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201 Engineering Profession Act (46/2000): Engineering Council of South Africa: Guideline for defining the Scope of Services and for determining the Professional Fees for Persons Registered in terms of the Act 3 35944

BOARD NOTICE

BOARD NOTICE 201 OF 2012

Engineering Council of South Africa

**Guideline for defining the Scope of Services and for determining
the Professional 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 defining the services to be provided on projects and for determining the professional fees for these services that could be used in negotiations between Clients and Engineering Service Providers.

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

The commencement date of these Rules shall be 1 January 2013.

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
- (v) Reimbursable expenses.

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 value of the work and the related extent of the services to be provided is somewhat uncertain.

Once the Client and Service Provider 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 Service Provider 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 Service Provider 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 Service Provider too low or too high a fee. However it remains the prerogative of the Client and Service Provider to negotiate a fee for the services to be provided.

ECSA acknowledges that many Clients who may appoint Engineers to undertake certain work, do not have the background and experience in 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 practitioners in the engineering profession.

It remains the prerogative of the Client and 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 Engineer is paid appropriately to deliver a sound professional service, where the result is appropriately optimized to provide an acceptable life cycle cost which 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 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 or wasteful expenditure in this regard 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 which are sorely needed to support the socio-economic development of South Africa.
4. Ensure that infrastructure development which 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

Subject to sub-clause 34(2) of the Engineering Profession Act, 2000 (Act No. 46 of 2000), the Guideline Scope of Services and Tariff of Fees for Persons Registered in terms of the Act, published in Government Gazette No. 34875, Board Notice 206 of 20 December 2011, is hereby repealed.

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) **“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 Agent while financial and administrative matters are 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.
- (ii) **“client”**, means any juristic person or organ of the State engaging a **consulting engineer** for **services** on a **project**;
- (iii) **“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.
- (iv) **“consulting engineer”**, for purposes of these rules only, means any professional registered in terms of **the Act**, or a juristic person who employs such professional, engaged by a **client** on a **project**;
- (v) **“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**;
- (vi) **“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 electronic systems and detailing the terminations, signals and interconnections of electronic components as distinct from 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 3.1;
- (xi) “**Principal Agent**” means the Professional Service Provider appointed as such.
- (xii) “**project**” means any total scheme envisaged by a **client**, including all the **works** and **services** concerned;
- (xiii) “**scope of work**” means the portion of the **works** for which the consulting engineer is engaged.
- (xiv) “**scope of services and/or services**” means the services contemplated in clause 3 on a **project** for which a **consulting engineer** is engaged;
- (xv) “**stage**” means a stage of **normal services** set out in clause 3.1;
- (xvi) “**the Act**” means the Engineering Profession Act, 2000 (Act No. 46 of 2000);
- (xvii) “**total annual cost of employment**” means the total annual cost of employment as defined in clause 4.2(4);
- (xviii) “**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;

2.4 Short Title

This Schedule is called the ECSA Guideline for Services and Processes for Estimating Fees for Registered Persons 2013

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.
- (5) Consultation with authorities having rights or powers of sanction as well as consultation with the public and stakeholder groups.
- (6) 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.
- (7) Searching for, obtaining, investigating and collating available data, drawings and plans relating to the works.
- (8) Investigating financial and economic implications relating to the proposals or feasibility studies.
- (9) Clause (8) 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 the Engineer's **scope of work** is concerned.

Deliverables will typically include:

- ◆ Collation of information.
- ◆ Reports on 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

These services listed below are applicable to projects where the nature, form and function of the facility 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 are the responsibility of the quantity surveyor and are not included as normal services of the Engineer. These services are shown in italics in the following lists.

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

In certain instances on building or multi-disciplinary projects these services are provided with the assistance of the 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 and the required services extend through to stage 4, 5 and 6, the services of the Principal Agent defined under paragraph 3.3.8 are included as normal services and must be agreed between the parties.

3.2.1 Stage 1 – Inception

(Defined as: Establish client requirements and preferences, assess 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) *Calling 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) *Evaluation of tenders.*
- (11) *Preparation of 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) Inspect works for quality and conformity to contract documentation
- (8) *Adjudicate and resolve financial claims by contractor(s).*

- (9) Assist in the resolution of contractual claims by the contractor.
- (10) *Establish and maintain a financial control system.*
- (11) Clarify details and descriptions during construction as required.
- (12) *Prepare valuations for payment certificates to be issued by the principal agent.*
- (13) Instruct, witness and review of all tests and mock ups carried out both on and off site.
- (14) Check and approve contractor drawings for design intent.
- (15) Update and issue drawings register.
- (16) Issue contract instructions as and when required.
- (17) Review and comment on operation and maintenance manuals, guarantee certificates and warranties.
- (18) Inspect the works and issue practical completion and defects lists.
- (19) 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

Where a quantity surveyor is included in the project team in building works, items 4,5,8,10 and 12 and related deliverables will not be required from the engineer.

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.
- (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.
- (21) 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.
- (22) Where more frequent inspections are required due to poor contractor performance or other extraneous factors these will normally be considered to be additional services.
- (23) Preparing as-built drawings on designs done by others or related to alterations to existing works.
- (24) 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.
- (25) 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.
- (26) 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) If the construction monitoring, as set out in clause 3.2.5, is deemed to be insufficient by the parties, the **consulting engineer** may, 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 and agreed with the **client**. The functions in respect of additional construction monitoring are to be limited to detailed inspections and exclude those mentioned under clause 3.2.5. In particular, such monitoring is required where designed elements are normally buried or covered or become inaccessible during the course of the Works.
- (2) Alternatively, the **client** may appoint or make available staff, as intended in clause (1), subject to approval by the **consulting engineer**.
- (3) Staff, as intended in clauses (1) and (2), shall report to and take instructions from the **consulting engineer** or an authorized representative of the **consulting engineer** only and shall be deemed to be in the employ of the **consulting engineer**.
- (4) Should any change regarding the persons utilized for additional on-site monitoring or their remuneration or duration of services be necessary, the utilization of such persons and/or their remuneration must be agreed in writing with the **client** prior to the implementation thereof.

- (5) If, for any reason, no additional staff or inadequate staff for construction monitoring is appointed, the **consulting engineer** shall provide additional services, including additional site visits, as required and agreed to in writing with the **client** prior to commencement thereof.
- (6) The duties of the **consulting engineer** for the following four defined levels of construction monitoring, respectively, are as follows:
- (a) Level 1:
- The construction monitoring staff shall:-
- (i) Monitor the outputs from another party's quality assurance programme against the requirements of the plans and specifications.
 - (ii) Visit the **works** at a frequency agreed with the **client** to review important materials, critical work procedures and/or completed elements or components.
 - (iii) Be available to advise the **contractor** on the technical interpretation of the plans and specifications.
- (b) Level 2:
- The **construction monitoring** staff shall:-
- (i) Review, preferably at the earliest opportunity, a sample of each important –
Work procedure
Construction material
for compliance with the requirements of the plans and specifications and review representative samples of important completed work prior to enclosure or completion as appropriate.
 - (ii) Visit the **works** at a frequency agreed with the **client** to review important materials, critical work procedures and/or completed elements or components.
 - (iii) Be available to provide the **contractor** with technical interpretation of the plans and specifications.
- (c) Level 3:
- The **construction monitoring** staff shall:
- (i) Maintain a part-time presence on site as agreed with the **client** to review random samples and review important completed work prior to enclosure or on completion as appropriate.
 - (ii) Where the **consulting engineer** is the sole consultant or **principal agent**, carry out such administration of the **project** as is necessary on behalf of the **client**.
 - (iii) Be available to provide the **contractor** with technical interpretation of the plans and specifications.
- (d) Level 4:
- The **construction monitoring** staff shall:-
- (i) Maintain a full time presence on site to constantly review –
Work procedures
Construction materials
for compliance with the requirements of the plans and specifications and review completed work prior to enclosure or on completion and include in as-built records and drawings as appropriate.

- (ii) Where the **consulting engineer** is the sole consultant or **principal agent**, carry out such administration of the **project** as is necessary on behalf of the **client**.
- (iii) Be available to provide the **contractor** with technical interpretation of the plans and specifications.

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 programme
- (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 charges 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

Engineering Services are normally procured through competitive bidding in accordance with the guidelines prepared by the Construction Industry Development Board (CIDB) or in accordance with the procuring organisation's own internal guidelines. 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.

As the cost of Engineering design services only constitutes a small element of the total life-cycle costs of the facility being designed, the "buyer needs to beware" 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 design 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) While the guidelines contained in this Schedule can be applied to many projects the factors that influence the fees to be paid for design services are complex and depend on several factors that are expanded upon in section 4.3.3 below.
- (5) 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.
- (6) Where the normal services 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.
- (7) 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.
- (8) 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 uncertain. 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.

- (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 the Engineering Council of South Africa after consultation with service providers and service users: 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 Project-Cost Based Fees

Fees based on project costs 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 and Structural Engineering Services

Project Type	Fee Category
Pipelines	
Pipelines - Water	A
Pipelines - hazardous substances	D
Transport Infrastructure	
Airport Runways, Taxiways and Aprons	A
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	
Concrete Dams	A
Earth and Rockfill Dams	A
Stormwater Pipes (Pre-cast Units)	A
Municipal and Building Civils	
Building civils	C
Municipal Services	C
Parking lots	A
Water and Sewage Treatment Works	F
Geotechnical	
Underground Structures	A
Reinforced Concrete and Structural Steel	
Complex Load Bearing Structures	F
Minor structures	C
Overpasses and Freeway Bridges	E
Powerstation Civil and Buildings	C
River Bridges	F
Stormwater structures and canals (Designed)	C
Unique structures	E
Water Retaining Structures	D
Water Towers	E
Building Structural	
Large Public buildings (Theatres, Museums)	C
Multi storey buildings	B
Single storey buildings	A
Warehouses	A

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

Project Type	Fee Category
Engineering Projects	
Alternative energy systems and energy management	F
Fire protection systems	D
Hazardous material systems	F
HVAC systems	D
Industrial building services	C
Industrial building utilities	D
Industrial process, piping and instrumentation	E
Mechanical plant and equipment	C
Pressure vessel design	F
Public health systems (wet services etc)	F
Pumping and pipeline systems	D
Refrigeration and cold storage	C
Vertical transportation systems and materials handling	D
Building Projects	
Airport buildings, museums theatres, libraries and public entertainment	E
Alternative energy and energy management	F
Commercial, retail and office complexes	D
General education (secondary and tertiary educational facilities and hostels)	E
Industrial building services	D
Institutional buildings and facilities	F
Primary healthcare (clinics and medical consulting rooms)	E
Secondary healthcare (general, academic, and specialized hospitals and facilities)	F
Specialised teaching (lecture halls > 100 students, research facilities, laboratories)	F
Tourism and leisure industry (hotels, resorts, conference facilities, casinos)	E

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

Project Type	Fee Category
Engineering Projects	
Alternative energy systems and energy management	F
Communications, data and IT cabling systems	E
Energy generation and transmission	D
Fire protection, security and access control	E
Industrial building services	C
Industrial building utilities	D
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 Projects	
Airport buildings, museums, theatres, libraries and public entertainment	E
Alternative energy and energy management	F
Commercial, retail and office complexes	D
General education (secondary and tertiary educational facilities and hostels)	E
Industrial building services	E
Institutional buildings and facilities	F
Primary healthcare (clinics and medical consulting rooms)	E
Secondary healthcare (general, academic, and specialized hospitals and facilities)	F
Specialised teaching (lecture halls > 100 students, research facilities, laboratories)	F
Specialized lighting systems	F
Tourism and leisure industry (hotels, resorts, conference facilities, casinos)	E

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 determination of 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 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 value 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.

It is convenient to express the guideline professional fee in relation to a fixed cost of Works to establish a common reference point and to subsequently adjust this fee depending on the value of works. The Table below shows the typical range of fees appropriate for different categories of Works with a 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 cost of Works

Fee Category	Typical Lower Limit		Typical Upper Limit	
	Based on a R10 million Cost of Works			
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 value 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 work high relative to the services being rendered, uniform conditions with minimal effort required in design	Value of Works low relative to value of the services being rendered, extensive variability and significant effort required to ensure design is optimised for conditions

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.

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, 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 engineer
Building Structures	Uniform foundations, uniform and simple architecture and good project information	Variable foundations, complex architecture and many uncertainties
Dams	Uniform geology and terrain and simple spillway and outlet structures	Complex geology, terrain and spillway and complex outlet structure(s)
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.
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 and complex geometry and load calculations
Water Retaining Structures	Uniform foundations and shape	Variable foundations and complex shapes

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.
Public buildings (Airport buildings, museums, theatres, libraries, and public entertainment)	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
Tourism and leisure industry (hotels, resorts, conference facilities, casinos)	Simple architecture with uniform 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
Public buildings (Airport buildings, museums, theatres, libraries, and public entertainment)	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
Tourism and leisure industry (hotels, resorts, conference facilities, casinos)	Simple architecture with uniform layouts and well defined service requirements and provision	Complex and unique architecture with many uncertainties and with many interfaces and coordination
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

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.

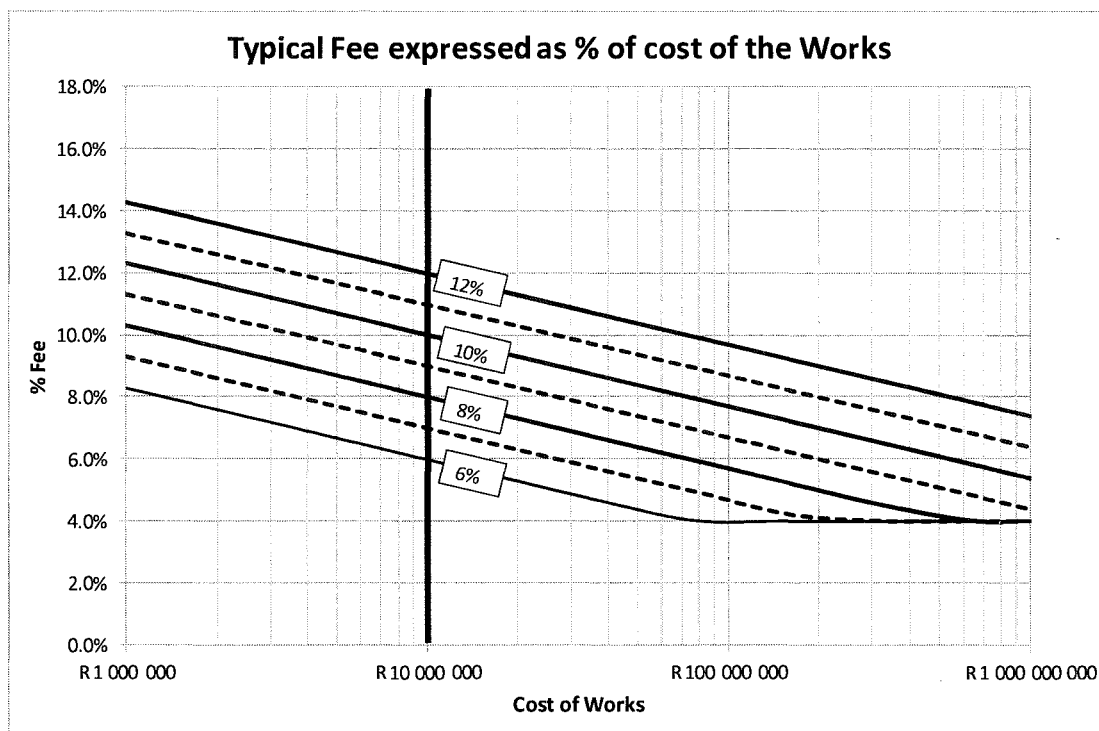


Figure 4-1: Adjustment for Cost of Works

4.3.5 Examples

(1) Civil Building

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

The cost of the Works provided by the client is R100 million.

The client is well known to the designer and the bid documentation has a conceptual layout of the proposed building and its parking lot. The engineer bidding for the works knows that the materials on site are not variable and that only minimal earthworks are required for the civil works. Stormwater design is included in the scope of Work and the designer is aware that stormwater management will be simple and can easily be accommodated in nearby valleys or bulk stormwater canals. The designer is also familiar with the requirements of the local authority and envisages minimal comebacks and requests for re-designs.

The designer mentions all of the above in his proposal and assesses the required fee as being on the low end of the range of fees. The project category ranges between C for building civils and A for parking lots. The designer feels that the fee should be relatively low at around 6% of the cost of works at a R10million project value. He then adjusts this for the project value by following the 6% line on Figure 4-1 above to the R100 million project value. The resulting fee is just below the minimum of 4% shown in the graph. The designer assesses the time and a cost associated with designing the works in more detail and confirms that 3.7% or R3.7 million will probably cover his costs and he proposes this amount without any further adjustment required should the cost of Works increase without changing the scope of work.

The client is comfortable that the designer knows that the design should not involve too many difficulties and that the proposed fee seems reasonable and appoints the designer to carry out the designs.

(2) Complex Urban Road

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 R180million

The designer understands that the interchange is in an area with complex road geometry and will require interfaces with numerous services. The designer is also aware that the client is relatively uncertain of the required scope of work and is a poor payer.

The designer assesses the project category as D 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 R180 million and reads off the percentage fee as 8%.

The experienced designer assesses the cost of carrying out the investigations and designs and how much of this work will be paid as additional services. He feels that the 8% is too low for the design and bids $10\% \times R180\,000\,000 = R18\,000\,000$ for the work and elaborates on the difficulties involved and the skilled staff that will be brought to bear on the project. He qualifies his bid that if the cost of the Works increases his fee should be adjusted based on his percentage fee of 10%.

Another inexperienced designer is not aware of all the difficulties associated with the project and bids 7% or R12 600 000.

The client awards the project to the lowest cost bid and the consulting firm produces a design that results in variation orders of R20 000 000 during construction due to inadequate discovery of services during the design phase and detailing of the Works involved in relocating these services. In addition, the designer takes short cuts to reduce design costs and does not produce a suitable alignment. This results in an accident black spot with an accident cost of over R1 million per annum.

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 Concept and Viability Design Development Documentation and Procurement Contract Administration and Inspection Close-Out	5 25 25 15 25 5
Structural: Engineering Projects: Inception Concept and Viability Design Development Documentation and Procurement Contract Administration and Inspection Close-Out	5 25 30 10 25 5
Civil: Building Projects: Inception Concept and Viability Design Development Documentation and Procurement Contract Administration and Inspection Close-Out	5 25 25 15 25 5
Structural: Building Projects: Inception Concept and Viability Design Development Documentation and Procurement Contract Administration and Inspection Close-Out	5 25 30 15 20 5
Mechanical, electrical and electronic projects: Inception Concept and Viability Design Development & Documentation and Procurement Contract Administration and Inspection Close-Out	5 15 30 40 10

- (2) Where not all the stages of the normal services are provided by the consulting engineer, the fee is, subject to clause 4.1(6), 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 0 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 shall 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) Expenses on special reproductions, copying, printing, artwork, binding and photography, etc. requested by the **client**.
 - (f) 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.
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