services	Large open plan buildings with little interface between services, utilities and processes	Many interfaces, complex geometry with much service coordination, high service level requirements and severe consequences of failure
Industrial project utilities and process systems, including piping and instrumentation	Greenfield site and simple process and plant layout with single or few utilities and simple well-established or predetermined process design	Complex and existing building and plant layout with multiple utilities and poorly defined process design with serious consequences of failure. May involve high level of detail drawing.
Institutional buildings and facilities	Simple architecture with well established and defined layouts and basic service requirements and provision	Complex architecture with sophisticated and unusual service requirements. Many uncertainties and interfaces with coordination and a high consequence of failure.
Airport buildings, museums, theatres, libraries, public entertainment, hotels, resorts, conference facilities casinos	Simple architecture with uniform and simple layouts and well defined service requirements and provision	Complex and unique architecture with many uncertainties and with many interfaces and coordination
Unique and specialized engineering systems	Simple design using standard, well established design codes and principles regularly used in the industry	Unique and unusual systems requiring specialised knowledge and experience. Often involves special regulatory requirements. Unusual level of responsibility and high consequence of failure

Table 4-9: Electrical Projects - Influencing Factors

Project Type	Less Effort	More Effort
Commercial retail and office complexes	Simple architecture with uniform open plan layouts and single tenant or owner-occupier and well defined service requirements and provision	Complex and unique architecture, high rise buildings and multi-tenant buildings. Many uncertainties and interfaces requiring coordination
Communications, instrumentation, data and IT cabling systems	Use of proprietary systems with performance specification	Complex systems, purpose-designed
Distribution (MV & LV) including substations	Greenfield site with few interfaces and large erven (> 250m^2) LV only or single substation	Complex existing site with many service interfaces and small erven (< 250m^2) Multi-substation interlinked systems with differential and/or directional protection
Educational facilities	Well-established, standard teaching and hostel facilities with well defined simple service requirements	Complex building design with many interfaces and service coordination and involving unusual or new and untried service design
Healthcare facilities	Simple primary healthcare facilities involving uniform, well established building services	Complex secondary and academic facilities involving complex building and services design with many interfaces and coordination and high consequences of failure
Industrial building services	Large open plan buildings with little interface between services, utilities and processes	Many interfaces, complex geometry with much service coordination, high service level requirements and severe consequences of failure
Industrial project utilities and process systems, including piping and instrumentation	Greenfield site, simple process and plant layout with single or few utilities and simple well-established or predetermined process design	Complex and existing building and plant layout with multiple utilities and poorly defined process design with serious consequences of failure. May involve high level of detail drawing.
Institutional buildings and facilities	Simple architecture with well established and defined layouts and basic service requirements and provision	Complex architecture with sophisticated and unusual service requirements. Many uncertainties and interfaces with coordination and a high consequence of failure.
Motor control and electrical installations for machinery and equipment	Greenfield site with few interfaces and excluding process cabling	Complex existing site and work involving plant shutdown/maintenance of supply during construction
Airport buildings, museums, theatres, libraries, public entertainment, hotels, resorts, conference facilities casinos	Simple architecture with uniform and simple layouts and well defined service requirements and provision	Complex and unique architecture with many uncertainties and with many interfaces and coordination
Street, area and sportsfield lighting	Uniform geometry and use of proprietary systems	Complex site with specialized lighting purpose-designed from first principles
Transmission (HV) including substations	Flat topography and uniform founding conditions	Difficult topography, variable founding conditions
Unique and specialized engineering systems	Simple design using standard, well established design codes and principles regularly used in the industry	Unique and unusual systems requiring specialised knowledge and experience. Often involves special regulatory requirements. Unusual level of responsibility and high consequence of failure

Combinations of one or more of the above factors may result in a substantial adjustment of the percentage fee that is required to fairly compensate the **consulting engineer** and this should be negotiated in good faith by both parties. Complicating factors may only become apparent during the course of the **services** and may require an adjustment to the previously agreed fee. This will require an adjustment to be made in good faith.

It should be noted that the above does not imply that each factor is weighted equally and nor does it imply that factors must arithmetically be applied to adjust the fee. Factors such as alterations to existing works, for example, will generally be far more significant than others.

4.3.4 Adjustment for Cost of works.

As the cost of **works** decreases or increases the percentage fee should be adjusted up or down, generally in accordance with the guideline provided below in Figure 4-1.

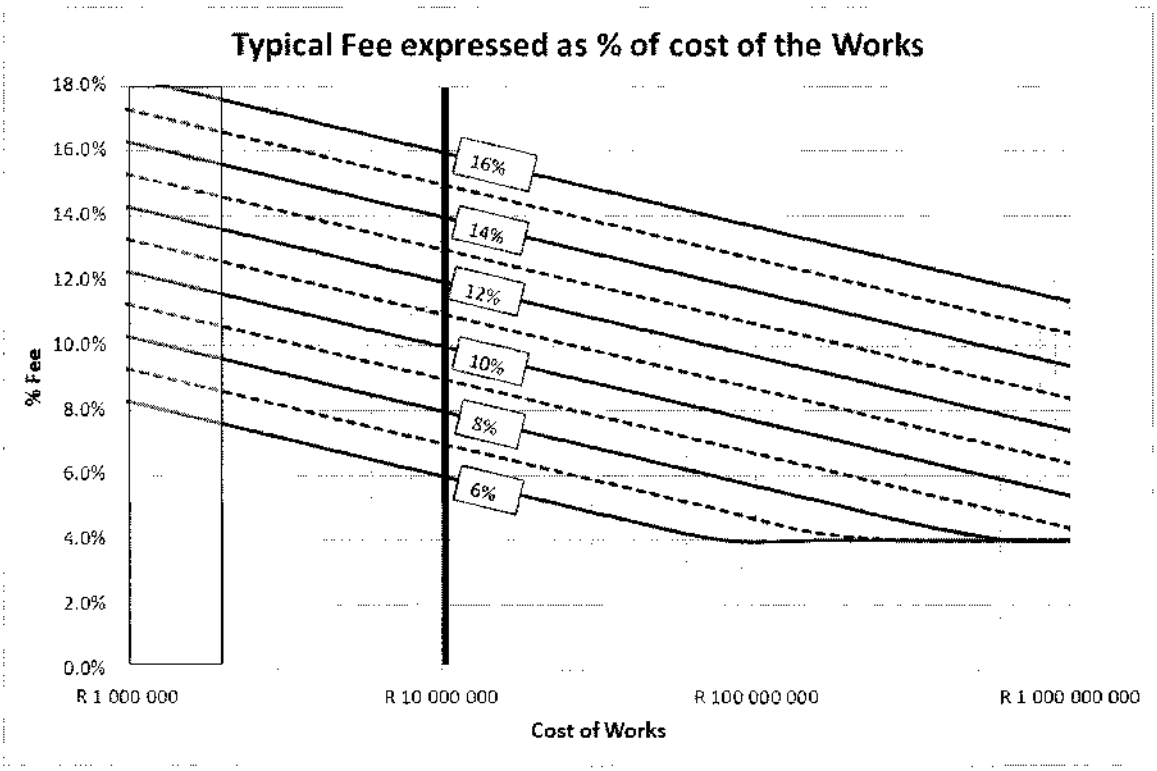

Figure 4-1: Adjustment for Cost of works

Note:

1. Where the **cost of the works** on which the percentage fee is based approaches R2million and less, the above straight lines no longer apply and the percentage fee will generally have to be adjusted upwards. This adjustment ranges from between 1% for a R2million cost of works to 3 % for a **cost of works** less than R1million to take into account the effort required relative to the value of the **works**.
2. Where the **works** involves a number of different types of work and disciplines the fees should be determined for each type and discipline separately.
3. Where the **cost of the works** becomes substantially greater than R100m then the fees based on individual elements should be used and allowance made for economies of scale.
4. Fees for comprehensive services that are less than 4% should be viewed with caution and should only be used where substantial economies of scale exist.

4.3.5 Examples

The following examples show how the design fees could hypothetically be applied and the related outcomes of certain procurement practices.

(1) Building Structure (Structural: Building Project)

A client calls for bids for the structural design of associated with a new commercial building.

The **cost of the works** related to the Consulting engineers **scope of work** provided by the client is R50 million.

The client is well known to the consulting engineer who is also aware that the project concept is reasonably well determined and is unlikely to change considerably during the design development process. The consulting engineer knows that the founding conditions are simple

and the building layout is not complex. The consulting engineer is also familiar with the requirements of the local authority and does not envisage any problems in this regard. Design coordination with a view to accepting the overall responsibility for the structure in terms of the National Building Regulations is also adjudged not represent any major additional inputs. Site monitoring inputs are expected to be average based on his expectation that the client generally awards their contracts to competent contractors.

The consulting engineer assesses the required fee for the services as being on the low end of the range of fees. The project category is E ie. between 10% and 13% for a **cost of works** of R10million. The designer feels that the fee or around 11% of the cost of works at a R10million **cost of works** should be reasonable. He then adjusts this for the project value by following the 11% line on Figure 4-1 to the R50 million **cost of the works**. The resulting fee is around 9%. The consulting engineer assesses the inputs and related risks associated with the services in more detail based on the investigations, drawings and specifications that will be required and confirms that a R5.4million fee represents reasonable remuneration. He therefore proposes this amount as a lump sum without any further adjustment required should the cost of works increase without changing the scope of work.

The client is comfortable that the consulting engineer will provide good quality services and that the proposed fee seems reasonable and appoints the consulting engineer to provide the services.

(2) Complex Urban Interchange

A client calls for bids for an urban interchange to alleviate congestion. The bidding document includes minimal details of the required interchange. The estimated cost of works provided by the client is R200million

Consulting engineer A understands that the interchange is in an area with complex road geometry and will require interfaces with numerous services. He is also aware that the project scope is poorly defined and that the client does not normally pay within 30 days.

The consulting engineer assesses the project category as D (9% to 11% at R10million **cost of works**) and that a fee of at least 11% at R10million **cost of works** should be applicable.

He adjusts the fees by following the 11% line in the above graph on Figure 4-1 to a project value of R200 million and reads off the percentage fee as 8%.

The consulting engineer assesses the cost of carrying out the investigations and designs and how much of his effort will be paid as additional services. He feels that the 8% is too low for the design and bids a percentage fee 9% based on the ultimate **cost of works** and elaborates on the difficulties involved and the skilled staff that will have to be brought to bear on the project. works

Consulting engineer B is not aware of all the difficulties associated with the project and uses a fee of 7% to bid a lump sum cost for the services of R14million regardless of the ultimate **cost of the works**.

The client has also not obtained a realistic assessment of what a reasonable fee for the services is likely to cost and awards the project to the Consulting Engineer B.

(3) Consequences

The consequences of the above examples can also be hypothesised as follows:

- In the case of example (1) the project is likely to be completed satisfactorily and the client and consulting engineer should continue to have a relationship of trust.
- In the case of example (2) consulting engineer B may have to cut back on the design effort to complete the project within the fee budget. This may, for example, result in an inadequate discovery of services during the design phase, which could in turn result in considerable additional costs being incurred during construction. These costs could far exceed the saving made by appointing the low fee bidder! worksIn addition, the designed facility may have certain operational defects that could, for example, result in an accident black spot with significant annual accident costs.

4.3.6 Services provided partially or in Stages

(1) The following table shows typical percentages that are typically used for proportioning the basic fee for normal services over the various stages of the services. The actual percentage used should be adjusted for individual projects through negotiation and depending on the work involved in each stage, the value that can be added in each stage and any commercial considerations that may be applicable:

Stage of Services	Typical percentage points for each stage
Civil: Engineering Projects:	
Inception	5
Concept and Viability	25
Design Development	25
Documentation and Procurement	15
Contract Administration and Inspection	25
Close-Out	5
Structural: Engineering Projects:	
Inception	5
Concept and Viability	25
Design Development	30
Documentation and Procurement	10
Contract Administration and Inspection	25
Close-Out	5
Civil: Building Projects:	
Inception	5
Concept and Viability	25
Design Development	25
Documentation and Procurement	15
Contract Administration and Inspection	25
Close-Out	5
Structural: Building Projects:	
Inception	5
Concept and Viability	20
Design Development	30
Documentation and Procurement	15
Contract Administration and Inspection	25
Close-Out	5
Mechanical, electrical and electronic projects:	
Inception	5
Concept and Viability	15
Design Development & Documentation and Procurement	40
Contract Administration and Inspection	35
Close-Out	5

(2) Where not all the stages of the normal services are provided by the consulting engineer, the fee is, subject to clause 4.1(9), calculated as a percentage of the total fee calculated in terms of this clause, which percentage is the sum of the percentage points appropriate to each stage as set out in the above table against those stages of the services provided by the consulting engineer, typically plus 10 percentage points to allow the engineer to become familiar with the project.

4.3.7 Cancellation or Abandonment

Should instructions having been given by the client to the consulting engineer to proceed with any of the stages of services set out in clause 3 and the whole or part of the works is **cancelled or abandoned or postponed for a period of more than six months**, the consulting engineer should be remunerated for services performed, plus a surcharge of one tenth of the full fee which would have been payable to the consulting engineer had his services been completed in terms of his engagement.

4.4 Fees for Additional Services

The Guideline fees for additional services, contemplated in clause 3.3, are normally agreed to between the client and the consulting engineer as set out in this clause.

(1) **For** additional **services** as a result of the resumption of such services or the alteration or modification of designs on the instructions of the **client**, the **consulting engineer** is normally entitled to time based fees and actual costs incurred.

(2) For the provision of a **construction monitoring service**, as contemplated in clause 3.3.2, the consulting engineer is typically entitled to recover from the client

(a) for monthly monitoring staff costs, the **total annual cost of employment** of such staff (as defined in clause 4.2(4)), divided by 12 and multiplied by one of the following:

(i) Case 1: Where payment is only made for actual time on site and site allowances are not paid separately:

2.1 times total cost of employment.

(ii) Case 2: Where payment is only made for actual time on site and site allowances are paid separately:

2.0 times total cost of employment.

(iii) Case 3: Where payment is made for leave and non-working days and site allowances are paid separately:

1.8 times total cost of employment.

(b) for part time monitoring staff costs, the amount payable to such staff at the guideline hourly rates contemplated in clause 4.2; and

(3) For all other costs, as set out in clause 4.6 the actual expenses incurred, normally multiplied by a factor 1.10 to allow for administration and cash flow.

(4) For duties under the **Occupational Health and Safety Act**, 1993 (Act No.85 of 1993), as contemplated in clause 3.3.3, the consulting engineer will normally, if so appointed by the client, be remunerated on a time and cost basis as agreed with the client.

(5) For services as **lead consulting engineer**, as contemplated in clause 3.3.5, the guideline additional fee is 10 percent (10%) of the total fees payable for the services.

(6) For **engineering management services or services as the principal consultant**, as contemplated in clause 3.3.6, the guideline fee is shown as category M in 4.3.2.

(7) The following table is typically used to proportion the basic fee over the various stages of the services:

Stage of Services	Typical percentage points for each stage
Concept and design development	25
Design, documentation and tender	35
Construction	35
Completion of all engineering management services	5

(8) For services as **principal agent** of the **client**, as contemplated in clause 3.3.8, the guideline fee is estimated as one percentage point (1%) of the total cost of the works comprising the project. The consulting engineer is not entitled to any fees for **principal agent** if he is not explicitly appointed as such. Services rendered as a **principal agent** can involve a considerable amount of essential work and the parties need to consider the work required and the corresponding remuneration carefully before such an appointment is concluded and a fee agreed.

4.5 Value Based Fees

Certain projects and disciplines such as Industrial Engineering and some other specialist disciplines lend themselves to Value-based fees where the fee is negotiated between the parties based on the value arising out of the work done rather than the cost of the works. Projects for which such fees will be applicable cannot be based on the cost of the works but rather on the value generated by applying engineering skills to improve overall productivity and cost-effectiveness. Disciplines for which such fees will be particularly applicable include industrial engineering, for example.

In such cases the Consulting Engineer and Client should agree a suitable fee that provides fair value to the client relative the value delivered through the services and also provides reasonable remuneration for the consulting engineer to encourage continuation of the development of the skills required to deliver the value required by clients.

4.6 Expenses and Costs

(1) Subject to clause 4.4(3) a consulting engineer may recover from the client:

(a) All expenses actually incurred by the consulting engineer and members of the consulting engineer's staff in rendering their services; and

(b) All other costs incurred on behalf of and with approval of the client.

(2) Recoverable expenses include:

(a) Travelling expenses for the conveyance of the consulting engineer or a member of the consulting engineer's staff by means of:

(i) private motor transport, including any parking charges, toll fees and related expenses;

(ii) a scheduled airline or a train, bus, taxi or hired car; or

(iii) non-scheduled or privately owned air transport.

(b) Travelling time on the basis of the rate set out in clause 4.2, for all time spent in travelling by the consulting engineer or members of his staff shall be as follows:

(i) when fees are paid on a time basis, all hours spent on travelling are normally reimbursable.

(ii) when fees are paid on a percentage basis, reimbursement for travelling time is often adjusted as all time spent in travelling minus the first hour per return journey.

(c) Accommodation and subsistence expenses incurred by the consulting engineer or a member of his staff;

(d) Agreed costs of typing, production, copying and binding of contract documents, pre-qualification documents, feasibility reports, preliminary design reports, final reports and manuals, excluding general correspondence, minor reports, contractual reports, progress reports, etc.

(e) Agreed costs of drawing reproduction

(f) Expenses on special reproductions, copying, printing, artwork, binding and photography, etc. requested by the **client**.

(g) Alternatively, a lump sum or percentage of the **cost of the works** may be determined and agreed between the **consulting engineer** and the **client** to cater for all or any of the above.

(3) Costs that shall be recovered under clause (1)(b) above include, but are not limited to:

(a) Site traffic surveys;

(b) Geotechnical investigations;

(c) Laboratory testing;

(d) Topographical and land surveys;

(e) Supply of specific equipment;

(f) Specialist sub-consultants;

(g) Environmental investigations and studies; and

(h) Land acquisitions, expropriation, way leaves, and servitudes.