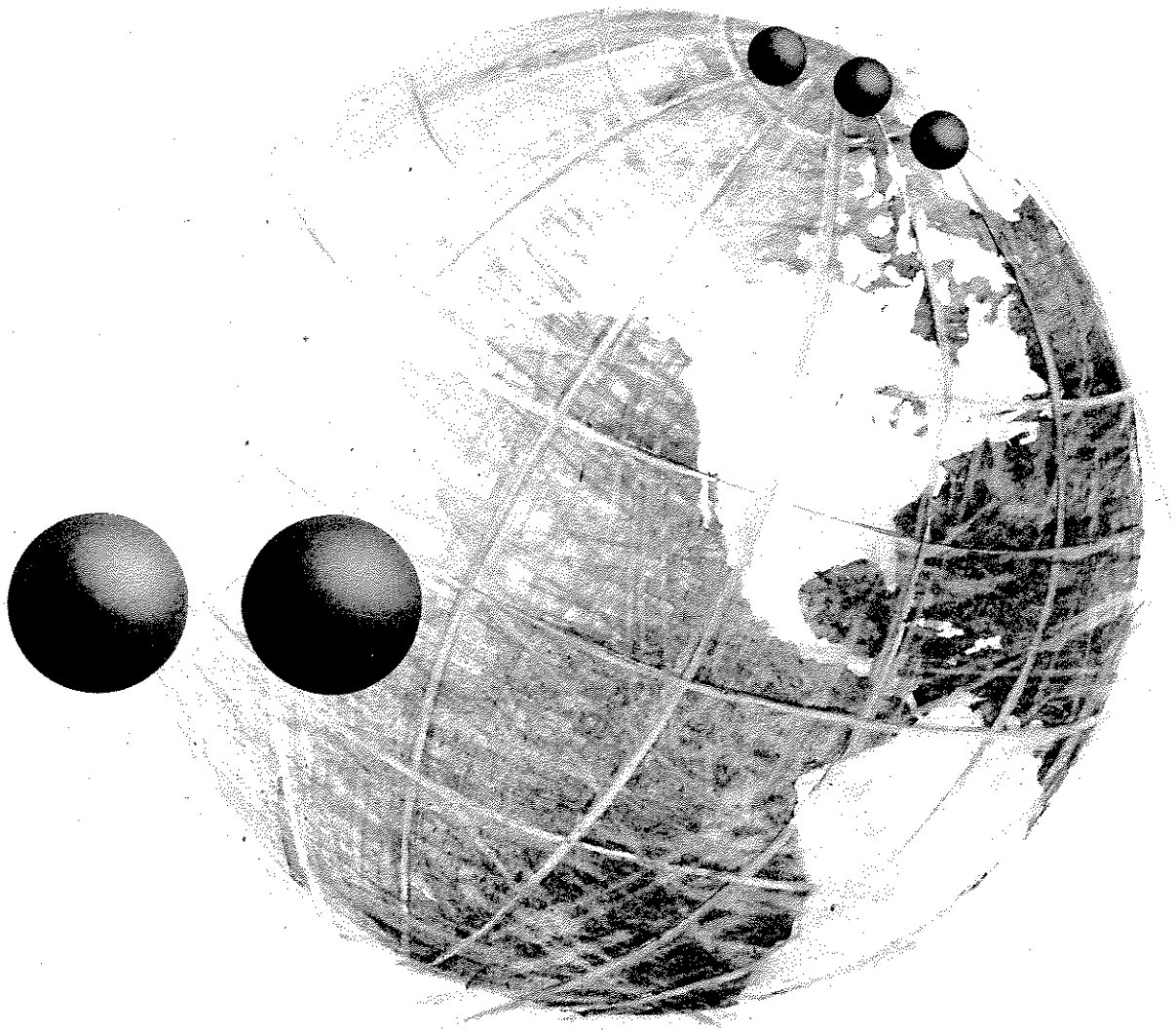
GUIDELINES TO **PROFESSIONAL PRACTICE**



Ordre
des ingénieurs
du Québec

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For further information about using the *Guidelines to Professional Practice*, the reader should contact the Ordre des ingénieurs du Québec.

PRESIDENT'S MESSAGE

Within the framework of their professional practice, engineers must take into account not only the Engineers Act, the Code of Ethics and related regulations, but also several other statutes which are not specific to their profession, but which affect them nonetheless.

Confronted with changes in both society and in the engineering profession, the Ordre des ingénieurs would like to provide its members and the public with the results of its reflection on this situation to allow them to better understand and establish the new requirements of the engineer's profession.

The *Guidelines to Professional Practice*, designed and developed to be flexible and manageable, yet complete, was prepared with a view to promoting competence, ethical conduct, responsibility and social commitment. It will enable engineers to improve their professional practice by showing them how to enhance their skills and, ultimately, attain excellence.

Given that the ultimate goal of engineering is to serve the higher interests of society, the largest number of people must be satisfied for the good of the whole. This means that the interests of society must take precedence over the personal interests of engineers, and even over those of employers and clients.

For these reasons, the Ordre des ingénieurs recommends that its members follow the *Guidelines to Professional Practice* and promote the manual to all those wishing to glean a better understanding of the unique role of engineers in society.

Finally, I would like to thank all those who contributed to this project, especially our approximately one hundred volunteers.

- ADMINISTRATION OF AN ORGANIZATION

NOTES

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FOREWORD

The Ordre des ingénieurs du Québec is one of the largest professional corporations in Quebec. According to the Professional Code, the principal function of a professional corporation is to protect the public, and to do so it must supervise the practice of the profession by its members.

Engineers make an essential contribution to the socioeconomic life of Quebec; they work in key areas crucial for shaping the present as well as the future of our province. And the field of professional practice is getting broader all the time as new needs appear: some technical disciplines are becoming more and more specialized, and at the same time professional practice is becoming more and more diversified, influenced by sociology, ecology, economics, politics and the legal framework of our society.

This is why engineering professional practice must meet the highest standards of competence and ethical conduct, standards fitting the paramount importance of the status and the role of the engineer in our society.

Pride in our profession is a long-standing tradition based on a constant search for competence and quality, sustained by the fundamental values adopted by the best engineers over many generations, and given concrete expression in increasingly more significant works that change present and future.

The purpose of this document is to describe the mission of the Order and the fundamental values of the engineer, to set forth goals for excellence the Order recommends to its members, and to help make members aware of the environment in which they practice.

The Order advocates self-discipline for supervision of professional practice.

The Guidelines give the Order an opportunity to inform engineers of their rights and obligations and to describe the Order's vision of excellence in professional practice. This initiative has wrought changes in the objectives of the Order, its organization and its plan of action for protecting the public. The mission of the Order must be given concrete expression in measures that will increase public confidence in engineers. Accordingly, the Order is prepared to provide members with information and educational services, as well as with resources and tools that can help them improve their practice.

The Order's aim in publishing the *Guidelines to Professional Practice* is to improve engineering practice through education. This must be very clear. The order considers the Guidelines as a series of goals of excellence to be achieved, not as a set of minimum standards that must be respected.

The Order's initiative must give rise to individual and collective investments of time and energy by engineers to guarantee their scientific, professional and social growth.

The status of the engineer will be advanced first and foremost through daily practice that is increasingly of higher quality and achievements of which engineers can be proud. Engineers must close ranks and continue to discipline themselves.

This way engineers will form an ever-stronger group of professionals, inspired by a contemporary, innovative and effective philosophy of action, and capable of commanding respect from everyone, of meeting the new challenges of society and of serving as inspiration for the builders of the future.

PROFESSIONAL VALUES

CHAPTER 1

The mission of the Ordre des ingénieurs du Québec is to promote and ensure the quality of the services engineers render society – individually and collectively, as members of the profession – and to foster their personal and professional development.

The mission statement issued by the Ordre des ingénieurs du Québec reflects the Order's dedication to ensuring the profession develops in harmony with the general advance of society. In keeping with its mission, the Order finds a source of inspiration for future action in the solid tradition of excellence in the profession. This has led the Order, with the help of its members, to identify four values fundamental to the professional practice of engineering:

- **Competence**
- **Ethical conduct**
- **Responsibility**
- **Social commitment**

Thorough knowledge of the field, well-developed skills and the right attitudes

COMPETENCE

Competent engineers are dedicated to mastering the knowledge necessary for their professional practice.

Competence is a question of applying scientific principles. Fundamentally grounded in logical and proven concepts, competence demands strict and constant application of standards of good practice in engineering.

Competence is also a question of art. It demands practical judgment and the ability to use knowledge effectively. It involves respect for the human element at every stage of professional practice.

The interests of clients and of society as a whole are key priorities

ETHICAL CONDUCT

Committed to ethical conduct, an engineer's top priorities are the interests of society and of his or her clients; personal interest and profitability come second.

Ethical conduct means dedication to integrity, availability, independence, professional discretion and solidarity with colleagues.

In the search for technical and scientific success within the limits of legislation and regulations, the engineer's actions are guided by his or her professional conscience.

An engineer is personally answerable for his or her work

RESPONSIBILITY

Responsible engineers only accept assignments for which they have the necessary competence.

The Professional Code grants members of the Ordre des ingénieurs du Québec professional status and an exclusive title. Professional status entails obligations towards clients who trustingly engage the services of an engineer.

Engineers must, therefore, assume full responsibility for the consequences of their professional actions. Engineers are personally answerable to their clients and to society as a whole for the work they do.

Helping society make the best choices for today and tomorrow

SOCIAL COMMITMENT

Engineers express their social commitment, first and foremost, by maintaining a high level of quality in their professional practice.

Through their professional practice, engineers can also help society make the best choices for today and tomorrow.

Engineers must explore avenues for economic, social, political and ecological development that promote the well-being of their fellow-citizens

CHAPTER 2

THE APPROACH OF THE *GUIDELINES TO PROFESSIONAL PRACTICE*

BASIC PHILOSOPHY

Competence and development of the quality of professional practice are the best guarantees that the interests of the public will be protected. Fully convinced of this, the Ordre des ingénieurs du Québec bases its strategy on two fundamental requirements:

- **Engineers must be familiar with the rights and obligations of their status.**
- **Engineers must conduct their activities in keeping with their status.**

Given the rich heritage of the profession, past and present, the Order hopes to convince its members to take stock of their practice. The Order believes this will give engineers new energy and enthusiasm for the challenges of the years to come.

Engineers have to their credit major achievements of which they have every reason to be proud. The engineering profession, grounded in recognized training, has made its mark in many spheres of activity. The development of services offered by engineers and the wide variety of disciplines engineers have mastered are eloquent testimony to this. Taking advantage of their exclusive role, engineers have gradually broadened the scope of their involvement in society; and their high quality achievements have earned them a prestigious place in society.

Today's engineers want to go even further in their relations with society as a whole.

The consultations and analyses conducted by the Order indicate that today's engineers want to go even further in their relations with society as a whole. The Order has chosen to publish the *Guidelines to Professional Practice* to communicate to all its members the findings of the discussions, analyses and research.

The Order believes that the status of the engineer must be maintained, and that the Order must be able to guarantee that services rendered by engineers always meet the standards of the profession. This is why the Order has worked in cooperation with engineers from representative organizations within the engineering community to identify fundamental professional values and the quality criteria they entail. These are criteria that apply to most of the activities engineers pursue.

In the *Guidelines to Professional Practice,* the Order sets forth quality criteria an engineer must meet by describing goals for excellence in professional practice. Set forth in detail in Chapters 3, 4, 5 and 6, the goals show how engineers give concrete expression in professional activities to the values of **competence, ethical conduct, responsibility** and **social commitment.**

The goals are formulated to leave as little leeway as possible for discrepant interpretations. They are detailed enough to clearly indicate the quality demanded; but they are also general enough for consistent application even with the wide variety of organizations, situations and individuals involved and the special features of each engineering discipline.

The engineer must constantly strive to achieve and surpass the goals of excellence in professional practice.

Competence is the ability to harmonize efficiency and excellence. Engineers must constantly strive to achieve and surpass the goals of excellence, but they must do so as efficiently as possible. This requires good judgment, creativity and a willingness to be innovative in executing projects.

Today's engineers must consider the impact of their work on the environment and on human life, health and property.

PROFESSIONAL PRACTICE IN A CHANGING WORLD

One of the first articles of the Code of Ethics of Engineers states that engineers must respect their obligations to humanity and consider the impact of their work on the environment and on human life, health and property. The human element is indisputably a primary concern of the profession.

As a result, it would help if engineers could identify, understand and evaluate the social, political, economic and ecological issues dominant in their society. Such issues have a definite impact on the organizations in which engineers work, on their daily tasks and on the projects for which they are responsible. Some such crucial issues come easily to mind—the language of work, our declining and aging population, immigration, sharing of the work market by men and women, the claims of native peoples and protection of the environment.

For a true understanding of the many concurrent influences on the organizations for which engineers work and the projects they undertake, engineers must be aware of the general setting in which their professional activities are conducted.

The Quebec of the early nineties is radically different from the Quebec of the early sixties.

Quebec has undergone radical transformation since the early nineteen sixties. The profound changes have engendered new social issues. New information has brought engineers to recognize the dynamics of relations between the individual, society and organizations, and to search for consensus without renouncing professional integrity.

The political situation has changed. The role of government in economic life—including development of certain industries—has been growing constantly since the early sixties. However, public authorities have been trying since 1980 to put a stop to this expansion of government intervention.

The economic situation has changed too. From an economy based on agriculture, Quebec has shifted to an industrial economy and is now gradually moving towards a post-industrial economy.

In recent years, the environment has become a major concern. Among the main reasons for this are the damage to terrestrial and aquatic plants and animals, the depletion of our natural resources, and the pollution of water, air and soil.

Project scenarios and conditions are determined by a wide variety of interacting parties.

Project scenarios and conditions can be very diverse given the wide variety of parties that may interact in planning and executing a project. Here is a sample of some of the parties that might be involved: elected officials, civil servants, national and local elites, community organizations, pressure groups and the media. Public consultation bodies also belong in this group—bodies such as the *Bureau d'audiences publiques sur l'environnement* (the Quebec bureau of public hearings on the environment), which is responsible for conducting public consultations on specific topics in accordance with standards stipulated by law. Still other parties that influence engineering work are employers' associations, trade unions, socioeconomic associations, and citizens.

Clearly, engineering work is not the only project dimension to be considered. The social, political, economic and ecological setting in which participants interact can determine the success or failure of a project.

The guidelines must become an integral part of an engineer's planning.

THE *GUIDELINES TO PROFESSIONAL PRACTICE* APPLIED TO INDIVIDUAL PRACTICE

The Guidelines are meant to be used for all assignments—large or small. An open mind, a willingness to adapt vocabulary and a readiness to make adjustments for the special features of a project are all that is required. The Guidelines should become an integral part of an engineer's planning, according to a timetable suitable for the engineer's organization or project.

The Guidelines must not, however, serve as a tool for making demands. It is up to the engineer to obtain the necessary consensus, to harmonize efficiency and excellence, to improve his or her practice and to ensure that his or her organization derives benefit from it all.

Managing client needs and constraints.

RELATIONS BETWEEN ENGINEER AND CLIENT

One of the objectives of the Guidelines is harmonious relations between client and engineer. The Guidelines are designed to facilitate the drafting of an agreement on services to be rendered and, concomitantly, on compensation for the engineer. The word client must be understood here in its broadest meaning—as anyone, including an employer, who benefits from an engineer's services.

The goals of excellence in professional practice set forth in the Guidelines focus on the quality of relations between client and engineer. There are two facets to this:

- Helping the engineer to better understand and manage a client's needs and constraints
- Providing the client with a frame of reference for the quality of professional services that the engineer can render

The hard part is doing everything at once—meeting all objectives and applying everything learnt—and doing it all for every single project.

THE CHALLENGE

Above all, the Guidelines offer goals for the quality every engineer should strive to achieve and surpass to the best of his or her ability. It is easy to learn something new and to remember it; and the goals of excellence are within every engineer's reach. The real challenge is to do everything at once—meet all objectives and apply everything learnt—and to do it for every single project.

In publishing the Guidelines, the Order is counting on the self-discipline of its members. The simple fact that goals of excellence have been suggested provides strong incentive to achieve them. Achievement of the goals can only benefit the profession as a whole, enhancing its reputation and improving its social standing and influence. And better professional practice inevitably brings an engineer recognition—higher status, career advances, the opportunity to work on important projects—as well as personal, intellectual and material enrichment.

The goals of excellence set forth in the second part of the *Guidelines to Professional Practice* are the fruit of the dedicated work of many engineers in industry, the civil service, construction and private consulting firms. In other words, the goals have been designed for all types of engineers to use, adapt and make their own.

CONTENTS

The *Guidelines to Professional Practice* is divided into three parts:

1. **The Engineering Profession**
2. **Excellence in Professional Practice**
3. **Engineering and the Law**

None of the components of the Guidelines can be used without the counterbalance of the other components. This is essential in guiding against misinterpretation of any single component by considering it in isolation.

The terms "engineer" and "organization" are used frequently in the Guidelines. The term "engineer" refers to any person who is a member of the Ordre des ingénieurs du Québec. It is understood that engineers may delegate their authority to other people; engineers who do so must supervise the work of the other people and remain responsible for their actions. The term "organization" refers to any organizational structure within which an engineer works: a company, a public body, a consulting firm or an engineering department.

1 THE ENGINEERING PROFESSION

The first two chapters of the Guidelines form Part One. Here the basic framework and the guiding principles of the *Guidelines to Professional Practice* are set forth. The fundamental values of the engineering profession are stated as well as the principles and philosophy upon which the Guidelines are based.

2 EXCELLENCE IN PRACTICE

Part Two deals with professional practice. It describes the goals of excellence in professional practice that the engineer should strive to achieve. This part is divided into four chapters.
Chapter 3: Technical Practice
Chapter 4: Project Management
Chapter 5: Organization Management
Chapter 6: Administration of an Organization

3 ENGINEERING AND THE LAW

The last part covers the legal framework governing the engineering profession. The applicable laws and regulations are available on the Ordre des ingénieurs du Québec website at www.oiq.qc.ca.

TECHNICAL PRACTICE

CHAPTER 3

3.1 ANALYSIS

3.1.1 IDENTIFYING PROJECT INFORMATION

DESCRIPTION: **Collecting and recording basic data necessary for carrying out a project**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Thoroughness	Together with the client, the engineer determines in advance a systematic approach for identifying key project information.
Scope of research	Data are collected to establish the following essential elements: • The real nature of the problem or the need relative to the client's objectives • Existing and future conditions • Technical information and existing and available technologies • Physical, technical, staffing, financial and administrative constraints • Environmental, social and legal constraints • Any other pertinent information
Validation	Data collected are analyzed for pertinence to and adequacy for the client's needs.
Recording and communication	Basic data are recorded, personnel concerned are informed of the data and data records are placed in project files.

3.1.2 STUDIES

DESCRIPTION: **That part of an engineer's assignment calling for study of needs and of possible solutions for meeting them**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Creativity	The engineer analyzes at least one alternative solution for each need identified.
Thoroughness	The research includes but is not limited to the following: • Methodology • Definition of needs • Identification of pertinent basic data • Description of solutions studied (including sketches and plans, if necessary) • Analysis of each solution relative to needs, constraints and basic goals identified • Costing for each solution • Analysis of deadlines • Value analysis • Profitability analysis • Recommendation

3.1.3 REPORTS

DESCRIPTION: **Written documents the engineer submits to the client about the work**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Structure	Reports supply the following: • Background information • Methodology used • Data • Analysis • Recommendations
Ease of comprehension	Reports contain the following: • A summary which is readily understood by the client • A table of contents; lists of appendices, plans, and tables; and a distribution list • All pertinent documents in support of the recommendations of the report
Form, presentation, syntax, grammar and spelling	The engineer systematically checks reports.
Technical approval	A procedure is established for review and approval of all project-related reports.

3.1.4 DEVELOPING THE SOLUTION SELECTED

DESCRIPTION: **Clarification of all aspects of the solution selected**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
Content	The engineer develops the solution selected based on the following: • The client's objectives, needs and constraints • Guidelines and requirements specified by the client • Basic data • Requirements of codes and regulations • Major calculations • Functional design of the solution selected • Detailed description of the solution selected, including specific choices made • Costs • Project schedule • Project implementation plan • General plans The above are formally reviewed and approved by the client early in the project and are updated with every change.

3.1.5 OBTAINING ACCESS, SERVICES AND LAND

DESCRIPTION: **Methods used by the engineer to obtain the access (given construction constraints, deadlines, projections and so forth) the services (power, telephone, cables, water, air, steam and so forth) and the land required for a project**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
The role of the engineer	At the outset of the project, the engineer and the client agree who is to assume responsibility for obtaining the necessary access and property titles. With the help of the client as necessary, the engineer ensures that services required for the project are secured.
Prior verification	During the preliminary study phase, the engineer ensures that steps are taken to guarantee that the required access, land and services are available. This includes checking that the project complies with all laws and regulations on land development (legislation on town planning, the environment and agricultural zoning) and relevant municipal bylaws. The engineer checks with the client whether reservation or conservation of certain land is necessary.
Purchase of land	The engineer ensures that steps are taken to purchase land required as early as possible.

3.1.6 REVIEWING PROFESSIONAL SERVICES OR ASSIGNMENTS TAKEN OVER FROM ANOTHER ENGINEER

DESCRIPTION: **Assignment to examine or review engineering work performed by another engineer or to complete work begun by a colleague**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
Notification of colleague	When requested to replace a colleague on an engineering assignment or to examine or review engineering work performed by another, the engineer informs the colleague concerned at the outset. Where applicable, the engineer makes sure the colleague's assignment is terminated before commencing the work.

3.1.7 EXPERT TESTIMONY

DESCRIPTION: **Expression of an independent and objective opinion about a specific subject for which a professional expert opinion is required—about a claim, a technical difficulty, dispute before a court, for example.**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Expertise	The engineer determines that he or she has the necessary technical competence and practical experience.
Preparatory activities	The engineer ensures that he or she has full knowledge of the facts; this may involve a site inspection. If the report is for legal purposes, the engineer makes sure that he or she understands the problem and the relevant points of law, so that the testimony will be appropriate and emphasize the client's arguments.
The report	The report is concise—containing only facts relevant for the analysis—and is written in simple, clear and precise language. Photographs, graphs and drawings necessary to complement the text of the report are included. The report demonstrates a clear and direct relation between the facts of the case and the engineer's conclusions. The report cites legislation, regulations, standards, specifications, calculations and references upon which conclusions are based.

3.2 DESIGN

3.2.1 SITE INSPECTION

DESCRIPTION: **Organization of site inspections**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Frequency	The engineer and the design team inspect the project site before, during and after the design work.
Design review	A team checks the feasibility of the layout and construction of the project as designed before final plans and specifications are drafted. If necessary, the preliminary design is modified. If too much time lapses between the drafting of plans and specifications and the execution of a project, the site is re-inspected.

3.2.2 COLLECTING SPECIAL INFORMATION

DESCRIPTION: **Identifying special information necessary for project design (surveys, special studies, analyses and so forth)**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Procedure	At the outset of the assignment, the engineer determines a procedure for gathering special information necessary for the project. The procedure incorporates the following steps: • Identification of type, quantity and quality of data required • Selection of methods for obtaining required information • Planning and organization of data collection • Data validation The procedure includes sequential iteration (trial and error) for type, quantity and quality of the data.
Communication of information	Key data are submitted to the client and to all members of the design team. The data is updated regularly.
Access	The engineer ensures that permission to access and gather the special information has been obtained.

3.2.3 CALCULATIONS

DESCRIPTION: **Mathematical, technical, referential and other elements used in developing a solution**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Records	Calculations used for project design are carefully and systematically recorded for easy future retrieval.
Content	Calculation records include all documents necessary to reproduce the calculations (references, graphic characteristics, basic data, estimates, articles of pertinent codes and so forth).
Validity of methods (software, equipment and so forth)	The engineer ensures that methods used for calculations are valid and assumes responsibility for errors that derive from methods used.
Supervision of calculations	The engineer checks the accuracy of completed calculations and the pertinence of the data used.
Review by the client	The engineer has ownership of the book of calculations. The client and the engineer agree to the client's access to this data. The book of calculations belongs to the employer, when the engineer is an employee.

3.2.4 DESIGN DEVELOPMENT

DESCRIPTION: **Determination and clarification of essential features of the solution selected**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Input and output	Early in the preparation of the preliminary design, the engineer determines input and output for each phase of the work.
Formulation	The design is optimized. Documents, diagrams, sketches and drawings are used to provide a simple and clear picture of the design.
Communication and approval	The design is submitted to the client for review and approval.

3.2.5 RISK CONTROL

DESCRIPTION: **Ensuring the integrity of the project and checking that safety factors are adequate**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
Aspects to be checked	The following aspects are reviewed with the client and are incorporated in procedure for reviewing risks and safety: • The risk of failure of part of the project and the consequences for the project itself and for human health and safety • The special public safety hazards of certain projects—hospitals, electrical power supply facilities, complex structures and so forth • The safety of personnel assigned to the project • Current and future compliance with limits on capacity and use of the project

3.2.6 PLANS

DESCRIPTION: **Graphic representation of the design**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Management of the preparation of plans	The engineer drafts and maintains an up-to-date list of plans to be drawn, including summary descriptions of the contents of each plan.
Review of plans	At the beginning of the design phase, the engineer determines a procedure for reviewing plans. The procedure ensures that the plans for each discipline are dated, signed and sealed, complete and clear, and that they are properly cross-referenced and coordinated with the plans for all other disciplines. The plans must illustrate a solution that meets the client's needs. When several professionals work on the same project, the engineer requests that the client designate the person responsible for final coordination of plans.

3.2.7 SPECIFICATIONS

DESCRIPTION: **Detailed, written, qualitative description of materials, equipment, workmanship, performance and other technical requirements**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Specifications management	The engineer prepares and maintains an up-to-date list of specifications to be drafted together with descriptions of their contents.
Specifications review	At the beginning of the design phase, the engineer determines a procedure for review of specifications. The procedure ensures that specifications for each discipline are dated, signed and sealed, complete and clear, and that they are properly cross-referenced and coordinated with specifications for all other disciplines. Specifications must describe a solution that meets the client's needs. The engineer ensures that all features of the plans and of the bid form are properly explained in the specifications. When several professionals work on the same project, the engineer requests that the client designate the person responsible for final coordination of the specifications.
Prudence	Whenever possible, the engineer refrains from specifying in the specifications any method or procedure for performing the work. The engineer should avoid assuming responsibility for work methods and procedures. Comments on methods or procedures should be limited to their impact on the design.

3.2.8 PRICE SCHEDULE

DESCRIPTION: **The document that describes and, if applicable, quantifies project items for which quotations are desired (trades, components, materials, work and so forth)**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Level of detail	The engineer makes recommendations and comes to an agreement with the client on an appropriate level of detail for the project description, quantities and unit costs in the price schedule.
Content	The engineer makes sure that all aspects of the plans and specifications are covered in logical order and that the price schedule is explicit enough to prevent any misunderstandings.

3.2.9 COST ESTIMATES

DESCRIPTION: **The engineer's determination of approximate costs before work begins**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Content	The engineer prepares cost estimates for the following and submits them to the client: • Supply of major project equipment and systems • Project construction • Project operation
Accuracy	The engineer agrees in advance with the client on the level of accuracy of estimation (%). The client is informed in advance of basic assumptions used in preparing estimates. Final estimates—including provisions for contingencies—should not differ from actual final costs by more than 10%.

3.2.10 BIDDING DOCUMENTS

DESCRIPTION: **Documents given to bidders**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
Content	Bidding documents include the following: • Bid notices • Instructions to bidders • Bid form, including price schedules • General and special conditions, including those at the site • Outline and detailed specifications • List of plans • Plans • Reference plans • Reports on soil conditions and other reports, if necessary • Administrative forms for contract management, bonds and insurance • Form of contract

3.2.11 TECHNICAL CHANGES

DESCRIPTION: **Procedure for informing all parties of changes in project design**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Planning	At the beginning of the project, the engineer determines a procedure for validation, approval and implementation of changes.
Thoroughness	Changes are validated for technical content, costs, deadlines and possible effects; they are supported by design and other suitable documents.
Communication	Changes are submitted to the client for approval.

3.2.12 TRANSFER OF KNOWLEDGE

DESCRIPTION: **Procedure used by the engineer responsible for the design to transmit design criteria, project goals and design approach—as well as the engineer's plans for project operation—to those assigned to construct and operate the project**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Thoroughness	As soon as the design is completed, the engineer drafts a report on how the equipment and the project are to be operated, listing key design criteria and describing expected project performance.
Communication	The report is submitted to the client and to those responsible for supervising the work and drafting the operating manual.

3.3 EXECUTION

3.3.1 PROCUREMENT OF GOODS AND SERVICES

DESCRIPTION: **Methods, resources and means the engineer uses to procure goods and services necessary for project execution**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Responsibility	The engineer and the client agree who will be responsible for procedures for procurement of goods and services necessary for project execution.
Planning	When applicable, the engineer plans procurement schedules for required goods and services. The engineer selects suitable methods and procedures for implementing the plan given quantities and quality required, resources available and objectives.

3.3.2 INVITATIONS FOR BIDS

DESCRIPTION: **Requests for bids from outside parties for execution of the work and for supply of goods or services**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Publication responsibility	The engineer and the client agree who will prepare bid notices and coordinate their publication. Legal deadlines are respected.
Identification of potential bidders	The engineer and the client either identify potential bidders and invite them to bid or begin the process of calling for bids.
Content of the bid notice	Typically a bid notice contains the following: • Project title and name of the client • A brief description of the work for which bids are requested • Date, time and place of receipt of bids and of the pre-bid conference, where applicable • Conditions for qualification of bidders, where applicable • Address and place where bidding documents can be obtained • Name of the person from whom information can be obtained, if necessary • Fee charged for the bidding documents, if applicable • Usual legal provisions, where applicable
List of bidders	To facilitate the issuing of addenda, the engineer drafts a list of bidders who have received or requested bidding documents.
Pre-bidding conference	The engineer schedules an information session for clarification of the bidding documents. A report of the discussion at the pre-bidding conference is sent to potential or probable bidders within 48 hours of the conference.

3.3.3 ADDENDA

DESCRIPTION: **Procedure for advising potential bidders during the bidding period that the bidding documents have been changed**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Expediting	The engineer makes sure all bidders have received the addenda.
Acknowledgment of receipt	The bidding documents contain a clause requiring bidders to acknowledge receipt of addenda issued during the bidding period.
Evaluation by the construction manager	During the bidding period—the exact time depends on the scope of the work involved—the construction manager reviews requests for information from potential bidders to decide if addenda should be issued. The engineer may postpone the bid opening date should the nature of the addenda so require.

3.3.4 BID OPENING, ANALYSIS AND EVALUATION

DESCRIPTION: **Procedures for analyzing bids after the close of bids**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Bid opening	The engineer determines bid opening procedure with the client. The engineer drafts a report showing the amount of each bid together with a list of the documents provided by each bidder.
Selection criteria and weighting	Before publication of the invitation to bid, the engineer and the client agree on selection criteria for awarding the contract and weighting the criteria.
Bid analysis report	The bid analysis report submitted to the client contains the following: • Summary of bids received • Summary of compliance criteria • Analysis of compliance of each bidder • Analysis of the financial and technical qualifications of the recommended bidder • Analysis of options proposed • Analysis of variances with estimate or budget • Recommendation
Legal advice	In case of nonconformity of bids and bidding documents, the engineer ensures that the client's legal advisor reviews the recommendation from a legal point of view.
Time for completion of the bid analysis report	The engineer submits the report within the period agreed upon in the project schedule.

3.3.5 AWARDING THE CONTRACT

DESCRIPTION: **Awarding a bidder a contract to perform work required for execution of a project or to supply goods and services**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Preparations for awarding the contract	The engineer and the client agree on the necessity for a meeting before awarding of the contract and on strategies to be used. The engineer submits a final recommendation in a report that is included in the contract file.
Communication with the successful bidder	The engineer assists the client in the contract award procedure.
Performance bonds, insurance certificates and other documents	On behalf of the client, the engineer coordinates the successful bidder's submission of performance bonds, insurance certificates and other documents required by the contract.

3.3.6 PURCHASING

DESCRIPTION: **The purchase of material, equipment and services required for project execution**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Planning	A plan and specific procedures are formulated for purchasing.
Follow-up, expediting and surveillance	The engineer ensures that the quality of goods and services purchased meet the client's needs. Once the contract is awarded, the engineer takes responsibility for following up and expediting purchasing-related activities—including shop drawings and visits to suppliers. The engineer ensures that progress schedules are respected and the quality of incoming products is as contracted.
Conformance control	Permits, certificates and reports of inspections and product conformance tests are registered and safely filed.
Receipt and warehousing	Upon receipt, deliveries are inspected for conformance with requisitions or contract documents. Goods are warehoused until integrated in the project.
Warranties	On behalf of the client, the engineer undertakes measures to validate and update suppliers' warranties when necessary.
Nonconformance control	The engineer records irregularities in incoming products and supervises their correction.

3.3.7 CONTRACTS

DESCRIPTION: **Agreement between the client and the contractor or supplier setting forth obligations of the parties for the performance of work and the purchase of goods and services**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Contents	The contract includes all bidding and contract documents, and any other pertinent documents. Each aspect of the contract is dealt with only once, without unnecessary repetition.
Sample contract	The engineer recommends a draft contract (preferably a standard document) that meets the client's needs.
Additional clauses	Procedure for issuing additional clauses after the contract is signed is clearly stipulated in the contract. Contract documents include a sample additional clause.

3.3.8 COMMUNICATING WITH SUPPLIERS AND CONTRACTORS

DESCRIPTION: **Establishing business relations between the engineer's client and the contractors and suppliers involved in executing a project**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
Responsibility centre	The engineer seeks to promote relations of mutual trust between client, contractors and suppliers. The engineer is impartial.

3.3.9 SHOP DRAWINGS AND SUPPLIERS' MANUALS

DESCRIPTION: **Graphic representations of project components, controls and any other pertinent elements; manuals for operating and maintaining equipment**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Follow-up and expediting	The bidding documents include a list of equipment for which shop drawings and suppliers' manuals are required, as well as acceptance criteria and a review and approval procedure. Once the contract is awarded, the engineer is responsible for following up and expediting shop drawings and suppliers' manuals. The engineer ensures that deadlines are respected and that the quality of products furnished is as contracted. The list is updated regularly during construction and manufacture, as are production deadlines.
Review of requirements	As soon as possible after the contract has been awarded, the engineer reviews design requirements and shop-drawing criteria with the contractor, the subcontractors and the principal suppliers of equipment.
Operating and maintenance manuals	The engineer obtains from equipment suppliers all information necessary for operation and maintenance of their products. The engineer records and transmits copies of this information for the client. Shop drawings and suppliers' manuals are written in the language commonly used by the client.

3.3.10 EQUIVALENTS

DESCRIPTION: **Suggested technical options that differ from those in the contract documents but that will nevertheless yield work that meets the client's needs**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Informing the contractor	In the bidding documents, the engineer formally advises the contractor or supplier of the procedure for approval of equivalents.
Caution	The engineer conducts a careful, in-depth analysis of requests for equivalents, ensuring that all effects are considered.
Informing the client	The engineer submits full information to the client about the effects of the equivalent proposed—including a recommendation, if required, for permission to approve the equivalent.
Revision of plans and specifications	The engineer alters the plans and specifications to incorporate accepted equivalents.

3.3.11 SUPERVISION OF WORK

DESCRIPTION: **The inspection plan (including quality assurance) to ensure that work performed conforms to plans and specifications**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Level of supervision	At the beginning of the project, the engineer determines with the client the type of supervision appropriate for the work given its scope and complexity.
Safety	The engineer makes sure that an occupational health and safety programme has been prepared before work starts.
Methods of performing work	The contractor is responsible for selecting and implementing methods for performing the work. The engineer ensures that the quality of the finished product is as specified.
Content of the plan	The engineer prepares a detailed inspection and test plan to ensure that work performed conforms to plans and specifications.
Quality control	The client and the engineer responsible for supervision agree on the necessity of assuring quality control of materials and workmanship. They also agree on the choice of a professional who will be responsible for this supervision. Before the work begins, the engineer responsible for quality assurance submits a detailed quality control programme to the supervising engineer for approval. Quality control reports are submitted to the client and the supervising engineer.
Jobsite log book	The engineer maintains an up-to-date log book in which the following are recorded: • Daily progress of the work • Correspondence received and sent • Requests from the contractor and the client • Unusual events • Any pertinent information about a situation or a problem that might lead to misinterpretation of the contract documents
Review of plans and specifications	Before the work begins, the engineer re-examines the contract documents and then reviews them with the contractor to ensure they are properly understood. If necessary, the engineer makes minor changes in the plans to incorporate details helpful for executing the work.

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Technical information	The engineer is available at all times while the work is being performed to provide the contractor or the suppliers with any additional technical information they require.
Defective work	The engineer maintains an up-to-date list of defective work observed, including a description of corrective action agreed upon with the contractor or the supplier. The engineer follows up on implementation of corrective action.
Work to be completed	Towards the end of the construction phase, the engineer drafts a list of work to be completed. This list is constantly updated until final acceptance of the work.
Claims	The engineer provides the client with the necessary technical assistance for claims filed against the client or for claims the client files against others.

3.3.12 MONITORING

DESCRIPTION: **All work inspection activities for checking performance of the work, controlling costs and ensuring that deadlines are met.**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Informing the client	The engineer keeps the client regularly informed on the following: • Progress of the work • Meeting of deadlines • Respect of the budget • Defects, defective work and corrective action • Change orders • Quality control
Programme planning	In compliance with the client's requirements and before work begins, the engineer establishes a monitoring programme for performance of the work and cost accounting.
Detailed progress schedule	Before work begins, the engineer obtains a progress schedule from the contractor. The schedule is reviewed for conformance with project requirements. The engineer submits the schedule to the client, if necessary, approves it and distributes copies to all concerned.

3.3.13 PAYMENT SCHEDULE

DESCRIPTION: **Cost breakdown according to work completed, for purposes of progress payments**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Approval	The engineer periodically prepares, or reviews and approves, requests for progress payments for lump-sum and unit-price contracts. The engineer submits the requests to the client and follows up to ensure payment.
Content	To indicate project progress, the engineer's recommendation for progress payment also specifies the following: • Comparison of recommended payments with the contract and the budget • Forecast of variance with final budgeted cost • Up-to-date statement of authorized change orders and their impact on the budget • Explanations of variance with the budget
Caution	Before approving amounts to be paid, the engineer considers costs that have been incurred to date, estimates for project completion and forecasts for final cost versus budgeted cost.

3.3.14 CHANGES

DESCRIPTION: **Variation orders for work not included in contract documents**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Validation	The engineer ensures that prices submitted by the contractor or the supplier are accurate and reasonable, that the contract is respected and that all additional costs the change entails are included.
Approval	The engineer obtains the client's approval of the change in advance. To do so, the engineer provides the client with the following information in writing: • The origin of the change • A description of the change and the reason for it • Justification of the recommended change • Cost of the change and impact on the budget • Time for project completion with incorporation of the change and the impact on work schedules • The engineer's recommendations

3.3.15 ACCEPTANCE

DESCRIPTION: **The stage of the project when work or equipment is delivered to the client and the client assumes responsibility for it**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Planning	Once work begins, the engineer does the following: • Drafts a list of equipment and work to be inspected • Drafts a plan for inspections and tests to be conducted (dry runs, load tests, extended-time tests and so forth), including procedures and schedules • Prepares assignments for firms specializing in pertinent tests or inspections • Makes sure that a list of applicable equipment warranties is drafted and approves the list • Plans the preparation of reference material • Determines equipment maintenance needs
Activities prior to acceptance of the work	The engineer does the following: • Reviews the findings of the inspection and test plan • Fully inspects the work • Updates the list of work to be completed and the list of defects and defective work to be corrected • Checks that the contractor has supplied tools and spare parts as contracted • Prepares schedules and documents for acceptance of the work • Obtains reference manuals, inspection and test reports, and reports on client warranties • Checks that the work is completed and defects have been corrected so that the client can use the work for the purposes for which it is intended • Compiles and issues calibration data sheets The engineer issues the certificate of acceptance of the work.
Follow-up	The engineer ensures that the work is completed, that defects have been corrected and that the contractor has fulfilled all contractual obligations.

3.3.16 AS-BUILT DRAWINGS

DESCRIPTION: **The original plans revised to incorporate alterations made during the course of the work**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Agreement with the client	The engineer and the client agree on quality, content, and schedule for completion of as-built drawings.
Accuracy	The engineer ensures that as-built drawings are kept up to date throughout the project.

3.4 OPERATION

3.4.1 COMMISSIONING

DESCRIPTION: **The start-up phase for equipment and facilities—the goal is to achieve the project performance objectives set by the client**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
Responsibility centre	Early on in the project, the engineer and the client agree on a commissioning programme and the division of responsibility for the following: • Start-up programme • Training of staff • Procuring of raw materials and work tools • Preparation of operating, maintenance and preventive maintenance procedures • Organization of technical assistance

3.4.2 START-UP

DESCRIPTION: **Physical starting up of equipment and facilities**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Planning	The engineer reviews with the client the impact of equipment or facility start-up on the client's organization, adjacent operations and labour relations. The engineer drafts a start-up programme, determines raw materials needed and recommends any modifications or adjustments of facilities that may be required.
Resources	Based on the start-up programme, the engineer determines requirements for analyses, monitoring of operations and maintenance, as well as resources needed.
Raw materials	The engineer ensures that raw materials are available on schedule and that quantities and qualities are as required.
The approach	The engineer collects and analyzes operating data, identifies problems and solves them. The engineer's constant goal is to obtain products of the desired quality at the least possible cost. Throughout, the engineer respects the environment and the lives, health and property of all.

3.4.3 TRAINING OF PERSONNEL

DESCRIPTION: **Qualifying future operators for efficient project operation**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
Planning	The engineer plans the content of the training programme with the client and identifies to whom the programme will be addressed. The engineer identifies resource people required to implement the programme. The engineer ensures that all instructors carry out the training programme satisfactorily.

3.4.4 PROCURING RAW MATERIALS AND WORK TOOLS

DESCRIPTION: **Identifying materials and products required for uninterrupted project operation**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
Responsibility centre	The engineer and the client's operators agree who will be responsible for identification and acquisition of materials and products required and for their integration into the client's management system. To ensure uninterrupted project operation, the engineer determines the following requirements: • Spare parts • Materials for daily use • Tools for maintenance staff • Laboratory equipment • Communications systems • Work accessories • Any other necessary equipment or material The engineer drafts a procurement and delivery schedule.

3.4.5 ESTABLISHING OPERATING AND MAINTENANCE PROCEDURES

DESCRIPTION: **Planning and organizing operation of the project and its components; for the benefit of operators, the engineer drafts documents outlining working data and methods of operation**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Responsibility centre	At the beginning of the assignment, the engineer and the client agree who will be responsible for planning and organizing project operation and for preparing reference manuals (content, format and presentation).
Serviceability	The engineer ensures that all reference manuals are in the appropriate language, are easy for users to understand and use, and are compatible with the project operator's existing manuals.
Work management (for projects comprising several separate but interacting elements)	The engineer integrates, summarizes as simply as possible and keeps records of the following: • System components, their characteristics and any changes made • System functional design • Overall performance assessment • Operation of the system as a whole • Management directives • Basic layout plans • Anything else pertinent
Project operation	The engineer plans and organizes project operation and keeps records of at least the following: • Equipment ratings, including efficiency curves • Safety standards • Calibration procedures • Operating procedures, including procedures for stopping operations • Performance standards and targets • Starting, stopping and emergency procedures • Alternative operating plans and procedures for emergencies or outages • Preventive and regular maintenance procedures • Tests, including testing procedures • Sample instruction sheets, check lists and reference tables • Information on hazardous materials used for the work • Anything else pertinent Documents are prepared for the project as a whole—and if the complexity of the project so warrants, for each piece of equipment.

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Maintenance of major pieces of equipment	The engineer plans and organizes project maintenance and maintains records of the following: • Equipment assembly drawings • Safety instructions • Technical drawings • Equipment and supplier catalogues • Routine inspection procedures • Equipment maintenance programmes, including lubrication • Tolerances and settings • Calibration procedure • Anything else pertinent
Warranty monitoring	The engineer determines and initiates the warranty monitoring programme to ensure the client benefits from all applicable warranties and to permit the client to continue the programme. The engineer ensures that the client is aware of any limitation which could void a warranty.

3.4.6 TECHNICAL ASSISTANCE

DESCRIPTION: **Identification of equipment whose operation and maintenance may require additional technical assistance**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
The engineer's role	With the assistance of the operator, the engineer identifies equipment whose operation requires additional technical assistance from the manufacturer of the equipment, the local agent or a specialist. The engineer determines who can provide the assistance required.

3.4.7 OPERATION

DESCRIPTION: **The series of interdependent activities for effective production or use of goods or services**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
The engineer's role	The engineer optimizes the use of human, material and financial resources to ensure that project operation produces the highest quality product at the lowest possible cost within stipulated lead times and that the environment and the lives, health and property of all are respected. The engineer identifies potential problems that affect cost/quality ratio. The engineer determines the least costly short-term and long-term solutions for such problems; the solutions must consider the operation of the process as a whole.

3.4.8 TROUBLESHOOTING

DESCRIPTION: **Rapid action taken by the engineer to solve an urgent problem**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Contacting the client	The engineer meets with the client and indicates the symptoms of the problem. The engineer's first priority is human safety, and protection of property and environment. If the engineer does not have the necessary competence to solve the problem, he or she informs the client and assists in finding an expert whose field of competence is appropriate for identification and implementation of a solution.
Analysis	The engineer personally checks the facts with the operators. The engineer gathers information, performs tests and analyzes the situation as a whole to determine the precise nature of the problem.
Implementing a solution	The engineer identifies a suitable solution given the circumstances, informs the client of what the solution entails and ensures the solution is implemented.
Follow-up	The engineer is responsible for follow-up and informs the client of costs incurred.

PROJECT MANAGEMENT

CHAPTER 4

4.1 SELECTING PROFESSIONALS

DESCRIPTION: **Methods for selecting professionals for a specific project**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Selection procedure	The initial selection derives from a selection procedure for achieving the best match between the requirements of the project and the qualifications of the professionals respecting the following: • Competence (proven experience, methods proposed, specialized knowledge) • Capability (availability, project manager, size of staff, financial stability) • Reputation (quality of work and service, professional affiliations) • Location • Any other pertinent qualitative attributes The final selection follows agreement on the services required and budget proposals of the selected professionals.
Offers of service	Before submitting a specific offer of service, the engineer devotes the time and resources necessary to clearly identify the requirements and expectations of the client and to select professionals for assignment to the project accordingly.
Agreement for professional services	The agreement stipulates the following: • The scope of the services to be provided • The nature and quality of the services required • The information supplied by the client • Work the engineer must deliver • Means of communication, representatives of the parties • Project schedules • Division of responsibilities between the professionals involved and the client • The nature, amount, and method of payment of professional and civil liability insurance (errors and omissions) • The role of the engineer in reviewing and approving shop drawings • Any other contractual items
Client assistance	The engineer offers to assist the client in determining which specialized services should be provided by others.

4.2 CLIENT PARTICIPATION

DESCRIPTION: **Active participation of the client in executing a specific project and in achieving assignment objectives**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Professional relations with the client	The engineer establishes a relationship of mutual trust and cooperation with the client. The engineer helps the client identify needs and understand his or her responsibility to the project and to the engineer.
Autonomy of the engineer	When carrying out the assignment, the engineer considers the extent to which the client wishes to participate in the project.
The engineer's responsibility	No matter how much the client participates, the engineer remains responsible for problems inherent in the engineer's mandate, unless the client fails to comply with written advice from the engineer. If an engineer is responsible for the technical aspects of engineering work and the advice of the engineer is ignored, the engineer clearly indicates the possible consequences to the client in writing. The engineer may not, without justifiable cause, cease to act on behalf of a client. The following, among others, may constitute justifiable cause: • A conflict of interest or any situation that casts doubt on the engineer's professional independence • Instigation by the client to commit illegal, unjust or fraudulent acts • The client's failure to follow the engineer's advice The engineer must give the client reasonable notice of his or her intention before ceasing to act on the client's behalf. These terms are normally set out in the agreement between the client and the engineer.

4.3 REPORTING STRUCTURE AND SUPERVISION

DESCRIPTION: **Defining a reporting structure for effective project execution**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Assignment responsibility	Each assignment is the responsibility of a single engineer who represents the organization and has been accepted by the client. This engineer ensures that the client knows the engineer's immediate supervisor.
Measure of client satisfaction	The engineer ensures that the organization obtains from the client regularly during the assignment (as well as at the end of it) an expression of the client's degree of satisfaction with the professional services rendered.

4.4 STARTING A PROJECT

DESCRIPTION: **Project planning and organization activities**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Assignment definition	The engineer and the client review the scope of services to be rendered, the level of detail expected, and the degree of freedom the engineer will have in carrying out the assignment. The engineer drafts a detailed work schedule for the entire project.
Definition of administrative responsibilities	The engineer obtains the client's statement of administrative obligations.
Standards and procedures	The engineer obtains the client's standards and procedures as quickly as possible. The engineer establishes his or her standards and procedures for the project. The engineer lists effective legislation, regulations, codes and standards applicable to the project.
Stages of work	Stages of the work are determined with the client based on project scope and schedule. When applicable, the following are considered in dividing the work into stages: • The process • The client's needs • Trades concerned • Delivery periods for equipment and services • Budgets • Schedules • Availability of resources • Anything else pertinent
Cost control	The engineer prepares a suitable detailed budget and cost control document for the assignment. The project budget includes an item for contingency allowances.
Planning	The engineer schedules project stages, determines general time frames and sets specific schedules for the following: • Each stage of the work • Engineering procurement and construction • All parties involved
Work teams	The engineer prepares a project implementation plan. The engineer assembles sufficient, competent, in-house and outside personnel so that all team members may apply themselves properly to their tasks and bring the project to completion.
Information management	The engineer organizes procedures for circulation of information and establishes a coding and filing system for project documents.
Design criteria	A list of design criteria is prepared and is submitted to the client for approval. The criteria are communicated to the project team.
Integration and coordination	Workforce scheduling, organization chart, budget, time frames, and the client's and the project's needs and constraints are integrated and coordinated.

4.5 PRODUCT CONTROL AND THE CLIENT'S NEEDS

DESCRIPTION: **Verifying that the work to be done or the structure to be built (the goal of the assignment) meets the client's needs**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Concern for the client's needs	In planning services for the client, the engineer arranges for systematic and formal verification that what is produced meets needs expressed by the client. The engineer informs the client as soon as possible of any changes in project parameters that entail the following: • Needs will not be satisfied • Budgets will be overrun • Deadlines will not be met • Standards will not be respected • Additional work will be required In each case, the engineer recommends corrective actions.
Contract control	The engineer informs the client as quickly as possible of the effects of agreed changes. Contracts are modified or renegotiated if necessary.
Informing the client	At the beginning of the assignment, the client is informed of the stages of the project and the assignment. The engineer regularly informs the client of the status of work completed and of work that remains to be done.
Points for comparing product and client's needs	Periodic checks for product control are agreed upon in advance with the client. Typical times are as follows: • When basic data are known • When possible solutions are identified • When the design is developed • When a solution is recommended • When preliminary general layout drawings and process flowcharts are sufficiently advanced • When the client must be informed of a questionable point of design • When the plans and specifications are nearing completion • On opening of the bids • When a technical change is required • At regular intervals during project construction and commissioning • After commissioning

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Control of outside services	The engineer ensures that sufficient competent personnel are assigned to meet the client's needs. The engineer ensures that services provided conform to the terms of the original assignment and that the product delivered meets the client's needs.
Errors	The engineer informs the client as soon as possible of any serious error the engineer has made in carrying out the assignment. The engineer informs the client of the consequences of the error and of measures to take to correct it. The engineer acts in a similar manner upon discovery of errors made by others involved in the project.

4.6 COORDINATION

DESCRIPTION: **Direction of the engineering activities of all parties involved in the project**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Responsibility centre	For the duration of the project under his or her responsibility, the engineer ensures coordination of the activities of all parties concerned—the client, the engineer and other professionals and specialists.
Communication	The engineer ensures harmony of professional methods and personnel assigned to the project. The engineer sets up mechanisms for effective communication.
Information for teams under the engineer's responsibility	The engineer ensures that all engineering personnel assigned to the project, including outside professionals are constantly aware of the following: • Project objectives • Project constraints • The nature of the work to be done • Time frames • Budget • Standards • Project criteria • Procedures • Project implementation plan Timely meetings are held regularly.

4.7 MEETINGS

DESCRIPTION: **Meetings held to advance project execution**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Organization	Meetings are planned ahead of time and a detailed agenda is issued to all concerned.
Reports	After each meeting, minutes are prepared; these are sent to all concerned within three days of the meeting. The minutes summarize the information discussed under each agenda item and specify solutions adopted, personnel who will be involved, actions to be taken, and time frames for execution.

4.8 QUALITY

DESCRIPTION: **Activities for determining and demonstrating that the value and nature of work performed is satisfactory**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Criteria	The technical quality of work performed must conform to the highest standards of engineering practice. Throughout the project, the engineer complies with technical standards, codes and regulations in effect. The engineer incorporates current technical standards, codes and regulations in the study of the impact of the project on the environment and on life, health and property. The engineer incorporates the following criteria in the project. Order of priority is determined and reassessed, when necessary, with the client. • Level and quality of services required • Costs • Client's time frames • Conformance with client's standards
Review	To check compliance with the above criteria, projects are subject to internal control and review procedures at points determined in advance with the client.

4.9 PROJECT PROCEDURES

DESCRIPTION: **Organizational procedures that facilitate meeting project objectives**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Systematic project organization	For each project activity, the engineer stipulates the nature of the work to be performed, the stages of production, inspection and approval, the division of responsibility, the forms and documents to be used and produced, and the methods for document management.
Communication	Procedures are communicated to all concerned as they become involved in project activities. Procedures are established and issued to all concerned in the early stages of the project.

4.10 COST CONTROL

DESCRIPTION: **Measures to control project costs and to ensure cost reports are prepared and budgets cross-checked**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Responsibility centre	The engineer constantly keeps track of developments in actual project costs versus budgeted and forecast costs.
Authorizations	The engineer ensures that monies necessary for project execution or for additions to the project have been duly authorized by the client.
Control system	The engineer and the client agree on cost control procedures. The cost control system includes at least the following: • Expenditure coding • Budgets • Expenditure commitment control • Cost (actual and forecast) and variance monitoring • Reports • Management of changes and contingencies

4.11 SCHEDULE CONTROL

DESCRIPTION: **Organization, analysis, control and monitoring of the stages of project execution**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Responsibility centre	The engineer keeps track of developments in progress schedules. The engineer agrees with the client on procedures for schedule control.
Critical activities management	To determine schedules and ascertain activities which may cause delays, the engineer constantly evaluates constraints and the material and personnel resources required for project execution. The engineer then develops corrective actions.
Communication and updating	Planning is updated regularly during the assignment. Revisions are communicated to the client and to the members of the project team.

4.12 CODING OF EQUIPMENT AND MATERIALS

DESCRIPTION: **Measures for ensuring that all equipment, construction material and other materials that are to be incorporated in the work are codified and easy to trace**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Establishing a system	The engineer sets up a coding system in conjunction with the client. The system is established at the beginning of the assignment, and it is used to list equipment, materials and any other components.
Updating	The list is regularly updated until the assignment is completed and a final list is submitted to the client.

4.13 PERMITS

DESCRIPTION: **Authorizations required before the project can be executed**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Regulations	The engineer keeps up-to-date on regulations pertinent to his or her field of competence.
Obtaining permits	The engineer informs the client of permits required to carry out the project and ensures they are obtained.

4.14 REFERENCE MATERIAL FOR THE CLIENT

DESCRIPTION: **Project documents kept by the engineer for later transfer to the client**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
Composition	The precise requirements for reference material are agreed upon with the client. The principal documents derived from project records are as follows: • Important correspondence • Basic data • Study and control reports (quantitative and qualitative) • Minutes of meetings • Monthly progress reports on the work • Plans, specifications and documents • Contracts, including progress charts, change orders, and contract administration documents • Training, operation and maintenance manuals, shop drawings, suppliers manuals and up-to-date project plans • Forms helpful for project operation • A compilation of certificates, warranties and guarantees The project documents are submitted to the client at a time agreed upon in advance.

4.15 POST-PROJECT EVALUATION

DESCRIPTION: **System for recording observations during the execution of a project and analyses conducted once the project is concluded**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Formality	A systematic project evaluation procedure is planned.
Responsibility centre	The project evaluation procedure is implemented by a manager specifically designated for the task; this person is not the project manager.
Scope of the analyses	Analyses cover the following: • Conformance of the product delivered to the client's needs and expectations • Technical performance • Costs and schedules • Management procedures
Results of the evaluation	Adjustments and changes made as a result of the evaluation are recorded.
Communication of results	The results of the project evaluation are communicated to personnel concerned.

ORGANIZATION MANAGEMENT

CHAPTER 5

5.1 GENERAL MANAGEMENT

5.1.1 PLANNING

DESCRIPTION: **Forward-looking analysis to map out how an organization will carry out its activities**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Written formulation	Planning elements are put in writing.
Contents	Planning encompasses the following: • A production plan • A quality plan • A research and development plan • A personnel and materials development plan • A business development plan • A financing plan
Preparation	Annual plans are prepared and approved before the beginning of the fiscal year to which they apply. Annual plans are re-evaluated periodically.
Integration	Plans are consistent with budgets and with the organization's development plan.

5.1.2 BUDGETING

DESCRIPTION: **Forward-looking analysis to determine operating expenses, capital expenditures, revenues and cash on hand**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Written formulation	Budgets are detailed and are put in writing.
Contents	Budgeting encompasses the following: • Revenue budget • Operating expenses budget • Cash budget • Capital budget
Preparation	Annual budgets are prepared and approved before the fiscal year to which they apply begins. Annual budgets are re-evaluated periodically.
Integration	All management staff are closely involved in the budgeting process. Budgets are consistent with planning in general and with the organization's development plan in particular.
Budget control	Budgeting plans include formal budget control at regular intervals. Throughout the year, project results are periodically matched to general annual forecasts. Discrepancies are analyzed and suitable solutions are identified.

5.1.3 QUALITY MANAGEMENT

DESCRIPTION: **All the activities by which an organization plans, organizes, guides and monitors all aspects of the organization and the quality of its products**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Written formulation	A quality management plan is put in writing. The plan incorporates the principles enunciated in the quality policy; it covers all the organization's activities, with particular emphasis on products delivered.
Implementation	Quality management is based on a systematic approach to organization, management and control of quality.
Communication	The quality management plan is communicated to all employees.

5.1.4 NEW BUSINESS DEVELOPMENT

DESCRIPTION: **All structured activities pursued by an engineer in the search for new assignments**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Marketing strategies	The engineer uses marketing strategies compatible with the Code of Ethics of Engineers. Among other things, an engineer may not directly or indirectly use methods that undermine—or result in undermining—the credibility of colleagues. The engineer shall not directly or indirectly give or offer any benefits, discounts or commissions either to obtain a contract or when carrying out engineering work.
Publicity	When advertising professional services, the engineer respects the provisions of the Regulation respecting advertising by engineers.
Grants and subsidies	The engineer identifies applicable grants and subsidies and assists the client with procedures to obtain them.
Appropriate expertise	The engineer only accepts assignments in his or her areas of competence. The engineer informs the client of specialists he or she plans to consult or hire to carry out an assignment.

5.1.5 PROFESSIONAL FEES AND BILLING

DESCRIPTION: **The engineer's fees for services to the client and the billing of these fees**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Informing the client	Before an agreement is concluded, the engineer and the client agree on the scope of the services to be rendered. The engineer also makes sure that the client is aware of the terms and conditions of payment and the magnitude of the fees. The engineer formally advises the client before undertaking additional engineering work not in the agreement. The engineer obtains the client's approval before proceeding.
Setting fees	Fees are fair and reasonable when justified by the circumstances and proportional to the services rendered. In setting fees, the engineer considers the following: • Time required to complete the assignment • Level of knowledge the work requires • Difficulty and scope of the assignment • Complexity of services required • Competence and qualifications required • Speed with which the work must be accomplished • Responsibility the engineer must assume • Anything else pertinent
Dependable billing	Barring agreement on other arrangements, fees are billed monthly and at the latest 30 days after services are rendered.
Content of bills	The client receives a detailed bill showing the following: • The original budget (or the revised budget, where applicable) • Progress status of the project • Current and cumulative fees, including pertinent details on how they are computed
Conciliation and arbitration	In case of disagreement with the client about an account for professional fees, the engineer informs the client that the services of the Order are available for conciliation and for arranging arbitration should the disagreement remain unresolved and the client wish to involve the Order.

5.1.6 ACTIVITIES REVIEW

DESCRIPTION: **The process of evaluating operations over the past year**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
Formal statements	Every manager submits a written assessment of his or her activities annually. Among other things, the assessment deals with the following: • Products • Quality • Human resources management • Clientele and market • Financial management

5.1.7 RECORDS MANAGEMENT

DESCRIPTION: **A system for establishing, updating, classifying and filing engineering records**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Classification system	The system identifies and classifies printed and computer-stored documents required to set up a file.
Compliance with the Code of Ethics of Engineers and the Regulation respecting the keeping of records and consulting offices by engineers	The system is designed to comply with the rules of professional secrecy and provides for files by client and by project.
Content of client files	Client files contain the following information: • The client's name, address, telephone number and facsimile machine number, and a list of resource people • The client's constraints, administrative standards and technical standards • A list of assignments completed for the client • A list of fees collected

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Content of project files	Project files contain the following: • A brief description of the assignment • A brief description of the project • The date of the contractual agreement, where applicable • Reference documents about the assignment (resolutions, letters, contracts and so forth) • An up-to-date record of personnel and materials used in carrying out the assignment, including copies of all bills for fees • An up-to-date record of costs ascribed to the project • Project-related correspondence sent or received • All technical documents about the project
Content of engineer-employee files	The employers' records on services an engineer renders are considered the engineer's files if the engineer is entitled to enter the items and information listed above and to have access to the records. If the engineer is not entitled to do so, he or she must maintain files of the following documents: • Reference to the contract or project on which he or she is working • A description of the work he or she is performing • Technical records related to the work • Copies of studies, reports or other documents prepared by the engineer and pertinent to his or her work The engineer must sign or initial every document or report he or she prepares as well as all entries in the files of his or her employer or of a partnership of which the engineer is a member.
Filing	The engineer uses a filing system.
Storage	The employer or the engineer keeps full project records for at least ten years after services have been rendered. At the end of this period, the engineer offers the client the original documents before destroying them.
Updating	The list of clients and projects is regularly updated.

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Cessation of practice	An engineer who temporarily or permanently ceases to practice transfers his or her records to another engineer. Should the engineer be unable to find a transferee, the records are entrusted to the Secretary of the Ordre des ingénieurs as provided for in the Regulation respecting the records of an engineer who ceases to practice. Within thirty days after taking possession of the records, the transferee informs the clients of the engineer who has ceased to practice that transferee has the records. As provided for in the regulation mentioned above, the transferee must inform the clients of his or her address, telephone number and office hours and of their right to consult another engineer. When the engineer who ceases to practice is a partner in an engineering firm or is employed by a firm or an individual, the regulation does not apply to records used by the engineer for professional practice but belonging to the firm or the employer. The regulation does, however, apply when all partners in an engineering firm cease to practice.

5.1.8 DOCUMENT SECURITY

DESCRIPTION: **Safekeeping of documents essential for carrying out a project**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Safekeeping	The engineer makes sure that duplicates of all printed and computer-stored documents are kept safe from deterioration and theft.
Regular checking and updating	The content and quality of the duplicates are checked and updated at regular predetermined intervals.
Confidentiality	The engineer ensures confidentiality of all project and client records.

5.2 HUMAN RESOURCES MANAGEMENT

5.2.1 HUMAN RESOURCES DEVELOPMENT AND ASSESSMENT PLAN

DESCRIPTION: **Forward-looking analysis to optimize allocation of human resources based on the needs of the organization and the professional development needs of the personnel on which the organization depends**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Knowledge of personnel	The plan is designed and regularly revised to ensure knowledge and evaluation of personnel. The list of employees is kept up-to-date. An up-to-date file is kept on every employee.
The needs of the organization	The plan provides for quantity, quality and organization of personnel the organization requires.
Staff needs	The plan provides for professional development of personnel within the organization.

5.2.2 CAREER PLANNING

DESCRIPTION: **Forward-looking analysis of the development of an engineer's status on the job market**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Responsibility centre	The engineer is responsible for the management of his or her own career.
Contributions of the organization	In allocating engineering assignments, the organization endeavours to promote the professional growth of the engineer and of the organization's employees. Assignments are also allocated based on the competence required for the task and the needs and constraints of the organization.

5.2.3 PROFESSIONAL DEVELOPMENT

DESCRIPTION: **All efforts the engineer devotes to maintain and develop his or her knowledge**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Responsibility centre	The engineer is responsible for his or her own professional development.
Contributions of the organization	The organization supports the engineer's efforts by helping to defray expenses for professional development and by offering flexible working hours.
Opportunities for education	Every year, the engineer devotes time and energy to professional development by participating in courses, symposiums, seminars or other structured educational activities. The engineer has access to recognized scientific and technical publications in his or her field of competence The engineer maintains a personal library of up-to-date manuals and technical standards in his or her field of competence.

5.2.4 OCCUPATIONAL HEALTH AND SAFETY

DESCRIPTION: **All provisions the engineer makes to foster occupational health and safety within the organization**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Integration	In rendering services, the engineer considers the occupational health and safety programmes of the engineer's own organization as well as those of the client's.
Formulation	Provisions for occupational health and safety must • be incorporated in a programme; • comply with applicable legislation and regulations in effect, recognized standards and best trade practice; • be appropriate for the working conditions; • define responsibilities; and • define tools for updating, follow-up and monitoring.
Training	The engineer makes sure that employees are constantly provided training called for in the programme.
Safety equipment	The engineer makes sure that he or she personally and the employees have all required equipment for proper protection against hazards inherent in the work they must perform.

5.2.5 JOB DESCRIPTION

DESCRIPTION: **The agreement between the engineer and the immediate supervisor – or between the engineer and a subordinate employee – on the position held and the duties and the responsibilities of the position**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Preparation	The engineer drafts a job description for each subordinate employee, discusses the description with the employee and updates it regularly. The engineer makes sure that the same process is applied to himself or herself.
Content	The job description is explicit and comprises the following: • Job title • Duties, function, responsibilities and relative importance of the position

5.2.6 RECRUITMENT

DESCRIPTION: **All practices the engineer uses to identify, select and hire staff**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Selecting the successful applicant	An applicant is selected whose competence corresponds to the requirements of the position to be filled.
The role of the immediate supervisor	The future employee's immediate supervisor must be involved in the selection procedure. The recommendation of the immediate supervisor is considered when selecting the successful applicant.

5.2.7 REMUNERATION

DESCRIPTION: **Salary an engineer receives for work performed**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Market fairness	Wage policy is based on the market as well as on the organization's ability to pay and its development outlook.
In-house fairness	Wages reflect an employee's level of responsibility and performance.

5.2.8 PERFORMANCE EVALUATION

DESCRIPTION: **The supervisor's assessment of how much an employee – given his or her job description – has helped the organization fulfil its mission and achieve objectives**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Formal statement	The engineer periodically (at least once a year) writes a formal performance evaluation for each employee. The engineer makes sure that he or she also receives formal performance evaluations periodically.

Features of the evaluation system	The performance evaluation system can be described as follows:
	• The process is continuous.
	• The purpose of the system is first and foremost to acknowledge and improve performance.
	• The performance evaluation identifies an employee's strengths and weaknesses and indicates measures to correct weaknesses.
	• The content of the performance evaluation is communicated to the employee by the immediate supervisor.
	• The following are discussed with the employee:
	  • The job description
	  • Specific objectives
	  • A career plan
	  • Performance standards

Performance standards	The following principles govern application of performance standards: • Each standard is for a specific duty defined in the job description. • Each standard is measurable and is to be met by a specified time determined in advance. • The employee and the immediate supervisor agree in advance on performance standards.

5.2.9 THE WORKING ENVIRONMENT

DESCRIPTION: **The physical place of work and the equipment the engineer uses**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
General layout	The general physical layout is designed to group departments and disciplines that regularly require coordination. The engineer has suitable access to the following: • Subordinate employees • Colleagues in the same department and in other departments • The engineer's immediate supervisor • Equipment used • Relevant work areas
The engineer's work space	The engineer's work space is suitable for the type of work he or she does. The space is clean and soundproof (if necessary to ensure confidentiality). The work space is suitably furnished, lit and ventilated.
Library	The work place includes an area used exclusively as a library, a place where research can be conducted and reference works can be consulted. The library contains all reference and technical works. These are classified and updated regularly.
Conference rooms	There are enough conference rooms of suitable size for the needs of the organization. Conference rooms are properly furnished, lit, soundproofed and ventilated.
Data-processing technology	The data-processing equipment used (hardware and software) is regularly reviewed for relevance and adequacy for the tasks that must be performed. The software is systematically inventoried and technically validated. It is classified and stored for easy availability.
Specialized equipment	Specialized equipment and measuring instruments are available, calibrated and maintained in good operating condition.

5.3 RESPONSIBILITY MANAGEMENT

5.3.1 THE CODE OF ETHICS OF ENGINEERS

DESCRIPTION: **The document that describes standards of moral conduct and professional duties of an engineer**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
The engineer's responsibility	The engineer makes sure that he or she knows, understands and applies the Code of Ethics of Engineers.

5.3.2 PROFESSIONAL OPINIONS

DESCRIPTION: **Expressions of the engineer's point of view on given subjects or problems – as part of the engineer's work or at any other time**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Responsibility	The engineer is responsible for any advice he or she gives at any time.
Discipline	The engineer expresses opinions only when founded on competence in the field and sufficient knowledge of the subject.
Discretion	The engineer refrains from giving opinions without checking all the facts. The engineer indicates the limits to interpretation of his or her opinion.
Documenting of opinions	The engineer keeps records of all professional opinions given, including those given orally.
Communication	The engineer provides the client written confirmation of advice given.

5.3.3 SIGNATURE AND SEAL

DESCRIPTION: **Regulations for professional signatures on engineering documents**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Plans and specifications	The engineer must sign and seal originals and copies of every engineering plan and specification he or she has prepared as well as those prepared by non-engineers under his or her immediate control or supervision. The engineer may also sign and seal originals and copies of engineering plans and specifications prepared, signed and sealed by another engineer. The engineer makes sure that his or her seal and signature appear on all copies of the originals mentioned in the preceding paragraphs. An engineer may sign and seal engineering plans and specifications only under the circumstances described above. Accommodation endorsement is forbidden.
Written consultations and opinions, measurements, layouts, reports, computations, studies, drawings and job instructions	The engineer signs such documents he or she has prepared as well as those prepared by non-engineers under his or her immediate supervision and control. The engineer may sign such documents prepared and signed by another engineer. The engineer places his or her seal on such documents when the client so requests.
Protection of the responsibility of the engineer	Whenever an engineer signs or seals a document, he or she enters the date of signing and sealing close to the signature and seal. The engineer retains copies of all such documents.
Junior engineers	When a junior engineer prepares engineering plans and specifications, written consultations and opinions, measurements, layouts, reports, computations, studies, drawings or job instructions, he or she must sign the document indicating status of junior engineer. Any document submitted to a client must be countersigned and sealed by an engineer.

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Engineering documents incorporated in a specification or some other engineering document	Engineering documents which have not been signed and sealed by an engineer and which are incorporated in another engineering document must be checked and signed, or, as the case may be, signed and sealed by an engineer.
Plans and specifications prepared outside Quebec	Plans and specifications prepared outside Quebec must be checked, signed and sealed by an engineer who is a member of the Ordre des ingénieurs du Québec or by an engineer to whom the Order has issued a temporary license to practice the engineering profession. Excluded from the above are plans and specifications exclusively for industrial manufacture of machines and equipment used in electrical, mechanical, hydraulic, aeronautical, electronic, thermal, nuclear, metallurgical, geological and mining work or in applied chemical or physics processes. Accommodation endorsement is forbidden.
Changes in documents	When a document produced by an engineer has to be changed, a revised document incorporating the changes and dated and signed (sealed too, if necessary) by the engineer must be produced. The changes made are clearly identified on the revised document.

5.3.4 LIMITS TO PRACTICE OF THE ENGINEERING PROFESSION

DESCRIPTION: **Rights and duties of the practice of engineering and of related or complementary professions**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Rights of professional practice	The engineer makes sure that he or she knows the limits of the practice of the engineering profession and those of professionals in the same field of practice: architects, biologists, forest engineers, geologists, chemists, bacteriologists, physicists, technologists, urban planners and so forth.
Duties of professional practice	The engineer is responsible for any assignment or work he or she performs, no matter what type.

5.3.5 THE ENGINEER'S SPHERE OF INFLUENCE

DESCRIPTION: **The engineer's influence in the engineering profession and the community where he or she works**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Volunteer work	The engineer actively contributes to community development by devoting time, energy and material resources.
Conferences and papers	The engineer takes advantage of opportunities to express a point of view on subjects in his or her field of competence, among other ways, by producing papers and attending conferences.
Standardization committees	The engineer participates in initiatives on the part of industry or relevant public organizations working to standardize technical and professional practices.
Paraprofessional and socioeconomic associations	The engineer is an active member of at least two associations working in his or her community or field of competence.

5.3.6 ACTIVITIES OF THE ORDRE DES INGÉNIEURS

DESCRIPTION: **Activities of the Order to which the engineer can contribute**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Availability of the engineer	The engineer makes sure that he or she is available and that the Ordre des ingénieurs is aware of the engineer's field of competence. The engineer sits on an arbitration board or a standing committee at the request of the Order.
Advancement of the profession	The engineer contributes to the advancement of the profession by sharing knowledge and experiences with colleagues and engineering students and by serving as a teacher or a tutor for continuing education or professional development programmes.
Sponsorship of junior engineers	The engineer agrees to sponsor junior engineers. Where applicable, the engineer complies with the requirements of the sponsorship programme.

ADMINISTRATION OF AN ORGANIZATION

CHAPTER 6

6.1 MISSION

DESCRIPTION: **Statement of the goals of an organization, including a brief description of the means advocated by management for achieving the goals**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Written formulation	The mission statement is put in writing.
Nature of the mission	When the mission statement concerns engineering services, specialities and services offered are specified.
Communication	All employees are informed of the mission statement. Anyone else the mission statement concerns is also informed of it.

6.2 MANAGEMENT PHILOSOPHY

DESCRIPTION: **Brief expression of the values of an organization's management and of the principles of management on which it relies**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Written formulation	Values and principles of management are stated clearly in writing.
Recognition of the status of the engineer	The values of the organization's management concerning services offered by engineers are consistent with the values of competence, ethical conduct, responsibility and social commitment advocated by the Ordre des ingénieurs du Québec.
Communication	All management staff have access to the document that describes the organization's management philosophy.

6.3 OBJECTIVES

DESCRIPTION: **The values and management philosophy of the organization's management expressed as simple and measurable goals established on the basis of a few parameters which are easy to recognize, monitor and control**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Written formulation	Objectives are stated clearly in writing.
Communication	All management staff are informed of the objectives.

6.4 ADMINISTRATIVE POLICIES

DESCRIPTION: **Statements of principle outlining the organization's orientation and position on specific administrative issues**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Written formulation	Administrative policies are stated clearly in writing.
Ethics	The policies are in keeping with the Code of Ethics of Engineers and other regulations of the Ordre des ingénieurs.
Production policy	This policy describes in detail products offered and production processes used. This policy also mentions innovations that might be introduced.
Quality policy	The quality policy establishes guiding principles for the following: • Identification of client needs and measurement of client satisfaction • Quality level of products offered • Customer service • Problem solving • Handling of nonconformance The quality policy requires that an engineer certify products delivered, particularly when performing the following duties within the field of practice of engineers: • Giving consultations or opinions • Making measurements, drafting layouts and preparing reports, computations, studies, drawings, plans, specifications and job instructions • Inspecting and monitoring work
Research and development policy	The research and development policy sets criteria for establishing an organization's contribution to research and development. This policy also establishes criteria for setting priorities for research and development efforts.
Policy on civil, professional and criminal liability	This policy establishes guiding principles for handling errors and omissions.
Policy on social responsibility	This policy sets criteria for establishing the social role of an organization and its responsibilities to the community.
Marketing and advertising policy (see section 5.1.4 as well)	This policy sets criteria for marketing and advertising initiatives. The policy establishes guiding principles for gathering and analyzing data about clientele and market.

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Human resources policy	This policy establishes guiding principles for the following: • Selection of staff • Remuneration • Employee benefits • Promotions • Professional development • Performance evaluations • Possibilities for employee access to ownership, if applicable • Occupational health and safety
Control and monitoring policy	This policy stipulates preferred methods of control for the following: • Technical matters • Financial administration • Management of human and material resources • Development
Financial policy	The financial policy sets criteria for guiding principles on management of the following: • Dividends on shares • Reinvestment of earnings • Fixed assets • Accounts receivable and accounts payable • Internal control • Short-term financing • Long-term financing • Billing The financial policy respects criteria for preparing and using financial statements.
Responsibility centres	Those responsible for policy implementation are identified and levels of approval for decisions are stipulated for each policy. Policies are transformed into administrative procedures.
Communication	Policies are communicated to all personnel concerned.

6.5 DEVELOPMENT PLANNING

DESCRIPTION: **General forward-looking analysis to determine how an organization can achieve the objectives of the next three to five years**

KEY CONSIDERATION	EXCELLENCE IN PRACTICE
Written formulation	Organization development planning is clearly set forth in a plan incorporating the following: • Categories of products offered • Categories of target clientele • Development of the organization's resources • Research and development • Earnings and expenditure budgeting, including a breakdown of earnings by product and type of client (see section 5.1.4 as well) • Capital budgeting • Funding of operations (including funding needs and sources)

6.6 HUMAN RESOURCES ORGANIZATION

DESCRIPTION: **Allocation of tasks and responsibilities within the organization and definition of lines of authority**

KEY CONSIDERATIONS	EXCELLENCE IN PRACTICE
Management staff	Management staff is composed of employees with competence in at least the following areas: production, finance, corporate law and human resources administration.
Organization chart	All positions appear on the organization chart. All personnel concerned are aware of the organization chart. The chart is updated regularly (at least once a year). The organization chart confirms the obligations of an engineer who supervises technical engineering work.