QUALITY OF CONSTRUCTION

Improving the Quality of Construction

INTERNATIONAL FEDERATION OF CONSULTING ENGINEERS

A guide for actions

Fédération Internationale des Ingénieurs-Conseils
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preface

Quality of Construction or rather, the lack of quality, is increasingly being identified by consulting engineers as a serious concern worldwide. A lack of sustainability as well as potential health and safety problems in completed projects, an increase in the number of disputes and a failure to provide value for money in completed contracts are obvious outcomes of the lack of Quality of Construction. Accordingly, FIDIC decided to take up the issue by establishing a Quality of Construction Task Force.

The Task Force recognized that FIDIC should take a leading role in working with other stakeholders to address the potentially serious problem of decreasing Quality of Construction. It would first verify the extent of the problem by undertaking a survey of FIDIC Member Associations and client organizations.

If it was confirmed that a problem existed on a global scale, then appropriate guidelines and policies would be prepared, together with other stakeholders.

The aim would be to develop appropriate processes and contract provisions which address the problems from a technical and engineering perspective rather than a legalistic viewpoint, including:

- more rigorous selection and pre-qualification processes, linked with closeout assessments
- Business Integrity Management Systems to ensure transparency in the selection of contractors
- other measures which could be identified as relevant for achieving quality in the construction process.

The survey of member firms and client organizations was conducted by the Task Force between April and June, 2001. The results of the survey, presented at the FIDIC 2001 Annual Conference, confirmed that a problem did in fact exist on a global scale. The Task Force subsequently started work on the development of this guide for actions.

FIDIC has issued many publications which reflect on quality, including guidelines, agreements, policy statements, contract documents, procedures and advice. The present guide aims to complement these resources by:

- helping users understand what is meant by Quality of Construction
- providing a summary of what has been published by FIDIC relating directly to Quality of Construction
- offering guidance for achieving an appropriate level of quality.

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1 introduction

1.1 Background

The FIDIC 2001 survey on the Quality of Construction within Member Associations confirmed that the failure to achieve an appropriate Quality of Construction was a worldwide problem. As could be predicted, the pressure to reduce the costs of construction and supervision were found to have had an adverse effect on quality. The problem was serious, and was evident in both developed and developing countries.

Lack of Quality of Construction was manifested in poor workmanship, unsafe structures, delays, cost over-runs and disputes in construction contracts. The survey also highlighted three major trends:

- Within the conventional process for the procurement of a construction contract, contractors, who are keen to win tenders, can do so by submitting low prices, at the risk of not being able to produce construction work which fulfills specifications.
- Consultants are often appointed by a client only to provide a part of the services needed during construction. This increases risks with respect to the quality and safety of construction, and frequently increases the overall cost of a project when account is taken of delays and disputes. Longer-term costs such as increased maintenance are also incurred.
- It would appear that newer project delivery systems such as Design-Build, Quality Assurance Contracts, Design-Build-Finance-Operate, etc. which are designed to shift risk and responsibility away from the client onto the contractor, and which may eliminate the client's engineer in the process, may also lead to a reduction in the quality of design and construction, and to reduced value. The result is therefore the very opposite of what was initially intended with these project delivery systems. It is hoped that this trend is temporary and will change as the systems become more fully understood.

1.2 Best practice approach

This guide recommends a best practice approach to achieve a proper Quality of Construction:

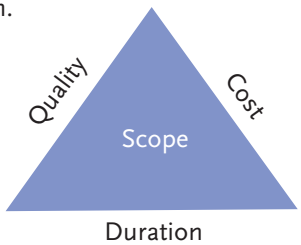
- Bid documents must be comprehensive and of appropriate technical quality, and clear in defining the scope and quality of the work required. Standard contract documents and specifications should be used wherever possible.
- A fair, competent and transparent system should be adopted for selecting and appointing a properly qualified contractor for each construction contract.
- Unless the client has experienced supervisory staff, it should be standard practice to engage a consulting engineer to render a full range of consulting services, including tender evaluation and construction supervision, for all projects which are taken through to construction.

For a best practice approach, it is necessary to specify which party is responsible. Accordingly, the guide recommends actions by:

government:	as a client as regulator
international financing agencies industry:	FIDIC Member Associations member firms contractors

1.3 A systems approach

During the roundtable discussion on Quality of Construction held at the FIDIC 2001 Annual Conference (Montreux, 3 - 5 September), Prof. Wang Qi-Zheng of Tsinghua University pointed out that there is a dialectic relationship between quality, cost, duration and project scope, which are interdependent. Quality should thus be discussed in terms of the other factors, as illustrated in the diagram.



The scope of a project defines the quality, cost and duration.

1.4 Demand and supply side measures

Stakeholders in the construction process can be classified as follows:

Demand side	*Supply side*
Community	Engineer as a designer
Client	Contractor
Government as an employer	
International agency as a lender	
Engineer as a supervisor	

Many Quality Management Systems address supply side measures. Efforts to improve the Quality of Construction will meet with more success if greater emphasis is placed on the demand side for Quality of Construction.

1.5 Engineering is not value-free

The solutions that consulting engineers are asked to bring to problems are strongly influenced by the values and beliefs held by clients – they are not "value free". Through their qualifications and experience, consulting engineers are expected to strike an optimum balance between:

- durability and maintenance intensive designs
- labour-based and industrial construction processes
- local and imported materials
- non-renewable and renewable energy
- mobility and accessibility
- sustainable quality and least initial cost.

Similarly, the approach to Quality Management and Quality of Construction will also reflect on the values and beliefs that the stakeholders hold.

1.6 Risks in lowest price procurement

Wherever procurement practices focus overly on the least initial cost, the following is procured if the repetitive delivery of a standard project is not required:

- lowest cost designer
- lowest cost project supervision
- lowest cost contractor using lowest cost materials
- lowest cost workmanship.

Whereas procurement based on the lowest cost might be reasonable when products can be exactly specified and subjected to pre-purchase sampling and testing, this is impossible in the procurement of either consulting engineering services or construction work.

The lowest cost approach is even more inappropriate when one considers that much of the work of consulting engineers involves:

- imperfect theories
- imperfectly understood loads and load cases
- imperfect analysis, synthesis and design
- imperfectly understood materials
- imperfectly manufactured products
- imperfect construction methods.

As was said at the FIDIC 2001 Anual Conference workshop in relation to the "least initial cost" approach: "It's a miracle that anything stands!"

2 Quality of Construction survey

2.1 FIDIC survey

The FIDIC Quality of Construction survey was carried out to capture the situation and to identify the adverse effects of a lack of Quality of Construction and other problems.

Replies to a questionnaire sent to FIDIC Member Associations were discussed at the FIDIC 2001 Annual Conference roundtable. The survey confirmed the existence of the problem at both global and local levels.

As summarised in the table on the next page, the survey concluded that:

- there is an unjustified cost squeeze: the result is poor quality
- guidelines and policies should be developed together with other stakeholders
- more rigorous pre-qualification processes, linked with closeout assessments, are necessary
- Business Integrity Management Systems need to be adopted to secure transparency in selection.

2.2 The way forward

FIDIC's response was based on the premises that:

- in order to eliminate problems, member firms need guidelines and policies for communicating with clients
- FIDIC should take a leading role in actions with international funding agencies to achieve: improved contract provisions, pre-qualification processes and transparency in selection; adoption of Business Integrity Management Systems; enhanced management capability of clients; rendering of a full range of consulting services; more widespread use of independent verifiers.

FIDIC has issued many publications dealing with business practice, including guides, guidelines, agreements, contract documentation, procedures and policy statements. This guide for actions aims to highlight FIDIC's resources by:

- helping users understand what is meant by Quality of Construction
- providing a summary of what has been published by FIDIC relating directly to Quality of Construction
- issuing guidance for achieving an appropriate level of quality in the form of references to best practice.

2.3 FIDIC vision, mission and objectives

FIDIC believes that construction must be sustainable. An important aspect of this principle is embodied in the FIDIC policy statement *Quality of Construction* [1] which states "... and to this end, it is the policy of FIDIC that each party in the construction process must be committed to satisfying its obligations in respect to achieving Quality of Construction."

Quality of Construction in this context is defined as that quality, which meets or exceeds the requirements of the employer, as specified in the contract documents, while complying with law, codes, standards and regulatory policy that apply to the contract for construction.

The commitment to Quality of Construction is aligned with FIDIC's vision, mission, objectives and strategic action plan as set out in the FIDIC report *Engineering our future*, 1998 [2]. The report stated that FIDIC's mission is "to promote the business interests of members providing technology-based intellectual services for the built and natural environment, and while doing so, accept and uphold our responsibilities to society." The report continued with FIDIC objectives, which state, amongst others, to "Assist members with issues relating to business practice."

The objectives led in turn to the following actions as set out in the strategic action plan given in *Engineering our future*:

- Promote Quality Based Selection and provide Member Associations with assistance on this selection policy.
- Develop guides to best practice in Risk Management and insurance and in Quality Management, and assist Member Firms in their application.
- Promote and facilitate Quality Management in firms and the industry, and link Quality Management to Quality Based Selection.

Quality of Construction survey conclusions

Question	*Reply*
Who is affected?	Client, contractor, consulting engineer, user
Why is there a cost squeeze?	Tight budget
	Inappropriate selection
What is practiced that leads to poor quality?	Selection of inexperienced contractors
	Poor materials
	Lack of workmanship
When does poor quality arise?	Budget distributed among third parties and not used for real purposes
	Tender competition based purely on price
Who should be pressured to change the situation?	Clients, contractors, consultants, users, international funding agencies
How to secure appropriate costs?	Strict application of regulations
	Close monitoring by international funding agencies
	Client effort; consultant effort
What should be done for business integrity?	Ensure transparency in selection
How to secure full consultant services?	Monitor international funding agencies
	Client effort; consultant effort
What should FIDIC do?	Hold discussions with international funding agencies
	Publish guidelines for clients

Topic	*Suggestion made*
Pre-qualification	Require submission of certificates for quality, such as ISO standards-based certificates
	Fairness and transparency in pre-qualification processes
	Clear pre-qualification evaluation criteria
Tendering	Proper application of Quality Based Selection
	Fairness and transparency in tendering process
	Clear tender evaluation criteria
Contract type	Preference for unit price contracts
	Proper matching of contract type and specifications
	Single consulting engineer in charge of design and supervision
Contract amount	Setting of minimum tender price
	Evaluation on both technical and price bases
	Separation of the cost of Quality Management from its appropriate evaluation
Contract duration	Consulting engineers should consider a realistic duration of construction
	Maintain good communication among stakeholders
	Need careful evaluation of any shortening of the construction duration
Liability and insurance	Preparation of a simplified form for liability insurance
	Carried jointly by employer, consulting engineer and contractor
	Limit of liability should be stated and the cost of cover recoverable
Construction management	Standardize the construction management method and form
	Collaborate with governing bodies, ISO, the Project Management Institute, etc.
	Quality requirements should correspond to the country concerned
Construction workmanship	Education and training of workplace personnel
	Establish quality control systems
	Collaborate with ISO to ensure that quality assurance and quality control procedures develop
	Appropriate evaluation of, and incentives for, good workmanship
Construction procedure	Need assurance of the independence and integrity of the engineer through FIDIC Statutes
	Standardize formats, specifications, contracting, etc.
	Place unsuitable firms off-limits
	Project price to reflect quality demand
	Set the level of client involvement based on the client's ability to handle technical issues
FIDIC role	Need assurance of the independence and integrity of the engineer through FIDIC Statutes
	Standardize formats, specifications, contracting, etc.
	Set the level of client involvement based on the client's ability to handle technical issues

Parties

There are basically six parties to the construction process, as contemplated by a construction contract, for instance, FIDIC's *Construction Contract, 1999* [7], *Plant and Design-Build, 1999* [8] or *EPC/Turnkey Contract*, 1999 [9].

Employer (owner, purchaser or client)

The employer may have several financiers, advisors, regulators, shareholders and other parties to coordinate and satisfy, but it is normal that all inputs to the contract are channeled through the employer. Thus the employer is defined as central to the construction process and to the contract.

Contractor

The contractor will also have several associated entities such as: sub-contractors; suppliers of materials, processes, plant and equipment or labour; testing authorities; financiers and designers (in the case of design-build contracts). But again, the contractor as the contracting entity is responsible under the construction contract as representing all the entities on the construction side of the process.

Engineer

The Engineer under the construction contract may be an entity of the employer, or from an consulting engineering firm.

Dispute Adjudication Board

The Dispute Adjudication Board is an independent body comprising a person or persons nominated in, and integral to, a FIDIC contract for the purpose of resolving disputes. There are older conditions of contract where an adjudicator is not nominated, in which case the dispute resolution role passes to the Engineer, in the first instance.

Funding agency

The funding agency will be an aid agency or international funding institution. While not necessarily involved in the contract phase, the agency is in a position to, and has a vested interest in, influencing quality through policy decisions.

Designer

The designer is a consulting engineer acting under the terms of the designer's agreement with a client, and responsible for producing both the completed design and the tender and construction documents for the employer's approval.

Scope for action

Each of the six parties has, to a varying degree, the opportunity to influence the quality of the constructed project.

Employer

The employer indicates the quality requirements as to: scope and budget; approach to implementation; selection of the consulting engineer; function and appearance; completion on time and within budget; life-cycle cost; operability and maintainability; environmental impact; health and safety; social impact.

Contractor

The contractor defines the quality requirements in terms of: price appropriate to the scope and quality; a reasonable schedule; timely decisions by the employer and engineer; fair treatment; realistic risk sharing; reasonable profit; a satisfied employer.

Engineer

The Engineer specifies the quality requirements as to construction and contract administration activities including technical and contractual services as well as the review and approval of the completed construction.

Dispute Adjudication Board

Dispute Adjudication Board has a limited direct impact on quality, but will adjudicate on issues relating to the construction documents, which have a bearing on quality.

Funding agency

The funding agency has specific mandates for ensuring the proper use of funds. These mandates, depending on the nature of the project, its location and the type of services required, have a limited but definite impact on quality.

Designer

The designer defines the quality requirements and defines them in a well-organized set of specifications, plans and other contract documents.

Policy Statements FIDIC has published several policy statements [1] which reflect on the roles and responsibilities of the six parties.

Employer
FIDIC policy is that purchasers of both consulting services from consulting engineers and construction services from contractors should be fully informed on the technical aspects of a specific project and on the proper processes for procuring and managing the supply of plant or equipment for these services.

Contractor
The contractor is the party which is responsible for providing the works. FIDIC policy is that quality as well as price should be adopted as criteria for selection of the contractor. This can be achieved via the tender assessment process where there should be weighting for non-price factors.

Engineer
The engineer is a consulting engineer or other professional who acts for the employer taking due regard of all relevant circumstances. FIDIC policy is that in making a tender evaluation, the engineer should evaluate the tenderer's professional and technical resources, financial resources, managerial capability, experience and track record in the class of work and geographic region. During construction, the engineer should work to ensure the provision by the contractor of the quality required by the contract.

Dispute Adjudication Board
The Dispute Adjudication Board is an independent body to which a dispute between the parties is referred for adjudication. Such disputes may well refer to quality.

Funding agency
FIDIC considers that the funding agency is in the same "informed purchaser" role as the employer. Furthermore, an international financing institution is in the position to influence quality positively by way of policy decisions.

Designer
The designer, acting under the terms of an agreement with a client, is responsible for producing the completed design for the employer's approval. The technical documents produced by the designer will define the required quality.

Principles Principles for the Quality of Construction can be grouped into seven areas.

Management
Projects should have the appropriate levels of quality of design and construction management.

Allocation of risk
There should be an appropriate allocation of risk between the parties to the construction contract. The engineer should make clients aware of all identifiable risks.

Transferability
Quality can sometimes be difficult to identify and define. Experience in a particular technology or geographic area may not be transferable to another technology or area.

Consultant selection
Selection of the consultant should be on a non-price basis of quality.

Contractor selection
Selection of contractors should have regard to quality as well as price.

Cooperative environment
Adversarial relationships lead to lower quality. This fact requires the main parties, notably the employer, engineer and contractor, to recognize the importance of creating a cooperative environment.

Address adverse factors
Some factors which adversely affect construction quality are: unrealistic or unclear specification requirements or details; procurement problems; an unsatisfactory legal and business framework within which a project is developed; accidents; force majeure; lack of or poor communications.

4 approach to quality

4.1 Policies and best practice

FIDIC has published a variety of documents on policies and practices that relate to the construction process. A full list is included in Appendix 1 for ease of reference. Copies are available from the FIDIC Bookshop.

Conditions of contract

The FIDIC contracts are especially relevant to the Quality of Construction:

- *Short Form of Contract*, 1st Ed 1999 [6]
- *Construction Contract*, 1st Ed 1999 [7]
- *Plant and Design-Build Contract*, 1st Ed 1999 [8]
- *EPC/Turnkey Contract*, 1st Ed 1999 [9]

Use of these standard contracts, and of *The FIDIC Contracts Guide*, 1st Ed 2000 [10], satisfies the FIDIC recommendation that, as a major contributor to Quality of Construction, contracts should be:

- standardized
- clear in spelling out the obligations of all parties involved in the contract
- quality oriented
- fair and achievable by both parties to the contract.

Prequalification

Since the preparation of bids requires a substantial investment of effort and money, the pre-qualification or shortlisting of firms guarantees that bids will be submitted only by firms initially found to meet minimum requirements for experience and resources.

The objective of pre-qualification is to receive responsive proposals from suitably qualified firms at a reasonable cost to the consulting engineer and the client. Pre-qualification of bidders is conducted in three stages:

- invitation to pre-qualify
- issue and submission of pre-qualification documents
- assessment of the pre-qualification applications.

The preparatory work for pre-qualification and the subsequent processing by clients will also be greatly facilitated through the use of standardized formats.

The aim of pre-qualification is to establish a list of capable (qualified and competent) firms which appear suitable for providing the required works while ensuring that proper competition is maintained. The number of firms to be invited to compete should normally be in the range of three to seven.

The evaluation system should aim at minimizing subjective judgments by defining before the evaluation begins, the factors that are to be evaluated and the criteria to be used.

Tendering procedures

FIDIC's *Tendering Procedures*, 2nd Ed 1994 [37], is intended to help the employer and consulting engineer:

- receive sound competitive tenders
- minimize tendering costs
- ensure that all tenderers receive a fair and equal opportunity.

The document presents a systematic approach for the tendering and awarding of contracts for international construction projects.

Procedures are related to FIDIC's *Conditions of Contract for Works of Civil Engineering Construction*, 4th Ed 1987 [11] and *Conditions of Contract for Electrical and Mechanical Works*, 3rd Ed 2001 [12], but can be readily adapted to any acceptable contract form.

Consultant selection

FIDIC's *Guidelines for the selection of consultants*, 1st Ed 2003 [35], presents the commonly used methods of consultant selection, explains the respective procedures, and combines them into a compact document, so as to emphasize and explain FIDIC's policies for consultant selection.

FIDIC stresses the pre-eminence of quality in the selection process and recommends that the preferred selection method for consulting services be the Quality Based Selection (QBS) method, particularly for nationally funded projects where the competition is between national consulting firms of more or less similar characteristics. FIDIC also recognizes the QBS method as the only method for those projects where there is a multiplier effect, significant complexity or significant potential damage if the project fails.

Informed purchaser

In any endeavour, a well-informed team will produce results that are superior to those from a less informed or less capable team. Evidence shows that the quality of the team, that is, the client (or the owner or employer), the consulting engineer and the contractor, is paramount for producing sustainable results with the best quality.

FIDIC's policy, as articulated in the FIDIC policy statement *Informed Purchasers* [1], is that purchasers of consulting services should be fully informed on the technical aspects of the specific project, and on the proper processes for the procurement and management of consulting and construction services. Similarly, purchasers of construction services from contractors should be fully informed on both the technical aspects of the specific project and on the proper processes for the procurement of construction or the supply of plant and equipment.

Business Integrity Management

Corruption jeopardizes the procurement process, is unfair and often criminal: it steals money from essential development projects and adversely affects the Quality of Construction.

In joining the world-wide effort to combat corruption, FIDIC has taken a proactive role by supporting international anticorruption initiatives, promoting high ethical standards and recommending the implementation of Business Integrity Management. The Federation has issued *Guidelines for Business Integrity Management in the consulting industry*, Test Ed 2001 [17]. The document was prepared with three main aims:

- To provide background information on, and an introduction to, Business Integrity Management, with convincing evidence that member firms must adopt effective Business Integrity Management practices, focused on a step-by-step process through the involvement of all of the firm's staff.
- To outline what constitutes a Business Integrity Management System (BIMS) for consulting firms.
- To outline the steps to be followed in order to initiate the implementation of a BIMS in a consulting firm.

Quality Management

Quality Management, as opposed to quality control or quality assurance, most accurately reflects the all-encompassing importance of quality. According to the International Standardization Organization (ISO), quality is:

> "the ability of a set of inherent characteristics of a product, system or process to fulfill requirements of a customers and other interested parties."

FIDIC recommends that:

- contract documents for construction projects must include a provision for the contractor to produce and work in accordance with a project quality plan based on ISO 9002:2000 principles
- for construction contracts, quality as well as price should be adopted as a criterion for selection. Quality or non-price factors in relation to tenders for construction contracts cover the tenderer's professional and technical resources, financial resources, managerial capability, experience, and track record in the class of work and region
- member firms adopt Quality Management Systems to enhance the quality of outputs.

From the left, FIDIC's Short Form, Construction, Plant and Design-Build and EPC/Turnkey contracts.

4 approach to quality

FIDIC's *Guide to Quality Management in the consulting engineering industry*, 1st Ed 2001 [19], and the accompanying *Guide to the interpretation and application of the ISO 9001:2000 standard for the consulting engineering industry*, 1st Ed 2001 [20], have four main purposes:

- To provide background information on, and an introduction to, Quality Management, with convincing evidence that member firms must adopt effective Quality Management practices, focused on continuous improvement through the involvement of all employees.
- To outline what constitutes a Quality Management System (QMS) for a consulting engineering firm.
- To outline the steps to follow to start the implementation of a QMS in a consulting engineering firm.
- To help integrate new employees, suppliers and sub-contractors without loss of quality by using a well documented QMS.

Sustainable development

All development projects have environmental, social and economic impacts that must be fully considered. An extensive amount of information on appropriate procedures is available to employers, consulting engineers and contractors to assess whether or not these impacts are acceptable in comparison to the benefits of a project.

FIDIC's *Consulting engineers and the environment: guide for actions*, 1st Ed 1994 [21], was developed as a flexible document, with modifications based on the experience of consulting engineers in applying the principles of the *Rio Declaration on Environment in Development*. Subsequently, the publication *Sustainable development in the consulting engineering industry: a strategy paper,* 2000 [25], defined the consulting engineering industry's role in sustainable development. The report *Sustainable development in the consulting engineering industry: a unique capacity to address the priorities*, 2002 [26], reviewed progress in meeting industry objectives.

The most important conclusion was that the industry's main contribution came from managing sustainablity at the project level, where the goal is to advance sustainable development incrementally on a project-by-project basis. Tools were foreseen that build upon FIDIC's contributions to training resource kits for Environment Management Systems for industrial facilities [23] and for facilities operated by local authorities [24].

Four major areas were considered critical to the successful involvement of consulting engineers in achieving sustainable development, namely:

- Social and environmental concerns in projects
- Responsibility and policy in business practice
- Education, training and research
- Information

Insurance

FIDIC's *Insurance of large civil engineering projects*, 2004 [29], outlines the current position in relation to, and deals with, the provision of project insurance for large civil engineering projects. The report proposes that eventually all the owner's risk could be covered under two policies:

- Full design-related physical loss cover under the contractor's all-risks policy, with full waiver of subrogation rights.
- Comprehensive cover for financial losses arising out of insured losses.

Risk Management

Recent decades have seen an increase worldwide in the number of legal actions within the construction industry. Risk Management in construction work occurs at several levels:

- Risk Management is the main purpose of Quality Management, namely, the monitoring of the processes by which: design and other professional tasks are carried out by design professionals; construction is carried out by contractors; materials and components are manufactured by suppliers. Quality Management should also regulate all of the peripheral tasks required for successful construction.

- Risk Management embraces the management of society and government expectations of design professionals and other specialists who provide the essential services on which modern living depends. While these specialists offer technical expertise, they do not normally possess the financial resources necessary to absorb their client's financial exposure.

FIDIC's *Risk Management manual*, 1st Ed 1997 [27], describes in detail the many aspects which should be kept in mind in managing risk, and suggests sound management procedures which should be followed in professional practice to minimize exposure to risk.

Procurement

Clients in several countries are emphasizing non-price factors during the tender process for construction projects. This practice is found in Australia's tender assessment system, Japan's comprehensive evaluation system, the US competitive negation system, and the European Union's competitive evaluation system.

FIDIC recommends that for construction contracts, quality as well as price should be adopted as a criterion for selection. Quality or non-price factors in relation to tenders for construction contracts cover the tenderer's professional and technical resources, financial resources, managerial capability, experience, and track record in the class of work and region. FIDIC suggests that price could constitute 80% and non-price factors constitute 20% in the evaluation, although this weighting could be varied depending on the complexity and risk profile of the project. An example of an evaluation with a 20% weighting for non-price factors is included in Appendix 2.

4.2 FIDIC contracts

The construction contract defines the relationship between the employer and the contractor: it assigns responsibility and authority for managing and administering situations that the parties expect to encounter, as well as procedures for addressing unexpected situations.

The development of the construction contract is a crucial phase in the life of a project. Each party must approach the development and negotiation of the construction contract in good faith, as the roles and responsibilities stated and assigned by the contract bear directly on the cost and quality of the project.

Some comments can be made on the importance of FIDIC's conditions of contract for Quality of Construction.

Construction contract

FIDIC's *Construction Contract*, 1st Ed 1999 [7], is recommended for building or engineering works designed by the employer or by the employer's representative, the engineer. Under the usual arrangements for this type of contract, the contractor constructs the works in accordance with a design provided by the employer, and the works may include some elements of contractor-designed civil, mechanical, electrical and/or construction works.

Construction subcontract

FIDIC's *Conditions of Subcontract for Works of Civil Engineering Construction*, 1st Ed 1994 [13], are recommended for use in conjunction with FIDIC's *Conditions of Contract for Works of Civil Engineering Construction*, 4th Ed 1987 [11]. The conditions, subject to minor modifications, are equally suitable when the subcontractor has been nominated by the employer. In preparing the conditions of subcontract, FIDIC recognized that while there are numerous clauses which will be generally applicable, there are some clauses which must necessarily vary to take account of the circumstances and locality of the subcontract works.

Plant contract

FIDIC's *Plant and Design-Build Contract*, 1st Ed 1999 [8], is recommended for the provision of electrical and/or mechanical plant, and for the design and execution of building or engineering works. Under the usual arrangements for this type of contract, the contractor designs and provides in accordance with the employer's requirements, plant and/or other works, which may include any combination of civil, mechanical, electrical and/or construction works.

Employers using this contract must realize that the Employer's Requirements which they prepare should describe the principle and basic design of the plant on a functional basis. The contractor shall then carry out any necessary design and detailing of the specific equipment and plant, and be responsible for the quality of the design and construction.

EPC contract

FIDIC's *EPC/Turnkey Contract*, 1st Ed 1999 [9], is suitable for the provision of a process or power plant, a factory or similar facility, or an infrastructure project or other type of development, where a government department or private developer wishes to implement its project on a turnkey basis using a strictly two-party approach.

Employers using this form must realize that the Employer's Requirements which they prepare should describe the principle and basic design of the plant on a functional or performance basis. The tenderer then carries out any necessary design and detailing of the specific equipment and plant, allowing the tenderer to offer solutions best suited to its equipment and experience. The tendering procedure must therefore permit discussions between the tenderer and the employer about technical issues and commercial conditions. All such matters, when agreed, shall then form part of the signed contract.

Short Form of Contract

FIDIC's *Short Form of Contract*, 1st Ed 1999 [6], is recommended for engineering and building work of relatively small capital value and where the work is fairly simple, repetitive or of short duration without the need for specialist sub-contracts. However, depending on the type of work and the circumstances, the Short Form may also be suitable for contracts of greater value.

The contractor takes full responsibility for the quality and care of the works from the commencement date until the date the contractor rectifies any loss or damage so that the works conform with the contract.

Unless the loss or damage happens as a result of an employer's liability, the contractor indemnifies the employer for the negligence or other default of the contractor, the contractor's agents or employees.

4.3 FIDIC recommends the ASCE guide

As a comprehensive, practical guide to achieving best practice in construction, FIDIC recommends the document *Quality in the constructed project: a guide for owners, developers and constructors*, 2nd Ed 2000, published by the American Society of Civil Engineers (the "ASCE guide").

The ASCE guide deals at length with all aspects of the construction project from the establishment of the owner's team to planning, selection of a delivery system, project management, design, tendering, administration of contracts, and, importantly, quality in the process.

The ASCE guide benefits from the experience and input of hundreds of industry professionals from virtually every area of design and construction. The information and recommendations presented are intended to aid readers in developing an approach to their work and practice that meets their individual needs, as well as the objectives of particular projects in which they may be involved.

FIDIC supports the following statement taken from the ASCE guide:

> "Quality in the constructed project is achieved when the project team works together to fulfill their responsibilities to complete the project objectives in a manner that satisfies the requirements of each participant.
> The agreement between the owner and design professional, and the contract between the owner and constructor, are the cornerstones of project quality. The process of developing these documents provides a structured forum for participants to express their requirements and align their interests. As a project proceeds, these documents are a key source of understanding for project objectives and the responsibilities of each team member. The level of project quality is directly related to the clarity with which the team members understand and express their requirements."

ASCE guide: chapter titles

1	Introduction
2	The owner's role and requirements
3	Project delivery systems
4	The project team
5	Coordination and communication
6	Selecting the design professional
7	Agreement for professional services
8	Alternative studies and project impacts
9	Planning and managing design
10	Design discipline coordination
11	Guidelines for design
12	Pre-contract planning for construction
13	The construction team
14	Procedures for selecting the constructor
15	The construction contract
16	Planning and managing construction
17	Construction contract documentation and submittals
18	Construction contract administration
19	Operation and maintenance
21	Computers and project quality
22	Peer review
23	Risk, liability, and avoiding conflict
24	Partnering
25	Value engineering

5 recommended actions

5.1 Demand side actions

The FIDIC Quality of Construction survey found that decreasing Quality of Construction is a worldwide problem, involving both developed and developing countries. Poor quality arises owing to inappropriate mechanisms of project delivery which lead to poor project practice, specifically:

- poor consultant and contractor selection
- poor design
- poor project supervision
- poor materials
- poor workmanship.

Since Quality Management and sustainable development are strongly linked at the conceptual level, there is a worldwide need to improve Quality of Construction to achieve sustainable development at large. During the Lekgotla ("dialogue of leaders") Business Action for Sustainable Development meeting held at the 2002 World Summit on Sustainable Development in Johannesburg it was stated that:

> "Quality management is a prerequisite for sustainable development. Without adherence to the required quality standard, wastage will occur, while the very purpose of this all is to reduce unnecessary consumption."

Experience has shown that interventions which aim to change behaviour are more successful if greater emphasis is placed on the demand side. In the case of Quality of Construction, stakeholders who are on the demand side therefore generally have a greater influence than those on the supply side for ensuring the acceptance of new construction processes, and for having them implemented and embedded in a project.

In the conventional project cycle, clients such as government and international agencies thus have considerably more influence than contractors and consulting engineers in achieving Quality of Construction. This guide for actions will therefore mainly focus on actors on the demand side of the project cycle. However, actors on the supply side can still make very significant contributions, so actions by industry are also recommended.

5.2 Actions by government

Engineering solutions are derived from stakeholder values, so the approach that organizations take in solving problems is influenced strongly by their values and beliefs. In short, values and beliefs drive attitude and behaviour, and thus outcomes. If improved Quality Management and Quality of Construction are desired, they must be embodied in a client's values and belief system. If this is not the case, all the good intentions of the suppliers of services, goods and processes throughout the project cycle will have limited impact.

Government as client

Governments who, as clients, want to achieve Quality of Construction should consider the following:

- Adopt a Quality Management approach towards projects and construction. Quality Management should include Quality Management Systems such as those based on the ISO 9001 Standard for their own departments and as a prerequisite for suppliers of goods and services who want to do business with a department. Adopting Quality Management may mean a fundamental review of the process by which government procures the services of consulting engineers and contractors (for instance, changing from an adversarial, "us versus them" approach to a partnership-based, "we together" approach).
- Recognize that Quality Management is a prerequisite for sustainable development, since a lack of adherence to appropriate quality standards will lead to waste in goods and services, whether, for example, through over-design, under-design or incorrect design, or through faulty construction requiring higher maintenance costs or early replacement.
- Adopt a sustainable development approach towards construction by:
  - Taking cognisance of the need to internalise total project cost as is pointed out in *FIDIC's Sustainable development in the consulting engineering industry – a strategy paper*, 2000 [25]. For example, calling for tenders to achieve lowest price may seem like an attractive option, but once all external costs such as

tender preparation costs and future costs owing to lack of quality are internalised, the outcome may be very different.
  - Reducing the volatility in the construction industry by, for example, overcoming boom-and-bust, or feast-and-famine, cycles. These notorious cycles increase the construction industry's risk, with the resulting loss of the most talented and highest calibre staff, thus impacting negatively on Quality of Construction and the industry's sustainability.
- Insist that, for the purposes of ongoing management, operation and maintenance, local capacity must be developed on all projects. "Local" may have the meaning of local areas within a country or a larger geographic region. Useful guides include FIDIC's *Capacity building: building the capacity of consulting firms*, 2001 [4] and *Improving transfer of technology: guide for actions*, 1992 [3].
- Adopt a Quality Based Selection approach for the procurement of consulting services, and include in the selection criteria the need for consultants to have the following in place:
  - Quality Management System
  - Business Integrity Management System
  - Environment Management System
  - Risk Management System
  - Professional indemnity insurance
  - Membership of a recognized body representative of the profession or industry.
- Adopt a quality-oriented selection process for the procurement of construction contracts, including:
  - Pre-qualification: this is no guarantee of quality, but it at least excludes those who are obviously less likely to execute the contract successfully.
  - Previous track record: in the context of pre-qualification, while requiring a solid track record may exclude possible new entrants and make the industry less competitive, it is essential for ensuring capability.
  - An appropriate combination of price and non-price award criteria (also known as tender evaluation criteria).
    This selection process has the advantage that it can be extended to include separate sections for sustainability dimensions such as the submission of a social plan and an environment management plan. Depending on the nature of the contract, for example, routine as opposed to complex and high risk, price could constitute 80% of the tender with the remaining 20% used for the non-price award criteria.
- Promote the adoption of standardised documentation by all clients, especially government departments and government authorities, for:
  - procurement procedures for consulting engineers
  - procurement procedures for contractors
  - client/consultant agreements
  - construction contracts
  - tender and construction documentation.

Government as regulator

Government often has a second, very important function in that it can create, through laws and regulations, an enabling environment in which a construction industry can flourish and often, as a consequence, the economy in general. Such an enabling environment should provide more appropriate Quality of Construction since the "rules of the game are known and a good referee can help raise the quality of the game."

Legislative and regulatory action that government may need to consider immediately includes the following:

- Creation and application of effective anti-corruption policies and practices.
- Creation of a specific set of construction activity targets.
- Formation of a body geared towards creating a more enabling construction environment.
- Registration of professionally qualified firms and persons in their respective categories.
- Recognition of equivalent foreign qualifications and registrations.

5.3 Actions by international agencies

International funding agencies are often as powerful as government in setting the right climate for what is expected from a construction project. Hence, the actions for international funding agencies are similar to those for government as a client. In summary, they are:

- Adopt a Quality Management approach towards projects and construction. This may mean a fundamental review of the process by which the agency procures the services of consulting engineers and contractors.
- Recognize that Quality Management is a prerequisite for sustainable development since the lack of adherence to appropriate quality standards will lead to waste in goods and services.
- Adopt a sustainable development approach towards construction by:
  - taking cognisance of the need to internalise costs.
  - reducing volatility in the construction industry.
- Insist that, for the purposes of ongoing management, operation and maintenance, local capacity must be developed on all projects. Useful guides include FIDIC's *Capacity building: building the capacity of consulting firms, 2001* [4] and *Improving transfer of technology: guide for actions*, 1999 [3].
- Adopt a Quality Based selection approach for the procurement of consulting services, and include in the selection criteria the need for consultants to have the following in place:
  - Quality Management System
  - Business Integrity Management System
  - Environment Management System
  - Risk Management System
  - Professional indemnity insurance
  - Membership of a recognized body representative of the profession or industry.
- Adopt a quality-oriented selection process for the procurement of construction contracts, including:
  - Pre-qualification: at least excludes those who are obviously less likely to execute the contract successfully.
  - Previous track record: in the context of pre-qualification, a solid track record is essential for demonstrating capability.
  - An appropriate combination of price and non-price award criteria.
- Make provision on all construction projects for adequate supervision by a consulting engineer.
- Promote the adoption of standardised documentation for:
  - procurement procedures for consultants
  - procurement procedures for contractors
  - client/consultant agreements
  - construction contracts
  - tender and construction documentation.
- Additional actions, which include:
  - Insisting on the implementation of effective anti-corruption policies and practices.
  - Insisting on capacity building and technology transfer, possibly using FIDIC guides for action.
  - Taking cognisance of local economic cycles, and smoothing these cycles rather than exacerbating or deepening them.
  - Reducing the project initiation period as continuity of firms and their staff improves Quality of Construction.
  - Reducing prolonged payment periods for claims from consulting engineers and contractors as this reduces the incidence of unacceptable shortcuts, and therefore improves the Quality of Construction.

5.4 Actions by industry

The various role players in the construction industry, including FIDIC, FIDIC Member Associations, member firms and contractors, are mainly on the supply side of interventions intended to improve Quality of Construction.

FIDIC and FIDIC Member Associations are not direct providers of services, but have important roles to play in defining and disseminating best practice as facilitators, coordinators and providers of channels of communication.

FIDIC

Actions for FIDIC include:

- Draw attention to the benefits of Quality of Construction at all times.
- Continue liaison with international agencies.
- Channel information between Member Associations.
- Facilitate the production, review and improvement of appropriate documentation, including contracts.
- Engage in education and training initiatives, and in the production of appropriate materials for Member Associations and their member firms.

FIDIC Member Associations

Actions for Member Associations include:

- Draw attention to the benefits of Quality of Construction at all times.
- Act as communication channels between FIDIC and member firms, and between the firms and their clients.
- Assist with the education and training of members.
- Assist with the implementation of improved quality and quality-related systems such as Quality Based Selection, Quality Management Systems, Business Integrity Management Systems, Environmental Management Systems, Risk Management and professional indemnity schemes.
- Lobby government for the adoption of the actions outlined in the section “Actions by Government”.
- Assist in the development of standard specifications.
- Encourage the use of internationally accepted contract documents.
- Publicise examples of good and poor practice.

Member firms

Actions for firms include:

- Produce standard but comprehensive tender and contract documents of the highest quality using established documentation.
- Include the requirement for project quality plans in bidding documents and contracts.
- Adopt Quality Management Systems, Environmental Management Systems, Business Integrity Management Systems and Risk Management.
- Review the Quality of Construction after the completion of projects for continuous improvement of the construction quality.
- Participate actively in Member Associations.
- Assist with:
  - lobbying government
  - reviewing FIDIC documentation and its local equivalents
  - providing feedback on systems and documents promoted by FIDIC for future review.
- Provide feedback to sub-consultants and contractors on performance regarding Quality of Construction.

Contractors

Actions for contractors include:

- Recognize the importance of Quality of Construction.
- Adopt Quality Management Systems.
- Provide procedures for corrective action when quality control and/or acceptance criteria are not met.
- Provide feedback to consultants for improvement of Quality of Construction.
- Recruit, train and deploy a skilled work force.
- Take measures to ensure that subcontractors are qualified, and/or licensed as required.

Further actions should be developed in consultation with the representative bodies of the international contractors.

1 FIDIC publications

Policy and strategy

[1] *Policy Statements*, 2004
[2] *Engineering our future*, 1998
[3] *Improving transfer of technology – guide for actions*, 1992
[4] *Capacity building: building the capacity of consulting firms*, 2001

Contracts

[5] *Client/Consultant Model Services Agreement*, 3rd Ed 1998
[6] *Short Form of Contract*, 1st Ed 1999
[7] *Construction Contract*, 1st Ed 1999
[8] *Plant and Design-Build Contract*, 1st Ed 1999,
[9] *EPC/Turnkey Contract*, 1st Ed 1999
[10] *The FIDIC Contracts Guide*, 1st Ed 2000
[11] *Conditions of Contract for Works of Civil Engineering Construction*, 4th Ed 1987
[12] *Conditions of Contract for Electrical and Mechanical Works*, 3rd Ed 1987
[13] *Conditions of Subcontract for Work of Civil Engineering Construction*, 1st Ed 1994
[14] *Standard prequalification form for contractors*, 2nd Ed 1994
[15] *Joint Venture Agreement*, 1st Ed 1992
[16] *Sub-Consultancy Agreement*, 1st Ed 1992

Business Integrity Management

[17] *Guidelines for Business Integrity Management in the consulting industry*, Test Ed 2001
[18] *Business Integrity Management System training manual*, 1st Ed 2002

Quality Management

[19] *Guide to Quality Management in the consulting engineering industry*, 2nd Ed 2001
[20] *Guide to the interpretation and application of the ISO 9001:2001 standard for the consulting engineering industry*, 1st Ed 2001

Sustainable Development

[21] *Consulting engineers and the environment: guide for actions*, 1st Ed 1994
[22] *Environmental Management Systems handbook*, 2000
[23] *UNEP-ICC-FIDIC Environmental Management System: a resource training kit*, 2nd Ed 2001
[24] *UNEP-ICLEI-FIDIC Urban Environmental Management: Environmental Management Systems training resource kit*, 1st Ed 2001
[25] *Sustainable development in the consulting engineering industry: a strategy paper,* 2000
[26] *Sustainable development in the consulting engineering industry: a unique capacity to address the priorities*, 2002

Insurance

[27] *Risk Management manual*, 1st Ed 1997
[28] *Professional liability insurance: a primer*, 1st Ed 1991
[29] *Insurance of large civil engineering projects*, 2004
[30] *Amicable settlement of construction disputes*, 1st Ed 1992
[31] *Construction, insurance and law*, 1st Ed 1986
[32] *Mediation of professional liability claims*, 1st Ed 1993

Risk Management

[33] *Risk Management manual*, 1st Ed 1997
[34] *Risk Management expectations*, 1st Ed 1991

Procurement

[35] *Guidelines for the selection of consultants*, 1st Ed 2003
[36] *Quality Based Selection for procurement of consulting services*, 1st Ed 1997
[37] *Tendering procedures*, 2nd Ed 1994

FIDIC publications are available in printed and electronic editions, both singly and as a components of document collections, from: FIDIC Bookshop, Box 311, CH-1215 Geneva
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2 Non-Price Evaluation of Tenders

The Employer will evaluate and compare only those Tenders submitted in accordance with the Tender Documents.

The evaluation of Tenders, including Alternative Tenders, by the employer will include, but not be limited to, the following:

- the Assessment of Tender Price
- all items in the schedules to Tender and in particular the Tenderer's Preliminary Construction Programme
- such other factors as the Employer considers may have an impact on contract execution, price and paments, including the effect of items or Unit Rates in the Bill of Quantities that are unbalanced or unrealistically priced or for which no quantities are given
- statements on commercial and financial matters.

The Employer will use the Tender Assessment Method as detailed in Appendix 2.1.

As part of the Tender Evaluation process the Employer may, but is not obliged to, request additional information from a Tenderer and the Tenderer shall supply that information within the period stated in the request. Without limiting the generality of this provision the Employer may request details of the make-up of the Tenderer's Rates and prices in the Bill of Quantities.

The Employer may request that one or more Tenderers meet with the Engineer at the Project Office in (specify location) in order to clarify any aspects of the Tenderer's tender. Such a request by the Employer shall not be taken as an inference that a Tenderer is or will be a Preferred Tenderer.

Award Criteria

The Employer may award the Contract to the Tenderer whose Tender has been determined to be conforming to the Tender Documents and whose Tender has been evaluated as being the best value for money to the Employer.

2.1 Tender Assessment Method

1 General

The Tender Assessment will involve an initial review of the Tenders received including:

- examination to establish conformity with requirments of the tender documents
- listing and commenting on any qualifications included in Tenders
- tabulating Tender prices to show any major discrepancies
- tabulating individual Rates and prices in the Bills of Quantities to show any major discrepancies, highlight any loaded prices and indicate possible errors in pricing by Tenderers
- assessment of Alternative Tenders.

If appropriate, additional information may be requested, as allowed by the Tender Documents.

After the foregoing review, selected formal Tenders will be further assessed as described in Section 2 in regard to non-price items to arrive at an adjusted Tender Price for Comparison of Tenders and a recommendation made based on the Tender which gives the Employer the best value for money.

2 Non-Price Assessment

Generally, the Non-Price Assessment will be based on the information supplied by Tenderers with their Tenders and confirmed as necessary by the Employer.

The Tender Non-Price element Assessment includes those aspects that are not capable of translation into an absolute money value. A number of more significant elements having a non-price aspect for each Tender will be assessed and given a score which will then be used as described below.

The scoring methodology used is detailed as follows:

- weighting Factors are allocated to Non-Price Tender elements based on relative importance
- when all Non-Price Tender elements are assessed and scored accordingly, the Weighting Factors will be applied by multiplying the score for each Tender element by the relevant Weighting Factor
- a Non-Price Evaluation Index for each Tender will be calculated by summing the weighted scores for all Non-Price Tender elements and calculating a ratio with the highest score set to one (1).

The Weightings for the Non-Price Evaluation are proposed as follows:

Non-Price Element	*Weighting*
Methodology (includes provision for traffic)	15
Construction Programme	10
Personnel (includes skills transfer)	15
Experience and Equipment	10
QMS and Environmental	10
Customer Focus	10
Sub-Contractors (includes local use)	10
Financial and Company Strength	20
Total	100

3 Selection of Recommended Tenderers

The formula for the determination of an adjusted Tender Price for the selection of the recommended Tenderer will be as follows:

Adjusted Tender Price =
[(100% - x%) multiplied by Tender Price] + [x% times Tender Price divided by Non-Price Evaluation Index]
The value of "x" is set at 20%.

4 Non-Price Evaluation

All Tenderers will be rated in accordance with the adopted Weightings. Comments on each of the Tenderer's Assessments will be given.

The Tenderers will be scored out of 10 for each of the Non-Price Evaluations previously determined. In this regard, it is usually considered that the following guidelines apply:

3 or less	Unacceptable
4	Acceptable
6	Good
8	Very good

These Ratings will be incorporated into a Table, as shown on the next page.

Non-Price Evaluation Table

Non-Price Item	Weight (%)	Contractor 1 Score 10 max	Contractor 1 Weighted Score %	Contractor 2 Score 10 max	Contractor 2 Weighted Score %	Contractor 3 Score 10 max	Contractor 3 Weighted Score %	Contractor 4 Score 10 max	Contractor 4 Weighted Score %
Methodology (includes provision for traffic)	15								
Construction Programme	10								
Personnel (includes skills transfer)	15								
Experience and Equipment	10								
QMS and Environmental	10								
Customer Focus	10								
Sub-Contractors (includes local use)	10								
Financial and Company Strength	20								
Total Weighted Score Non-Price Evaluation Index	100								

Applying the Non-Price Weighting Index to the Tender Prices, in accordance with the formula given in Section 3, Selection of Recommended Tenderers, the results are as set out in the following Table.

Adjusted Tender Price for Comparison of Tenders Table

	Tender Price	80% of Price	20% of Price	Non-Price Evaluation Index	Weighted Part of Price	Adjusted Tender Price
Contractor 1						
Contractor 2						
Contractor 3						
Contractor 4						

From this Table it can be seen which Tender offers the best value to the Employer, based on the Tender Price and the documentation submitted by the respective Tenderers.

2.2 Hypothetical example

Non-Price Evaluation Table

Non-Price Item	Weight (%)	Contractor 1 Score *	Contractor 1 Weighted Score %	Contractor 2 Score *	Contractor 2 Weighted Score %	Contractor 3 Score *	Contractor 3 Weighted Score %	Contractor 4 Scores *	Contractor 4 Weighted Score %
Methodology (includes provision for traffic)	15	7	10.5	9	13.5	9	13.5	10	15
Construction Programme	10	6	6	8	8	9	9	5	5
Personnel (includes skills transfer)	15	8	12	8	12	9	13.5	5	7.5
Experience and Equipment	10	5	5	6	6	9	9	5	5
QMS and Environmental	10	4	4	5	5	9	9	5	5
Customer Focus	10	3	3	5	5	9	9	5	5
Sub-Contractors (includes local use)	10	6	6	8	8	9	9	5	5
Financial and Company Strength	20	6	12	8	16	9	18	10	20
Total Weighted Score	100		58.5		73.5		90.0		67.5
Non-Price Evaluation Index**			0.65		0.82		1.00		0.75

* Out of 10 maximum.
** Calculated as Total Weighted Score divided by the highest Total Weighted Score.

Adjusted Tender Price for Comparison of Tenders Table
Hypothetical working example where the Weighting, x, given to Non-Price factors = 20%

	Tender Price	80% of Price	20% of Price	Non-Price Evaluation Index	Weighted Part of Price*	Adjusted Tender Price**
Contractor 1	2,222,222	1,777,778	444,444	0.65	683,761	2,461,539
Contractor 2	2,234,567	1,787,654	446,913	0.82	547,241	2,334,895
Contractor 3	2,234,567	1,787,654	446,913	1.00	466,913	2,254,567
Contractor 4	2,555,555	2,044,444	511,111	0.75	681,481	2,725,925

* Calculated as 20% of Price divided by the Non-Price Evaluation Index.
** Calculated by summing "80% of Price" and "Weighted Part of Price".

From the Adjusted Tender Price, the recommended Tenderer would be Contractor No. 3, very closely followed by Contractor No. 2.

contents

information

For information, consult www.fidic.org/qualityofconstruction

summary

A best practice approach to help solve a worldwide lack of Quality of Construction calls for action by FIDIC, FIDIC Member Associations, firms and international financing agencies.

Prepared by the Quality of Construction Task Force of the FIDIC Business Practices Committee (BPC)
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- Akira Shiroya, *Japan*
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further reading

Quality Based Selection, 1997
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