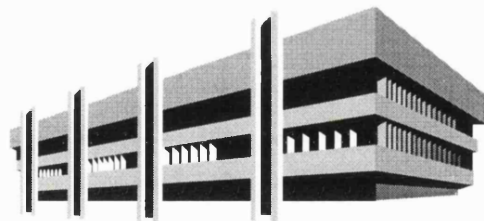


UNIVERSITY COLLEGE LONDON

THE BARTLETT GRADUATE SCHOOL

ISO 9000

in Greece and the UK



by Ioanna Trivella

MSc in Construction Economics and Management

September 1996

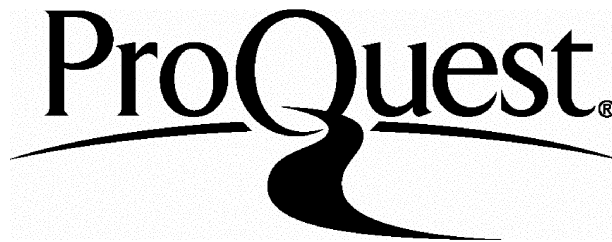
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*To my family
and
in memory of George*

*Στην οικογενεια μου
και στην μνημη του Γιωργου*

Acknowledgements

Had it not been for George, a dear friend and colleague whose memory I cherish, this work would not have been as it is. Not only did he give me the initial idea but he used his influential position at GEK to help me gather information and knowledge. It is not so much the practical help I acknowledge here but the fact that he offered it from the hospital bed where his life ended, cut short by leukaemia. In those last days, he never stopped thinking about the future pointing out to me that ISO 9000 is important to the industry and in my career development. Thank you George, I will always remember you.

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Abbreviations

AQAP	Allied Quality Assurance Publication
BS	British Standard
BSI	British Standard Institution
BVQI	Bureau Veritas Quality International
CEN	European Committee for Standardisation
CENELEC	European Committee for Electrotechnical Standardisation
ELOT	Ellinikos Organismos Typopiisis - Greek Organisation of Standardisation
EN	European Standard
EQNet	The International Certification Network
ESYD	Ethniko SYmvoulio Diapistephsis - National Accreditation Council
GEK	Geniki Etairia Kataskevov - General Construction Company
IOS	International Organisation for Standardisation
MoD	Ministry of Defence
PQP	Project Quality Plan
QA	Quality Assurance
QAT	Quality Action Team
QC	Quality Control
QM	Quality Manager
QS	Quality Standard
QSC	Quality Steering Committee
TQM	Total Quality Management
TUV	Technischer UberwachungsVerein
WCUK	Wimpey Construction UK

Summary

The issue of quality systems and their use in industry, especially the construction industry, in Greece and the UK is examined.

At first a brief historical background of quality management as a concept and a tool is given. The need for quality assurance in the form of standards and systems as has evolved through time is described, with emphasis in today's circumstances, highlighting especially the need for harmonisation. The dominance of ISO 9000 is established and the standard is described in detail. The consequences of achieving certification are examined with particular emphasis in the construction industries of Greece and the UK.

Two case studies are closely observed and comparisons were made between the companies to extract differences and similarities in their attitude towards ISO 9000. One Greek and one British company were selected. The companies were at an as much as possible equal standing in the respective countries' construction markets. Following comparisons final observations and recommendations were made.

1. Introduction



OUTLINE

A brief historical background of quality, as a concept and how its perception has been differentiated over the years, is given in this introductory chapter. Starting with the definition of quality in industry and the construction industry in particular, the evolution of quality systems with time is described, finally arriving at its status today. The importance of harmonisation of quality systems is also highlighted.

1.1 The Idea of Quality

Quality; degree or level of excellence, *The Oxford Dictionary*

This is only one of many definitions offered in explanation of the term 'quality'. It is not a quantity that can be measured and for which everyone has the same understanding; it is all about satisfying client needs. Whenever there is interaction between supplier and customer the issue of quality sits in a prominent place. More explicitly, quality of a product, service or process is a combination of characteristics which determines the level of satisfaction of specific needs. It is a responsibility of every employee in an organisation.

1.2 Quality in the Construction Industry

In particular, in the construction industry, quality is defined primarily by the client. Therefore, it is both qualitative as well as quantitative. Taking into account that any construction project consists of many clients, customers and suppliers, the meaning of 'client' should include all the parties involved in the 'quality chain'. It is not an exaggeration to say that quality problems or failures appearing at the late stages of the project are a direct result of neglecting quality issues at the early stages of the project. Therefore, quality is established in the design stage rather than in the control stage, as it brings together a number of issues that should be considered *in this early stage*, so that a product or service will meet the specification, programme and cost standards of the highest quality.

1.3 Improvement and Management of Quality

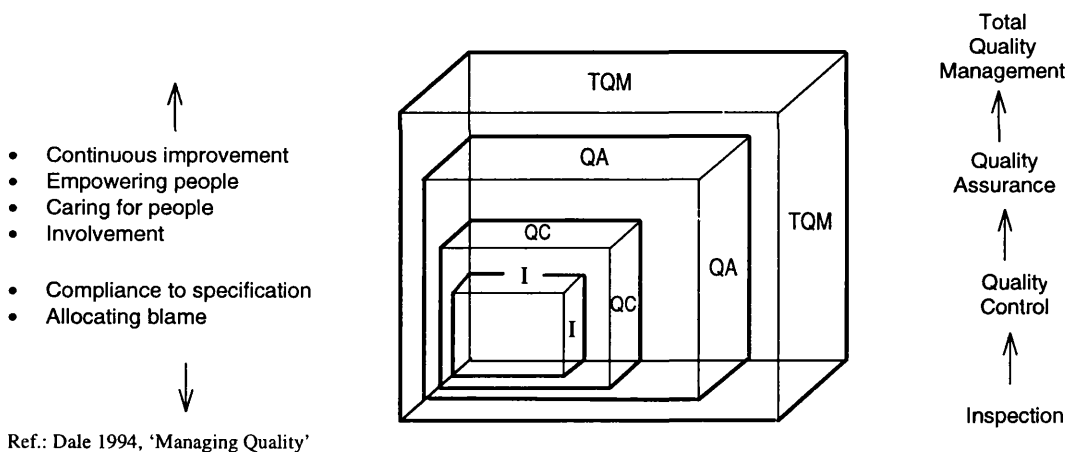
Quality must be planned for and built in, it can be controlled but it can not be inspected. A continuous improvement in quality should be a management commitment and it can be achieved by making efforts to plan and prevent problems occurring at source. Researchers have shown that quality related costs take a well respected percentage of construction companies' annual sales turnover. To make sure that a company delivers, not necessarily high but at least appropriate quality products or services, it is essential that there is control on how it operates its processes and that depends on how it manages quality.

Improvement of quality should be the principal objective of quality policy. It should be aimed not only to achieve customers' satisfaction by meeting their requirements such as

specification, time and cost, but also to increase performance in terms of improving productivity, reducing costs, enhancing reputation and increasing profitability and market share.

The issue of quality management has emerged over the years from the evolution of simple inspection activities. Quality Control (QC) and Quality Assurance (QA) was the next stage and finally today most companies and especially construction companies are working towards implementation of Total Quality Management (TQM) (figure 1). Quality Assurance is defined in BS.4778: Part 1 (1987) (ISO 8402,1986) as: ‘ all those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy the given requirements for quality’. TQM is a ‘culture’ by which a firm carries its business with the view to continuously improve its processes whereas QA promotes consistency and can often be perceived as a goal in itself.

Figure 1: The four levels in the evolution of Quality Management



Ref.: Dale 1994, 'Managing Quality'

In achieving this goal a company should look at the issue of attitude; if the inspector and the producer each think that quality is the responsibility of the other then omissions and failures will almost certainly occur. The matter becomes more complicated when dealing with a complex industry - such as the construction industry - where a variety of disciplines work together towards the same project. It is then important for the management to ensure that all employees have a clear definition and understanding of their own limits and responsibilities, in other words QA should be an integral part of the organisation's processes. In that light, QA has been accepted as a very important management tool in the construction industry in all developed nations.

1.4 The Need for Standards

Over the years the construction industry became aware that QA offers extensive benefits both to an organisation and its clients. The majority of firms now recognise that it is for their benefit to have a QA policy in place before offering their services and products to a customer. Should this be ignored then the firm's ability to compete as well as its potential profitability are threatened.

At this stage of the QA evolution it became apparent that a common 'denominator' should exist so that global comparisons can be made; the notion of a Quality Standard (QS) was born. Without standards there can not be product compatibility, customer satisfaction and production efficiency. If such standards are adopted by a company then a sound management mechanism should also be in place; such a system is known as a Quality System.

The development of quality systems and standards did not happen overnight. Their importance was first recognised by the American Military and over the years other industries have modified and adopted them. The construction industry tentatively started using them in the late 1970s/early 1980s.

1.5 A Historical Background

As early as 1959 the American Ministry of Defence produced the first quality standard called 'Quality Program Requirements' (MIL-Q-9858). In 1963 it was revised and apart of some slight modifications in 1981 and 1985 it is still in use today. In 1968 NATO adopted it with a new title and code, AQAP-1 (Allied Quality Assurance Publication), 'NATO Requirements for an Industrial Quality Control System' and was used in defence procurement. In 1970 the British Ministry of Defence (MoD) renamed it as DEF-STAN 05-21 and was used on defence suppliers as a criterion for inclusion on the list of MoD assessed contractors. When the AQAP series became available the MoD complied with it and DEF-STAN was withdrawn in 1985.

It is clear that the military has set the pace for the development of quality systems and then other industries followed suit. It was 1972 when the British Standard Institution (BSI) published BS.4891, 'A Guide to Quality Assurance' which was a set of recommendations intended for companies developing their quality management systems. In 1974 the revised

BS.5179 was published by BSI and it was finally withdrawn in 1981 after being superseded by the first version of BS.5750 - 'Quality Systems' - in 1979. In the mean time, many organisations such as British Gas and the National Coal Board, had produced their own standards.

The BS.5750 was an attempt to rationalise this situation and the set of guidelines produced provided a series of quality management system standards. Since then many companies have withdrawn their own quality systems and adopted BS.5750. It was around this time that the first certifications took place. At the same time, other countries adopted the system and modified accordingly for internal use.

Observing the expansion of the British quality system, BSI recommended that a technical committee be set up with the remit of developing international standards for assurance, techniques and practices. The idea was well received and finally in 1987 with the participation of some 20 countries and under the chairmanship of the Canadians, the International Organisation for Standardisation (ISO) - based in Geneva - published a series of documents - ISO 9000 series - on quality management systems.

These standards although they were drawn up to reflect international requirements, they are in essence a modified version of the 1979 BS.5750. The ISO 9000 series has now been adopted by the European Committee for Standardisation (CEN) and the European Committee for Electrotechnical Standardisation (CENELEC) as the EN 29000 series. In total the ISO 9000 series has been adopted by at least 50 countries.

1.6 Harmonisation

The participation of at least 90 countries in the international technical committee contributed to developing the need of harmonisation of standards across the globe. Companies competing in the international markets find it difficult to comply with various national quality regulations and restrictions and a uniform set of standards would certainly improve the situation.

In 1992 the Single European Act took place and EC became a Single European Market. The adoption of ISO 9000 by the European Community under the code EN 29000 was then a first step towards the harmonisation of quality systems within Europe. The impact on the world

trade is certainly large and the decision has additionally contributed to the creation of an internal market. Outside Europe, the tendency towards a harmonised quality system is becoming apparent by the growing number of countries adopting the ISO 9000 series.

1.7 Reflection on the Construction Industry

As mentioned earlier, the Construction Industry started complying with quality systems in the early 1980s, therefore it has been closely following the national and international developments on the QA issue. As for all industries the adoption of standards is of vital importance especially within the profile that today's Construction Industry attempts to keep in international market.

The same management standards and certification processes that apply in most other industries are used in the Construction Industry. In most cases the standards and certification are only applied to the actual work process undertaken by a firm.

In the same way that quality takes time to achieve, a firm certification does not happen overnight. There is long a path of preparation that a company has to go through before the certificate is granted. An increasing number of construction companies both in the UK and abroad are expressing an interest in preparing for ISO certification. The reasons are many and varied; clients are becoming increasingly insistent in dealing with a certified company rather than not. There are cases where bidding for contracts is only allowed to certified companies. A company's own interests are in improving their products and services so that they become more competent in the market.

It is certainly very clear that the future of the ISO 9000 series is a rather long term prospect and hence a proper understanding of ISO would be beneficial and so it is one of the objectives of this report. The causes and effects on a company and its image following certification will be established and highlighted by comparing companies and situations.

The procedures that a specific construction company in the UK has followed in order to obtain the certification of ISO 9000 will be presented as a case study, the difficulties and how they have been handled will be examined and analysed. The same observations will then be carried out for an equivalent company in a different European country (Greece) but in this case the

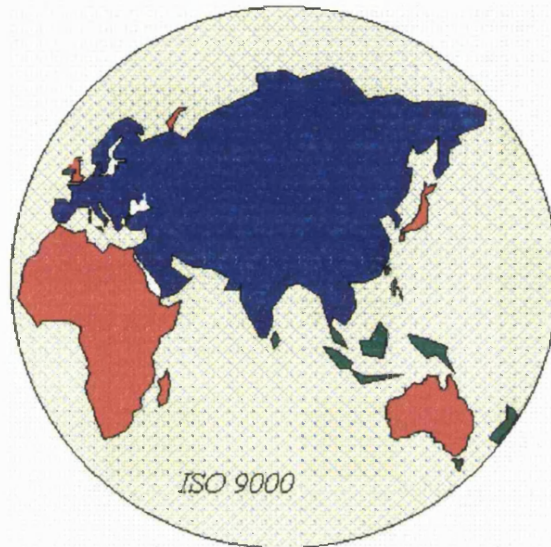
company will not yet be certified.

After giving an idea of the situation of the construction industry in Greece, and presenting what the selected construction company in Greece, GEK, is doing to obtain the certification, the third and most important objective is to pick up the important points where attention should be given for the easier and quicker adoption of the quality system of ISO 9000.

It should also be mentioned that at the moment in Greece, although after some time it will be necessary for the companies to have a certification of ISO 9000 to bid for big projects, there is no construction company which has yet obtained it.

Finally, some comparative observations on the two case studies and the construction industry will be given.

2. ISO 9000: An International Quality System



OUTLINE

After establishing ISO 9000 as the most favourite quality system today, a close observation of the standard is attempted. Additionally, the causes and effects that ISO 9000 certification might have to a company are presented. Finally the case studies have been introduced and the methodology of their comparison is laid out.

2.1 ISO 9000 Dominance

The rules of competition and the clients' demand for high quality products and services have created the need for quality standards by which projects and services are delivered and a consequence is the continuous quest for improvement. Quality conscious companies have created their own internal standards and efforts were made to adhere to them. In certain cases, the same company had different sets of standards for different branches depending on the country.

The open competitive market, however, has found it difficult to deal with a large and increasing number of very *different standards* both in the national and international levels and the need for *harmonisation*, not only for reasons of competition but also for legal reasons soon became apparent. A similar situation existed in the Construction Industry when in 1988 the Construction Product Directives made it law that all construction products in the EU must bear the CE mark. The necessity for harmonisation is now imminent since such a directive cannot really become reality unless a uniform level of attestation is being determined.

Another characteristic peculiar to the Construction Industry was that quality testing was a procedure to be carried out at the end of a project. The common practice was that the contractor had the responsibility to comply with the material and techniques specifications which were not actually checked until the end of the project. A site management structure would be in place with the intention of carrying out the project in the best possible way but some activities were better executed than others which were not fully covered by the project's structure. The weak points of this practice are that faults, both material and managerial, are highlighted too late; the unsatisfactory result was spotted but had not been prevented. Studies by the U.K. Building Research Establishment suggest that management short falls in design together with misunderstandings in communicating the design into construction are the main sources of problems for a project. This results in not only unnecessarily increasing the cost of a project but also perhaps limiting its lifetime. ISO 9000, being a quality management tool, is advantageous in that respect because it concentrates mostly in the *prevention* of problems rather than their solution by ensuring that quality is built-in in every step of the project.

As mentioned earlier the BS series of standards constituted the foundation stone unto which the now established ISO 9000 series was being based. Especially within the European

Community it has *superseded* other national standards. Especially in the Construction World there are instances where a company is not allowed to bid for projects unless it has ISO 9000 certification. This has important *legal implications* in cases of product liability, for a company can avoid paying claims for damages if it has been ISO certified both for management and product quality.

Summarising the above observations, the dominance of ISO 9000 over other quality systems comes as no surprise. It provides the open competitive market with much needed harmonisation of quality systems and it is in essence a '*common language*' in which companies of all nationalities and trades can fairly compete with each other to provide the customer with a quality product.

2.2 ISO 9000 in Detail

Although the International Organisation of Standardisation (IOS) was the body that published the ISO 9000 series the name ISO was borrowed from the Greek word '*isos*'. It means 'equal' and it is also used as a first element in words having to do with equality. In that sense it is used in the ISO 9000 series; the idea is that if a standard is available for a production process then the units of the product will be identical. It is, however, a mere coincidence that the anagram of the organisation (IOS) is similar to the name.

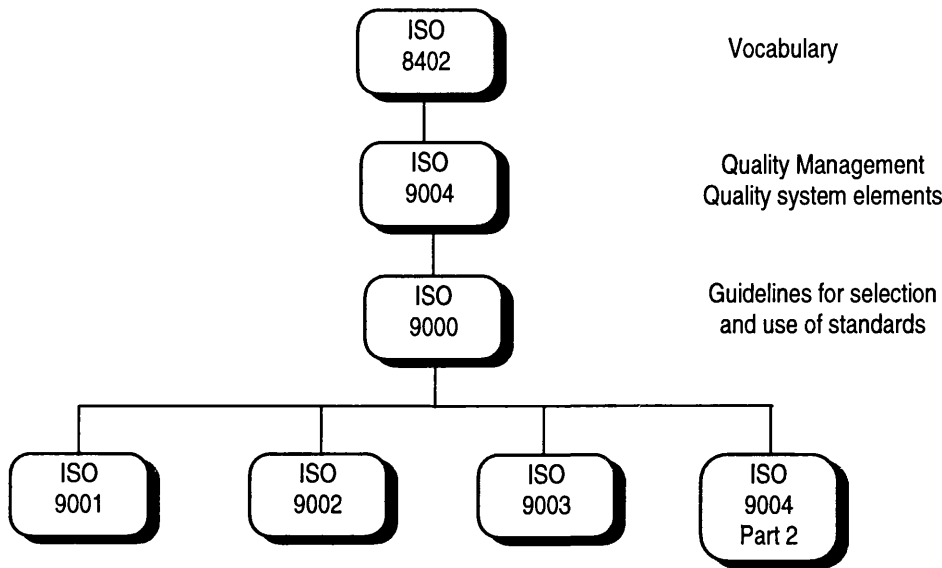
ISO 9000 standard is published by IOS in 17 different parts (Appendix 1). Most of these are guidelines and only 3 can be audited against the guidelines from the brief descriptions given below. ISO 9000 is the general heading of the series with title 'Quality Management and Quality Assurance Standards - Guidelines for Selection and Use'.

- ISO 9001: Model for Quality Assurance in Design/Development, Production, Installation and Servicing
- ISO 9002: Model for Quality Assurance in Production and Installation
- ISO 9003: Model for Quality Assurance in Final Inspection and Tests

In addition there are 20 clauses (Appendix 2) that should be observed collectively for the above 3 parts of the series. For ISO 9001 in particular there are 20 further clauses (Appendix

3). For simplicity, in this dissertation ISO 9000 will refer to all of the parts in the series except when otherwise specified. Figure 2 gives a schematic presentation of the main standards in the series.

Figure 2: Schematic Presentation of ISO 9000



Ref.: Rothery 1993, 'ISO 9000'

ISO 9000 is not a product standard. It is rather a model for quality assurance which can only survive as an operational system and needs improvement to fit within an organisation. There is no direct legal requirement to adopt it, in fact governments are forbidden to refuse purchasing from any EC company because of non-certification of the company in question.

ISO 9000 is not a technical product itself but rather a series of International Standards for quality management and quality assurance. The objective of adopting it is to ensure systematic *quality assurance* and control. In other words to provide guarantees that an organisation is doing what it says it is doing with respect to operating procedures and hence the quality¹ of products and/or services satisfy specific requirements set by the customer.

The series is set out in such a way as to provide a list of characteristics which are considered essential features in an organisation's management control systems so that in-built process

¹Definition of Quality according to ISO 8402 definitions: 'Quality is the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs'.

quality can be achieved. An important distinction is *that products can not meet ISO 9000 but organisations can*. A product can not be inspected against ISO 9000 but the process through which this product has been developed can. One has to be cautious when a certain product is advertised as meeting ISO 9000 requirement since such a claim's intention is to mislead the customer.

The standards were created so that companies are assisted in developing effective documentation for their quality systems requirements in order to maintain efficient production. Hence it offers the flexibility to be interpreted and adjusted in accordance with a company's policies and procedures and to be applied in a very wide range of situations and environments across the industries. Further, it allows each organisation to develop its own systems and then test them against the standard, consequently setting the platform for *global competition*.

Many organisations are known to voluntarily comply with the ISO 9000 requirements without seeking formal certification, doing so purely for their own satisfaction that their procedures are aiming towards better performance. In conclusion, ISO 9000 should *not* be perceived as a *panacea* to quality.

2.3 Beyond ISO 9000 Certification

Before attempting to become ISO 9000 certified, a company should consider carefully the advantages and disadvantages of such a managerial step.

Preparation and eventual registration to ISO 9000 brings about many changes in a company's image and attitudes towards quality. The certification itself is not something that a company can go out and buy; it is achieved through a long process of adaptation with appropriate managerial guidance. The path towards certification should ensure that everyone within an organisation is touched by quality and hence awareness is raised. Awareness of the fact that ISO 9000 certification will not only bring changes to quality but to a range of areas such as work environment, company reputation and even legal issues. Those changes and subsequent

certification are usually audited against by an independent body (Third Party certification)².

Even from the stages of preparation for registration, a company's employees have to be closely involved. Separation of responsibilities is an important aspect of the adaptation process in the first instance and positive consequences are the better co-operation and communication between the company's sections and individuals. Gradually the *work environment* becomes a better place and hence the employee morale continuously improves. This leads to creation of internal value and pride in organisational processes and eventually to higher operational efficiency and productivity. The chain reaction of happenings then goes on to reduce operational costs hence reducing errors, customer complaints and general costs of operations. There will then be improved satisfaction on the customer's part and hopefully a *reduction in audit time*. In summary, the process of preparation and subsequent registration to ISO 9000 will bring a *reduction in costs* of production by identifying and improving ineffective and surplus procedures and documents hence minimising wastage of resources in reworking, extra handling and executive time. Consequently the business survival is facilitated.

Such facilitation comes as a result of increased *customer satisfaction* due to improved quality; quality of product/service resulting from quality of processes and management. Increased sales is a welcome consequence and hence improved profitability and competitiveness. It is very important for a customer to know that a certain company will do the job the same way, time after time; such established consistency can cross international borders and demonstrate a commitment to quality. Consequently, registration to ISO 9000 becomes a useful foundation for a company to develop and perfect its quality system to meet the requirements of the customer and complement the TQM concepts.

The best advertisement for a company is a satisfied customer; higher customer trust boosts company prestige and reputation. After certification the company is allowed to advertise its registration, once this is completed. Some organisations use this to demonstrate to the 'market' that they have achieved 'the right level of quality' hence improving their *reputation*. Especially for British companies, after registration their name appears in the Department of

² The term 'third party' refers to the independence from both the supplier and the purchaser - the first and second parties to the contract for the goods or services concerned.

Trade and Industry's National Register of Quality Assessed Companies. Bearing in mind that certification is easier to achieve than maintain, then once the company has been on the Register for more than three years, it has a proven record of seriousness when it comes to quality and this helps to *attract and retain customers*.

The value of ISO 9000 certification as a *marketing tool* is evident; it creates opportunities for market expansion hence serving as leverage for new markets, products and even other industries. Additionally, it pushes a company to be proactive to customer demands both nationally and internationally consequently improving its *competitiveness*. Further, it is becoming more and more common for customers not to consider companies unless they are ISO 9000 certified, so the pressure for compliance is ever increasing, becoming a necessity for survival.

In certain cases this necessity is even more accentuated by *legal regulations*. Especially in the Construction industry, there are instances when a company can only participate in bidding if it has achieved ISO 9000 certification. This comes as no surprise since it provides a reference point for trade negotiations and a 'language' understandable to everyone involved irrespective of nationality. In that respect the EC forms a prime example by imposing a unique standard across the European nations. A not so obvious advantage emerging from such a policy is the limited product liability in the international market.

However, there are always two sides to an argument; there is a sizeable group of sceptics who cast doubts on the advantages of being ISO 9000 certified. Main *concerns* are those of costs for implementation and maintenance of certification - especially for small firms - and inadequate interpretation and application of the standards. ISO 9000 registration is *not a pre-requisite of TQM*, it merely forms part of the organisation's general TQM approach by ensuring that any improvements are maintained. The fact that it is increasingly becoming a pre-requisite to doing business means that there will be a point where its importance will be diminished by the actuality of everyone being registered. In addition, there are no guarantees that an ISO 9000 registered company necessarily improves the quality of the product/service since a product can not be ISO 9000 certified, only the process can. There is also the argument that ISO *restricts* a company's *innovation* because of the very idea of preserving the same process time and again. Given the existence of those concerns it is no surprise that there are companies - mainly small ones - opposing the process of certification mainly because of the

cost involved. The registration needs to be re-assessed every three years and the administrative costs are not easy to bear when there is only a small turnover. A last general concern is the *variation on the interpretation* of the clauses in ISO 9000 definition. At the moment there is not a mechanism for common interpretation to ensure consistency in its application and appropriateness in its use, a fact which can lead to misuse.

In summary, whatever the concerns, the increasing trend towards ISO 9000 certification and registration is evident in the construction industry and there are those who claim that 'ISO 9000 is here to stay'.

2.4 ISO 9000 Certification in Practice

Certification, as mentioned earlier, is a long and complicated process. In some countries the process is more common than others. UK is perhaps the leading country in terms of number of certified companies, whereas on the other hand, Greece has possibly one of the lowest numbers of certified companies in Europe.

A comparison of the path towards certification followed by two different companies is attempted here. A Greek and a British company are presented and their different approaches towards certification are examined. Information was mainly obtained through interviews with appropriate members of each of the companies. Ultimately, it is hoped that the results of this observation will assist the Greek construction industry in gaining knowledge in the process of ISO 9000 certification benefiting from the British extended experience.

2.4.1 In Greece and the UK

Two firms are studied in this dissertation; Wimpey in the UK and GEK in Greece. Both are representative companies of the construction industry in each country and they both undertake similar projects in terms of nature and size. Although Greek companies are not as specialised as the UK ones, GEK is considered to be the most suitable for the purposes of this study as it is in the final stages of the preparation of obtaining the certification.

2.4.2 Methodology of comparison

Interviews were carried out in order to find out the methods used by the British company in order to achieve certification, on the one hand, and the way the Greek company is trying to do so, on the other. A detailed discussion was carried out with the Wimpey quality manager who was responsible for all the procedures to be followed. On the GEK side, the quality manager responsible for the preparation and the company consultant were interviewed. Primary data were collected and were supplemented by secondary data from relevant periodicals, articles, seminars or courses and other publications on this subject.

2.4.3 Criteria for the Selection

The two companies to be compared are:

- **George Wimpey PLC**, British, recently changed into mainly a housing construction company.
- **GEK S.A.** (General Construction Company), Greek.

The choice of companies was such as to achieve the objective of selecting firms representative of the construction industry of each country.

The second objective was to find companies which were willing to offer access to information on their affairs. The quality manager of Wimpey was pleased to give as much information as necessary for the completion of this study and his contribution was greatly appreciated. The author had been working in GEK for almost four years so access to information was achieved through personal communication.

The *criteria* for selection were, at first, the size and type of firm. In terms of size the companies were evaluated according to their rank in the country's list of companies and there was not a great differentiation. In terms of firm type, the nature of projects undertaken by the companies was considered and was found to be identical. Wimpey, as from recently, concentrates on housing and construction and GEK has extensive experience in constructions works.

Ideally the comparison should have been made between companies that both have ISO certification but because in Greece there was no company which had yet obtained certification such direct comparison was not possible. Instead the selected Greek company is at least fulfilling the initial desired criteria and additionally is in its final stages of certification preparation, hence comparison was as close to ideal as possible under the circumstances.

3. ISO 9000 in the UK



OUTLINE

The first of the case studies is presented here. The path of WCUK towards ISO 9000 certification is presented taking also the opportunity to reflect on ISO 9000 perception in the UK in general. The company is ISO 9000 registered and hence concluding remarks on the effects of the registration were possible.

3.1 The UK and ISO 9000

The UK was, from very early on in the century, concerned with quality. In 1901 the British Standards Institution (BSI) was created with the sole purpose to look after quality issues, helping business become more efficient and more competitive. Perhaps it might have been the culture of the 30s and 40s with the slogan that 'British is best' which heavily contributed to the British efforts to remain a world leader in quality.

ISO 9000 was in essence born in the UK since it was created by adapting the pre-existing BS 5750 standard. The British way of observing quality expanded with a growing rate and at present more than 70000 organisations world-wide have been registered to the standard, most of them with the help of BSI. ISO 9000 standard provides a framework for management systems, procedures and work institutions. BSI QA assesses conformity with the requirements of the standard to ensure the declared quality system works continue to work effectively in practice. So it is no surprise that the UK is in the 1st place as far as the number of organisations that have been ISO 9000 certified (about 45000 companies) is concerned.

The British Construction Industry did not lag behind in developing quality standards. In such a world where products and services are constantly changing in response to both innovative ideas and customer demands, it is vital that a quality management system exists to guarantee that the latest specifications can be consistently met and there is a policy of continuous improvement. Large British construction companies have considered and understood the benefits of ISO 9000 certification and decided that it was the way forward towards the 20th century, one of those being GEORGE WIMPEY PLC.

3.2 WIMPEY & ISO 9000

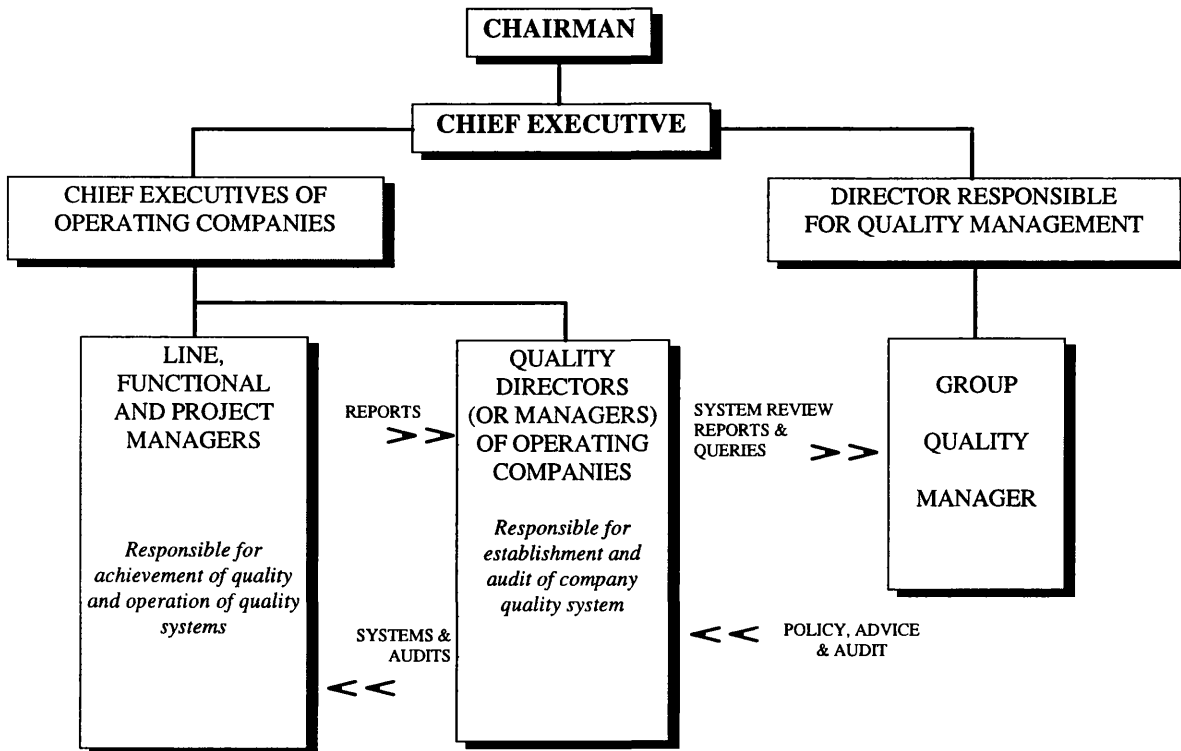
Wimpey is one of the largest construction companies in the UK and its activities have expanded into the US and Australia, hence placing Wimpey in an important position in the world's construction industry. The company is, in effect, a group of divisions the principal business units of which, until 1995 were:

1. Homes, in Europe and North America
2. Contracting
3. Minerals
4. Property

In addition to the business units, companies providing a range of core activities are established overseas and they are supported by Head Office service departments. During 1995 the chairman retired and this and other Board changes coincided with the development of a new strategy. In the future, the company focus will be exclusively on house building and land development in the UK, USA and Australia with the principal aim of improving returns for the shareholders. As a result, in 1996 through a major asset exchange with Tarmac PLC, McLean Homes - the Housing division of Tarmac PLC - joined the Wimpey Group. The aim of this transaction was to place the company not only as the market leader in the UK housing but also as one of the largest private housing and land development companies in the world.

Wimpey places quality in a high place in their strategy and, apart of any awards they have won, the company has also introduced internal quality awards in order to add to the competitive spirit of different sites. The company’s belief is that ‘quality doesn’t happen by chance, it has to be managed’ and that requires quality systems. Wimpey began developing formal quality systems in 1983, building on a foundation of techniques and controls put together over a hundred years of successful operations. Figure 3 shows the responsibilities and reporting lines for the management of quality in the Wimpey Group.

Figure 3: Managing Quality in Wimpey Group



Ref.: WIMPEY Group Quality Manual

The principles on which those systems are based are:

- Everyone who uses the products or services the company supplies becomes its customer.
- Quality means satisfying the needs and expectations of the company's clients and customers.
- Quality is the key to future prosperity for everyone.

This strong commitment to quality has led the Group to the decision to prepare the company's construction division (Wimpey Construction UK - WCUK) to obtain ISO 9000 certification. The Group's policy was that each division had to develop its own quality system, irrespective of their intention to go for certification. WCUK was one of the first units of the Contracting division that formally started to prepare for ISO 9000 certification, in 1988. Other divisions started at different times with the guidance of different teams. Since WCUK was the first to obtain certification, the other units learned from its experience. In this dissertation the case of the WCUK will be examined in detail. The organisational structure of WCUK can be found in Appendix 4.

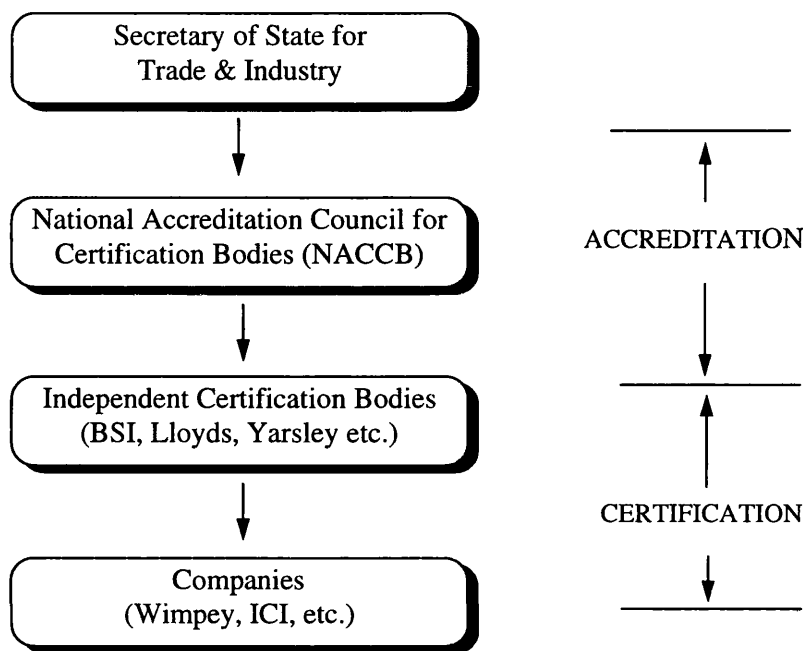
3.3 Preparatory Steps

WCUK did not consider it necessary to appoint a quality consultant because it was thought that people from within the company knew its workings better and they were the most suitable advisors. Hence, after a suitable individual was identified it was time to come to a decision regarding the certification body to address to.

The law requires that the certification bodies are totally independent and must conform to another set of European Standards known as the EN 45000 series, which have been in place with the purpose of providing a uniform system of accreditation across the EC. WCUK held interviews with the certification bodies in order to assess them. BSI was WCUK's *choice of certification body* because it was deemed the most suitable for the Construction Industry in the UK and the one able to give the best requirements. Further, BSI is fully approved by the NACCB to register organisations for ISO 9000 in the Building and Construction industries. Finally, since BSI certifications are valid for ever, continuous assessments are carried out so that the company's procedures for maintaining the quality standards is tested. Other

certification bodies offer registration valid for 3 years after which time they have to reassess the company’s suitability. This can cause the company to relax their quality procedures and rush near the end of the 3 year mark to re-establish them. The certification process as it is established in the UK is shown in figure 4.

Figure 4: The UK Certification Process



3.4 WCUK Preparing for Registration

The first step was to *raise awareness* of the standard and the details of the process towards certification. BSI QA had a wide range of support documentation to offer including specific ‘Guidance Notes’ to help them understand the requirements of the standard, particularly in relation to the Construction Industry and a formal quotation about the registration and other costs. After considering the requirements it was decided that WCUK should aim for the ISO 9001 certification.

As mentioned earlier, Wimpey as a whole had an internal quality system in place and hence it was not hard to identify a quality team that would guide the company towards certification. The next step was then for the team to *plan the project*. Figure 5 at the end of this chapter presents graphically the steps taken by WCUK.

Management Commitment

At first the management's commitment had to be established and this was achieved with the managers giving proper backing to the idea of the quality system in general and the ISO 9000 quality system in particular. Further, staff briefings and presentations were carried out to explain in simple and practical terms what was happening in the company and why, so that employees could appreciate how their own working practices would contribute towards the development of an effective quality system. The importance of everyone's participation in the success of the project was especially highlighted. Training was also provided, where necessary, to explain the company's quality policy and what assessment and registration meant.

Assess the Current Quality System

The company focused on the divisions' business processes at a general level, identifying the operating stages or processes that ensured a smooth and effective flow of work, from undertaking a project to delivering what was required. Perhaps the most important point here is that they concentrated on describing the existing processes, not on redesigning them. Some changes were necessary to fix obvious process problems and to ensure the ISO 9001 requirements were met. More explicitly, the quality team firstly decided which ISO 9001 clauses did not apply to their company's work, then identified which ISO 9001 clauses were or should be met by their existing business processes, and finally decided the new processes that they had to introduce so that all necessary ISO 9001 requirements were met. In other words they designed a quality management system that best suited the company and then tried to match it with ISO 9001. WCUK used the novel form of a matrix in order to assess the designed quality system against the ISO 9001 requirements. The matrix used can be found in Appendix 5.

Analysis of the Business Processes

This was the most demanding part of the work. When the business processes were identified, the next step was to analyse carefully how each process operated, checking in particular to see that each process operated in a controlled way. To achieve this, analysis of each process into its steps or sequence of work activities was carried out, usually by drawing a flow chart. The idea of this analysis was to understand the general criteria used to judge whether or not a business process was controlled. Controlled business processes were straightforward to

describe in written procedures and in general were already following the requirements of ISO 9001.

Finally the ISO 9000 required *quality manual, quality procedures, work instructions, forms and database* were produced by the quality team. The quality manual was the policy document for their quality system which contained WCUK's policy on quality, in a written statement called 'Policy Statement'. The 'Quality Procedures' was a document that specified the method of working, the separate tasks and/or actions needed to complete a work activity (work instructions). Those work instructions were given to employees for a first degree evaluation because it was thought that it was easier for them to comment and correct/add on to a document rather than producing it from scratch. It should also be noted that there was written documentation created on how to compile project quality plans (PQP).

Implementation of the Quality System

At this stage, attempts were made by the quality team and the managers to ensure that everyone was working to the documented procedures. Reviewing the quality system and auditing were used at this point. For this purpose company managers and engineers were trained by consultants to become *internal auditors*. Those trained in the first instance were then responsible for setting up their own internal courses to train others within the company. This in-house training had the welcome consequence of reducing the costs involved.

Pre-assessment

Before formal application for assessment was requested, the company pre-assessed the situation in order to pick up any gaps and any overlooked details. Procedures were reviewed once more by the quality managers and *changes* were made where necessary. The overall effectiveness and performance of the quality system was formally reviewed again at management review meetings. One problem identified at this stage was the need to keep better quality records; a requirement of ISO 9001, before the application this area was improved.

Application for ISO 9001

The application for registration was submitted in 1992. It was accompanied by the completed questionnaire, the quality manual and the fee. The fee covered the application for ISO 9001 registration, the pre-certification inspection, the annual registration fee and the annual

surveillance fee. The assessment was done to all of the 8 separate company offices¹ of the company throughout the UK as well as to several sites.

3.5 Post Application and Registration

Initial Assessment & Identification of Non-Conformities

Assessors from BSI QA with the help of the quality managers went through the system and through the workings of two sites. The assessment required them to show the BSI QA assessors that their quality system complied with the requirements of ISO 9001. This evidence included the quality manual, the written procedures and the quality records, and information given during discussions between the assessors and the Wimpey personnel at the time of assessment. From the 8 offices one was found with areas where the system was not up to the standards and corrective action was requested by the assessors. After the completion and *submission of corrective actions* they finally achieved *registration* in 1992. It was then a simple formality for the *certification* to be *issued*.

Post - Registration

ISO 9001 implies that a company has reached the minimum standard of quality but it is widely believed that a company should not stop at this minimum point but continue to take quality seriously by :

- **maintaining** standards
- **improving** on the efficiency and effectiveness with which they met those standards
- **innovating** occasionally to set new standards

WCUK's working principle is that an effective quality system is *continuously improving* and changing which conforms perfectly with the above belief.

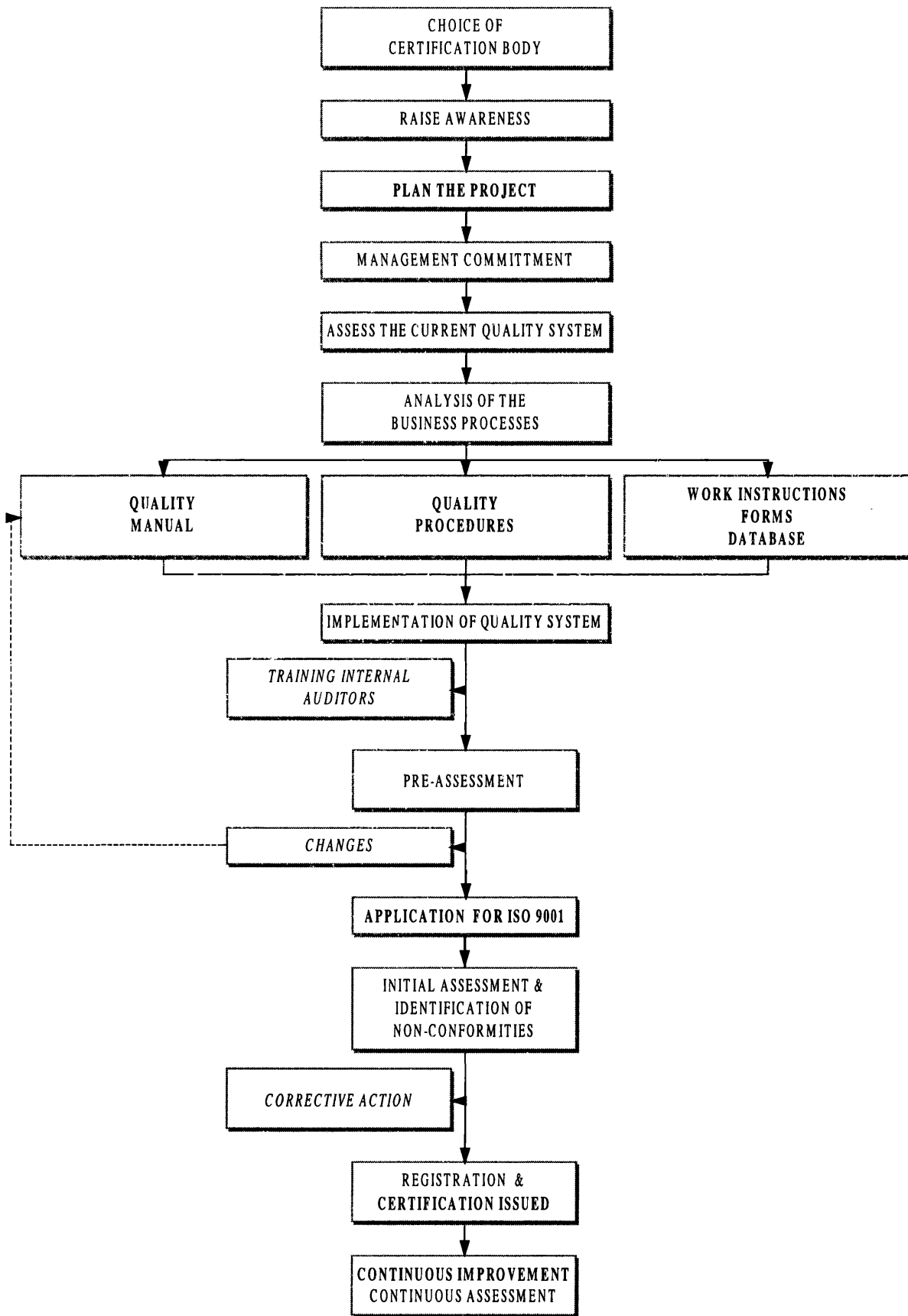
Following registration, BSI QA visit the organisation at regular intervals each year, on average about once to the offices and twice to the sites, to make sure that it remains in compliance with ISO 9001. The *continuous assessment* visits cover different parts of the quality system on each occasion. It should also be mentioned that the registered company has to notify the

¹ It must be noted that the Building Division offices are now reduced to 4.

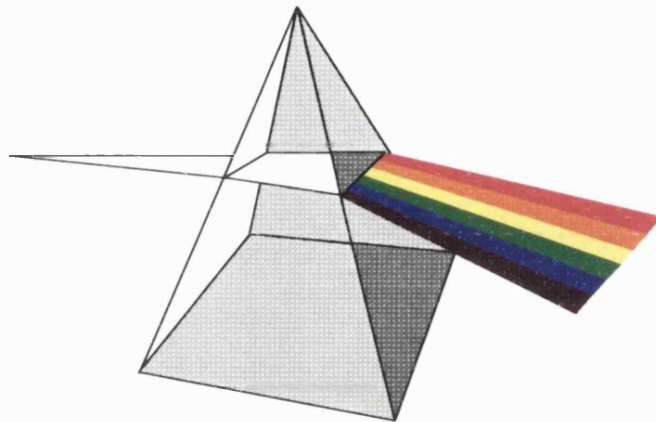
agency of any irregularities in its system and of any changes to the elements upon which registration is based.

WCUK is now an ISO 9001 certified and registered company enjoying all the benefits that this registration brings including being pre-qualified for jobs and benefiting internally from the system itself. By way of conclusion it is worth mentioning a couple of difficulties encountered during the utilisation of the developed quality system; depending on the culture, employees were not sometimes prepared to accept some quality management issues and, additionally, there was some resistance regarding the increased bureaucracy required by ISO 9001.

Figure 5: WCUK ISO 9001 Certification Steps



4. ISO 9000 in Greece



OUTLINE

The second case of the comparative study is presented here. GEK the Greek company seeking certification is followed in its efforts to develop a suitable quality system. GEK is not yet certified and analogous comparisons with WCUK could not be made. ISO 9000 status in Greece is also examined.

4.1 The Need for ISO 9000 in Greece

In Greece, as in the rest of the Western world, quality is today an issue of outmost importance. Perhaps this is the most important motive in the war of competition, which becomes stronger by the day. In the Construction industry in particular, the use and development of Quality Systems, both in Greece and internationally, comes as a result of the realisation of the costs incurred by poor quality control (especially when faults are discovered retrospectively) and additionally of the fact that the traditional methods are not as effective as they ought to be. An additional important point is the pressure a company is under to offer the lowest bids, tending to result in the long term in poor project quality. Further details on the construction industry, as it stands in Greece, can be found in Appendix 6.

Once the Greek construction world recognised that 'quality is the meeting of specific requirements and value for money', there was a shake-up in the way employees and management were used to confront quality issues. Greece, albeit a little later than other countries, slowly emerges as a sound player in the international competition game, eager to make quality 'a way of life' in the construction industry.

It was 1990 before the Greek industry became seriously interested in quality assurance and ISO 9000. Presently, Greece is in the 15th place in Europe as far as the number of certified companies is concerned. Although it was slightly later, compared to Europe, the idea has taken off and has become a central consideration among the companies. The path, of course, is not easy; problems that should be addressed include the lack of clear and specific quality procedures in production, employment regulations and many other company activities. Until considerations are given to these areas and solutions are implemented, quality in Greece remains largely a vision. A vision that can surely become attainable with hard work and systematic and methodical effort, but above all continuous training at all levels.

The Greek Construction Industry has not lagged behind in its efforts to comply with ISO 9000. Although no construction company has been certified yet, there is a growing number of companies well on the way one of which is GEK (Geniki Etairia Kataskevon - General Construction Company). The interest has especially grown in the last year and it is expected that it will follow the same rate for at least the next 2-3 years.

4.2 GEK and ISO 9000

GEK is one of the largest construction companies in Greece. It specialises in building works and more specifically in projects of rapid execution. Major activities include construction of building complexes, such as office buildings, factories, hospitals, schools, hotels, special industrial buildings of superior specifications as well as development projects. Activities are connected not only to the national private and public sectors but also to the international market. It was this broad range of the company's activities as well as its commitment to quality that predominantly led towards the decision to become ISO 9000 certified.

Other considerations emerged from clients' and market's requirements. As ISO 9000 becomes increasingly accepted, the client is looking for certified companies in order to have quality reassurance of the final 'product'. He insists on the company being able and willing to show and justify its level of procedure and systems quality. On the other hand the company, following certification, establishes their name to be associated with high quality standards and attains a marketing advantage over its competitors. This advantage in turn can eventually contribute to the company offering better prices due to increased clientele.

Last but not least were legal considerations; European and national law now require evidence of a company's quality measures. As mentioned earlier it is not uncommon for companies to be able to bid for projects only if they are ISO 9000 certified, a policy also adopted by the Greek Ministry of Public Construction. The particularity of the construction industry is that although the company might be ISO 9000 certified it does not mean that each project also is. Instead the company is required to produce a Project Quality Plan (PQP) for each project separately.

GEK, after carefully evaluating those issues came to the conclusion that it was to the company's advantage to seek certification. Additionally, it was estimated that the cost of certification was much lower than the long terms costs of ignoring the direction of the market. The formal decision was taken in April 1995.

4.3 Preparatory Steps

A *consultant was appointed* with the remit to oversee the preparation and support the

development of a quality system. His first action was to *raise awareness* within the company with an extensive presentation of ISO 9000 series issues to the company's management; it included information on the *Greek certification bodies, the certification stages* and the differences of each standard in the series. It was decided that the company should seek certification in ISO 9001.

Certification Bodies in Greece

Following figure 4 in chapter 3 there should be an equivalent of NACCB which approves of National Certification Bodies. In the case of Greece the National Accreditation Council (ESYD - Ethniko Symvoulío Diapisthepsis) exist in theory since 1994. In practice the organisation is not yet operational and associated problems are in existence.

There are, however, certification bodies who are fully operational. ELOT (Ellinikos Organismos Typopiisis - Greek Organisation of Standardisation) is the only Greek body in operation and it is approved by EQNet (The International Certification Network). Other international organisations in operation in Greece are the BVQI (Bureau Veritas Quality International) and TUV (Technischer Überwachungsverein, Österreich) with its headquarters in Austria.

Certification Stages

In Greece the estimated time before certification ranges between 1.5 and 3 years depending on:

- the priority a company gives to certification among other activities, and
- the distance to be covered between the present stance of the company and the position it should have in order to become certified.

It must be noted that since no Construction company has been certified yet, this time span is only a very broad estimate in the case of construction companies.

The main stages can be summarised in 3 steps:

1. The preparative stage consists mainly of gathering information on the ISO 9000 series standards as well as the details of certification procedures. ELOT requires additionally at this stage a preliminary application. Then the company makes all the internal changes in order to become ready for inspection.

2. The second stage starts as soon as the company applies formally to the certification body. An auditing team is appointed and after considering the company's application of a quality system and audit their procedures certification is granted if the inspection proved satisfactory.
3. Finally, the third stage is in effect the maintenance stage. Regular (ranging from one to four per year) inspections from the certification body ensure that a company's certification was not a one-off event but quality standards are constantly high and improving.

At present GEK is at the first stage and therefore references can only be made for those preliminary processes or substages.

4.4 GEK at Stage One

Figure 6 at the end of this chapter gives a graphical presentation of the sub-stages GEK followed in order to fulfil the requirements of the preparatory stage.

Top Management Commitment

Without the Chief Executive's full support the path would not be smooth. GEK had the full support of the Board of Directors and it was agreed that, for a successful preparation, close monitoring of the progress should be arranged and global involvement of all levels of management and employees should be ensured.

Establishment of the Implementation Team

At this stage the company's manager appointed a QM (*Quality Manager*), who is the person responsible for the supervision and implementation of the preparatory procedure. In addition, he is the mediator between the organisation's management, the ISO 9000 registrar and the quality consultant. The particular person who undertook the role and responsibilities of the quality manager in GEK was a person already in a senior management position in the organisation and one with a genuine and passionate commitment to quality. He has also the appropriate seniority to influence managers and others of all level and functions.

Along with him the Technical Director, the Technical Office Manager, the Commercial Director, the Chief Financial Officer, and project managers formed the *Quality Steering Committee* (QSC). The organisation chart of GEK is in Appendix 7. Their individual responsibilities included organising their respective *Quality Action Team* (QAT) within their departments and a network of clear reporting and communication was established.

Assess the Current Quality System

The consultant along with the QSC assessed the then Quality System of GEK and found that 70% of the requirements for registration were already present, albeit not documented. Therefore, there was already a sound foundation and the gaps to be sealed were mainly in the inspection and testing of the existing procedures as well as the level of communication between the Head Office and the sites.

Creation of a Documented Implementation Plan

After the initial assessment of the situation, an implementation plan was made by the QSC in co-operation with the QATs and approved by the QM. The aim was to bring the existing quality system to the level of full compliance with the standard's requirements. The plan gave the details of, procedures to be developed, objectives of the system, allocation of team responsibilities, any necessary training, available resources and estimated time of completion, which at the time was estimated to be one year.

Training

Since the ISO 9000 quality system affects all areas and all personnel levels in the organisation, the consultant proposed that it was wise to provide basic orientation in the quality system standard to all employees. This was achieved gradually following a top-down approach. The QM and QSC were the first to be trained either by the consultant himself or through seminars organised for this purpose in Greece. They, in turn, trained the QATs through meetings and presentations, putting the emphasis not only on the importance of quality systems in general and ISO 9000 in particular, but also the need for participation and co-operation of all employees.

Creation of documentation

This proved to be one of the most important and most demanding stages of the preparation. It was because of the time consuming process of documentation that the initial estimation of time needed was not met. Two basic rules of ISO documentation had to be applied:

- **Document what you do**
- **Do what you document**

The consultant noticed that the complete lack of documentation was in direct contrast with ISO 9001 standard. He pointed out that the creation of detailed written procedures and work instructions should be carried out. Many hours were spent trying to document any kind of work which affects quality, to describe the organisation, responsibilities and authorities, to describe procedures, to evaluate suppliers and sub-contractors etc. The QM, the QSC, the QATs and the consultant whose help was a determining factor at this stage, finally managed to complete the documentation of, the *quality manual*, the *procedures manual*, *work instructions*, *forms*, and *database* as necessary.

One of the main problems that emerged during this stage was the lack of available time on behalf of the QSC for devotion to the documentation due to pressing problems and deadlines in the day-to-day work front. Perhaps it was the deciding factor for the occurred delay in the completion schedule.

Document Control

After completion of documentation of the quality system, a control system was developed and documented. The purpose of this exercise was to create a means of managing, approving, revising and distributing the system's documentation. An obligatory requirement was that employees should have access to the documentation and records needed in order to fulfil their responsibilities. Additionally, selected employees had to be trained as auditors according to the existing auditors regulations so that they can successfully carry out in the future the internal controls as required by the standard.

Monitor Progress

The Quality System was now ready for testing its application within the company. At this stage the management at all levels had the responsibility to flag any gaps and assumptions in procedures and steps which were difficult, ineffective, or impractical. The QATs were in contact with all departments and with each other in order to suggest solutions where necessary. A few problematic areas were identified and some forms and procedures had to be revised as a consequence. Internal audits, formal corrective actions and management reviews by the QATs, QSC, QM and the consultant took place in order for the gaps and inadequacies to be taken care of.

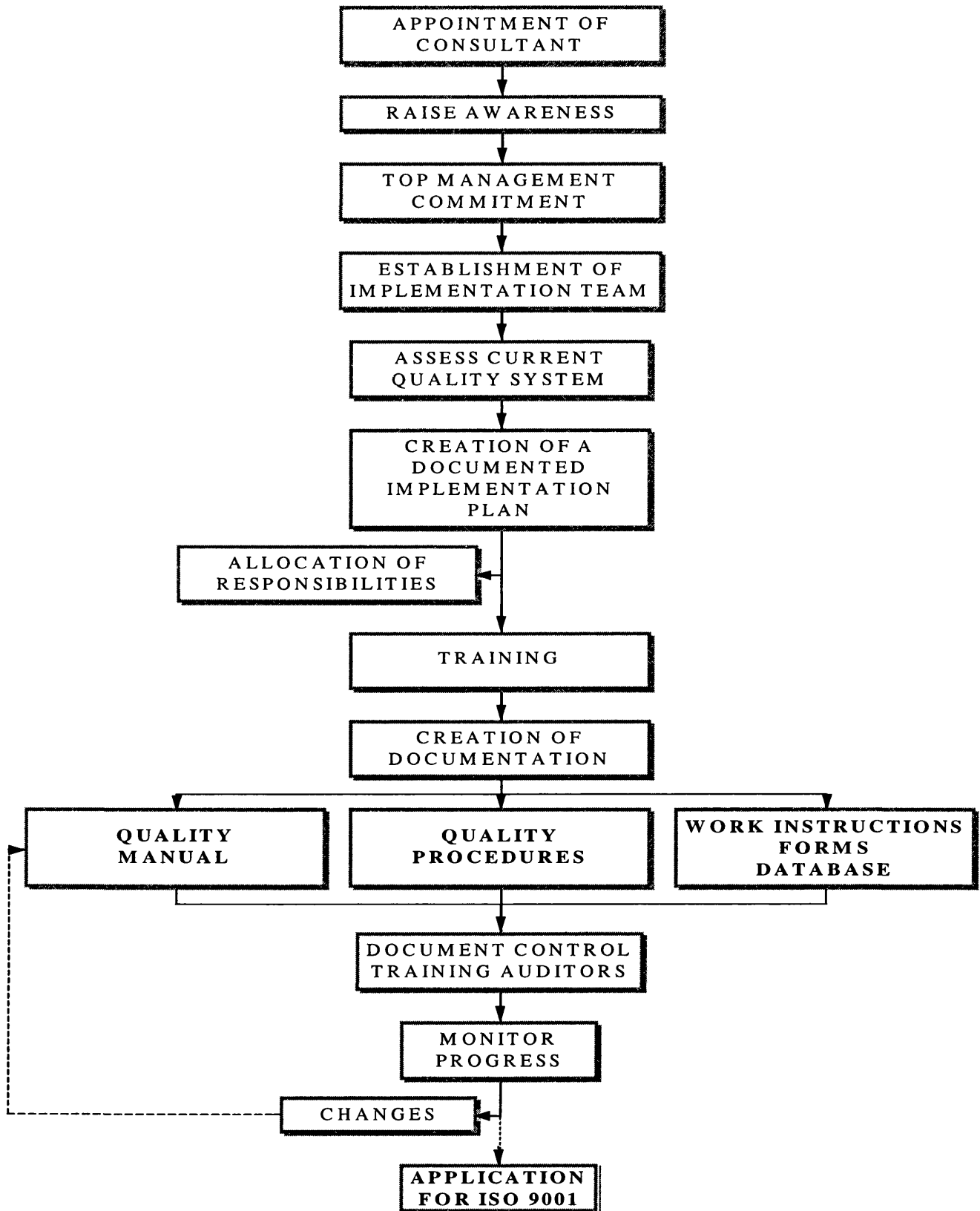
Additional problems encountered were the resistance to change shown by some members of staff and perhaps more importantly the discomfort caused by increased bureaucracy. The site teams were especially wary about the increased paper work imposed upon them since they were used to a more personal and direct approach. They also thought that it was quicker and more effective than the suggested procedures according to ISO 9000. It must also be noted that although GEK has not been certified, following client request they had to produce PQP on two separate occasions. A typical organisational chart of building project can be found in Appendix 8.

Having successfully completed those substages GEK is now on the brink of formally applying for certification. The company must first choose an appropriate certification body. The current feeling is that TUV will be the chosen certification body but a formal decision has yet to be made. The formal *application* has been scheduled for October 1996.

4.5 Conclusions

The feeling within GEK is that the company has generally benefited from going through the preparation for ISO 9000 certification. Teams and departments have discovered new channels of effective communication. It was due to the process that positive interfaces have been created between managers and employees. The fact that detailed documentation has been created provides in itself an improved way of working 'according to the book' and an easier orientation for new members of staff.

Figure 6: GEK Preparation Plan for Prospective ISO 9001 Certification



5. Conclusions



OUTLINE

Final comparisons between the two countries' construction industries and the two companies under observation are made here. Concluding remarks on the attitude a company should develop towards ISO 9000 are also included.

5.1 Comparative Observations for the Companies

In any economy, construction is a key activity. In the examples observed here two different economies are considered; the UK and Greece. The construction industry in both economies is indeed a key activity but in different scales. Wimpey is a multinational company with a number of divisions, each in very different types of the construction industry and many offices around the country and indeed the world. On the other hand, GEK is a large company in Greece but its international standing can not possibly be compared with that of Wimpey's. Yet these two companies are on an equal standing as far as their involvement in their respective country's construction industry is concerned. In other words, taking into consideration the comparative scale of countries, these two companies are 'similar'.

ISO 9000 and all factors associated with it are equally appealing and needed in both cases. Both companies have carefully considered the pros and cons of certification and for different but at the same time very similar reasons, when viewed in scale, have decided that it was beneficial to be ISO 9000 registered. WCUK already had a successful quality system in place but it was deemed necessary to upgrade it to ISO 9001 standards. GEK did not have a quality system as such but was quality-conscious in a sporadic manner, so ISO 9001 certification would invoke the development of a quality system.

Comparing the processes of the two companies, it is obvious that they used different strategies to achieve certification but with some similar steps. Their similarities and differences can be viewed pictorially in their respective certification steps diagrams (page 27 in chapter 3 and page 36 in chapter 4) and are also studied here.

- WCUK found it better to start by being informed about the certification operational bodies in order to choose the most suitable for the company, whereas GEK's first step was to appoint a consultant, which was in a way the result of the lack of experience the company had in quality systems.
- Raising awareness, establishing the top management commitment and keeping everyone informed at all stages were the points where the two strategies appear to have the most similarities. Both companies from very early on realised that these steps were crucial for the success of the process and went on to see them through.

- The implementation team of WCUK was almost in place and therefore not many changes were necessary here. They used almost entirely internal resources during the preparatory stages whereas GEK, had to seek external advice. The appointment of a consultant to provide guidance and support during the process was therefore a necessary step before the implementation team could be established.
- Both implementation teams set out to evaluate the respective company's quality systems in existence in order to produce the required documentation. WCUK devised their own method to compare and update the existing systems in accordance with the requirements of the standard, in the form of a matrix. The rows represented the company's state and the columns the ISO 9000 requirements. With this visualisation, it was relatively easy to point out the strong and weak points of their system and decide on what needs changing. GEK on the other hand started the documentation process from square one. So the main difference here is that WCUK applied the company's character on ISO 9000 on where GEK applied ISO 9000 on the company.
- Once the documentation for both companies was in place, controls were carried out in similar fashion in both cases to identify possible weak areas. Both companies trained internal auditors for future internal auditing according to ISO 9000 regulations.
- During monitoring of the system, similar problems occurred in both companies. It was found that employees had some difficulties in adjusting to the new styles of working, insisting that the old methods they were used to, were, in their opinion, better and less complicated to follow since they involved less bureaucracy.

In the case of WCUK the approach was obviously successful since the company is ISO 9001 registered. For GEK however, the result remains to be seen.

5.2 Comparative Observations in the Construction Industry

Although in effect two construction industries were considered it was found that they almost behave in the same way. There are similar characteristics and problems in the industries of both countries. That is hardly surprising, given the nature of the construction industry; the 'products' have well-known characteristics which differentiate them strongly from the

products of other industries. They are large, heavy, one-off, expensive, custom built with a long life span and geographically widespread. Those particularities generate problems of idiosyncratic nature in the management and scope of any construction company which need to be addressed in a very different manner from that of other industries. Additionally the 'products' are changing all the time and a company has to be able to respond to the environment of the market and possibly even be ahead of it.

A consequence of the nature of construction industry and its 'products' is that when it comes to preparation for ISO 9000 certification, the whole process takes longer to complete compared with other industries. The fact that many parties are involved (company, customer, architects, sub-contractors) working in different geographical locations (office, site) sometimes even in different countries, creates communication problems which the management has to consider and offer solutions for. This situation makes it also very hard to implement the idea that 'everybody should be involved'.

Apart from the similarities between the construction industries of the two countries under observation, there is a fine point where they differ. As in any other competitive situation, sustained effort will always be necessary to keep abreast of competition; the UK is in essence in the forefront of quality management and fights to stay ahead whereas Greece is trying not to stay behind but keep up with the rate of change and development.

5.3 Concluding Remarks

The way to start must be from the top. The approval and support of the management is an absolute must for the success of the certification preparation. The decision to attempt certification is a very important step for an organisation with implications on business performance and competitiveness. The management should respond to this challenge by making available all necessary resources.

The quality system to be developed should ideally complement any existing quality programs. In any case ISO 9000 should conform to the company's characteristics rather than the company conforming to ISO 9000. The interpretation of ISO 9000 requirements is not unique and needs to be adapted to the individual company. The idea is not to change the company's character but to improve it so that customers and employees alike have more trust in the

company and its processes. An important point to note here is that 'products' can not be ISO 9000 certified but the processes by which they have been generated, can.

High levels of awareness among the employees are necessary for the process to go smoothly. After all the employees are the protagonists of the effort and if they are not fully informed at every stage the whole process is in danger of failing. Appropriate training should also be provided when necessary. A way of cost saving demonstrated by WCUK is to use in-house training after the initial training.

Finally, the company should not become inert after certification is completed but should keep looking for ways to improve. All existing certification bodies have ways of checking whether or not registered companies are maintaining the standards but an organisation should not wait for those checks to be done before it reviews its methods.

In conclusion, ISO 9000 is rapidly expanding in the construction industry. It is considered nowadays the way forward for a company that respects itself and its customers and markets itself well. Certification is not achieved overnight but it is the result of hard work which involves everyone. Once achieved it only provides the minimum level of quality required and a company should continue to improve in order to be able to face the future with confidence.

On that note a 'good luck' wish is sent to both companies; to WIMPEY for continuing improvement and to GEK for a successful application for certification.

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Appendices

1. List of the ISO 9000 Family
2. Cross-Reference List of Quality System Elements
3. The 20 Clauses of ISO 9000 : 1994
4. The Organisational Structure of WCUK
5. WCUK Matrix
6. Construction Industry in Greece
7. GEK Organisation Chart
8. GEK Organisational Chart of Building Project

Appendix 1: List of the ISO 9000 Family

- [1] ISO 8402:1994, Quality management and quality assurance -- Vocabulary.
- [2] ISO 9000-1:1994, Quality management and quality assurance standards --Part 1: Guidelines for selection and use.
- [3] ISO 9000-2:1993, Quality management and quality assurance standards --Part 2: Generic guidelines for the application of ISO 9001, ISO 9002 and ISO 9003.
- [4] ISO 9000-3:1991, Quality management and quality assurance standards --Part 3.. Guidelines for the application of ISO 9001 to the development, supply and maintenance of software.
- [51] ISO 9000-4:1993, Quality management and quality assurance standards --Part 4: Guide to dependability programme management.
- [61] ISO 9001:1994, Quality Systems -- Model for quality assurance in design, development, production, installation and servicing.
- [7] ISO 9002:1994, Quality Systems -- Model for quality assurance in production, installation and servicing.
- [8] ISO 9003:1994, Quality Systems -- Model for quality assurance in final inspection and test.
- [9] ISO 9004-1:1994, Quality management and quality Systems elements--Part 1: Guidelines for services.
- [10] ISO 9004-1:1991, Quality management and quality Systems elements --Part 2: Guidelines for processed materials.
- [11] ISO 9004-1:1993, Quality management and quality Systems elements -- Part 3: Guidelines
- [12] ISO 9004-1:1994, Quality management and quality Systems elements -- Part 4: Guidelines for quality improvement.
- [13] ISO 10011-1:1990, Guidelines for auditing quality Systems -- Part I: Auditing
- [14] ISO 10011-2:1991, Guidelines for auditing quality Systems -- Part 2: Qualification criteria for quality Systems auditors.
- [15] ISO 10011-3:1991, Guidelines for auditing quality Systems -- Part 3: Management of audit programmes.
- [16] ISO 10012-1:1992, Quality assurance requirements for measuring equipment--Part 1: Metrological confirmation System for measuring equipment.
- [17] ISO 10013:1995, Guidelines for developing quality manuals.

Appendix 2: Cross-Reference List of Quality System Elements

Title	Corresponding Paragraph (Or subsection) Nos. in		
	9001	9002	9003
Management Responsibility	4.1	4.1a	4.1b
Quality System Principles	4.2	4.2	4.2a
Contract Review	4.3	4.3	-
Design Control	4.4	-	
Document Control	4.5	4.4	4.3a
Purchasing	4.6	4.5	-
Purchaser Supplier Product	4.7	4.6	-
Product Identification and Traceability	4.8	4.7	4.4a
Control of Production	4.9	4.8	-
Inspection and Testing	4.10	4.9	4.5a
Inspection, Measuring and Test Equip.	4.11	4.10	4.6a
Inspection and Test Status	4.12	4.1 1	4.7a
Control of Non-conforming Product	4.13	4.12	4.8a
Corrective Action	4.14	4.13	-
Handling, Storage, Packaging and Delivery	4.15	4.14	4.9a
Quality Records	4.16	4.15	4.10a
Internal Audits	4.17	4.16a	-
Training	4.18	4.17a	4.1b
After-sales Servicing	4.19	-	
Statistical Techniques	4.20	4.18	4.12a

a Less stringent than 9001

b Less stringent than 9002

- Element not present

Unmarked paragraphs indicate Full Requirement

Appendix 3: The 20 Clauses of ISO 9001:1994

- 4.1 Management responsibility
 - 4.1.1 Quality policy
 - 4.1.2 Organisation
 - 4.1.2.1 Responsibility and authority
 - 4.1.2.2 Resources
 - 4.1.2.3 Management representative
 - 4.1.3 Management review
- 4.2 Quality system
 - 4.2.1 General
 - 4.2.2 Quality system procedures
 - 4.2.3 Quality planning
- 4.3 Contract review
 - 4.3.1 General
 - 4.3.2 Review
 - 4.3.3 Amendment to a contract
 - 4.3.4 Records
- 4.4 Design control
 - 4.4.1 General
 - 4.4.2 Design and development planning
 - 4.4.3 Organisational and technical interfaces
 - 4.4.4 Design input
 - 4.4.5 Design output
 - 4.4.6 Design review
 - 4.4.7 Design verification
 - 4.4.8 Design validation
 - 4.4.9 Design changes
- 4.5 Document and data control
 - 4.5.1 General
 - 4.5.2 Document and data approval and issue
 - 4.5.3 Document and data changes
- 4.6 Purchasing
 - 4.6.1 General
 - 4.6.2 Evaluation of subcontractors
 - 4.6.3 Purchasing data
 - 4.6.4 Verification of purchased product
 - 4.6.4.1 Supplier verification at subcontractor's premises
 - 4.6.4.2 Customer verification of subcontracted product
- 4.7 Control of customer-supplied product
- 4.8 Product identification and traceability

Appendix 3: The 20 Clauses of ISO 9001:1994, cont.

- 4.9 Process control

- 4.10 Inspection and testing
 - 4.10.1 General
 - 4.10.2 Receiving inspection and testing
 - 4.10.3 In-process inspection and testing
 - 4.10.4 Final inspection and testing
 - 4.10.5 Inspection and test records

- 4.11 Control of inspection, measuring and test equipment
 - 4.11.1 General
 - 4.11.2 Control procedure

- 4.12 Inspection and test status

- 4.13 Control of non-conforming product
 - 4.13.1 General
 - 4.13.2 Review and disposition of non-conforming product

- 4.14 Corrective action
 - 4.14.1 General
 - 4.14.2 Corrective action
 - 4.14.3 Preventive action

- 4.15 Handling, storage, packaging and delivery
 - 4.15.1 General
 - 4.15.2 Handling
 - 4.15.3 Storage
 - 4.15.4 Packaging
 - 4.15.5 Preservation
 - 4.15.6 Delivery

- 4.16 Control of quality records

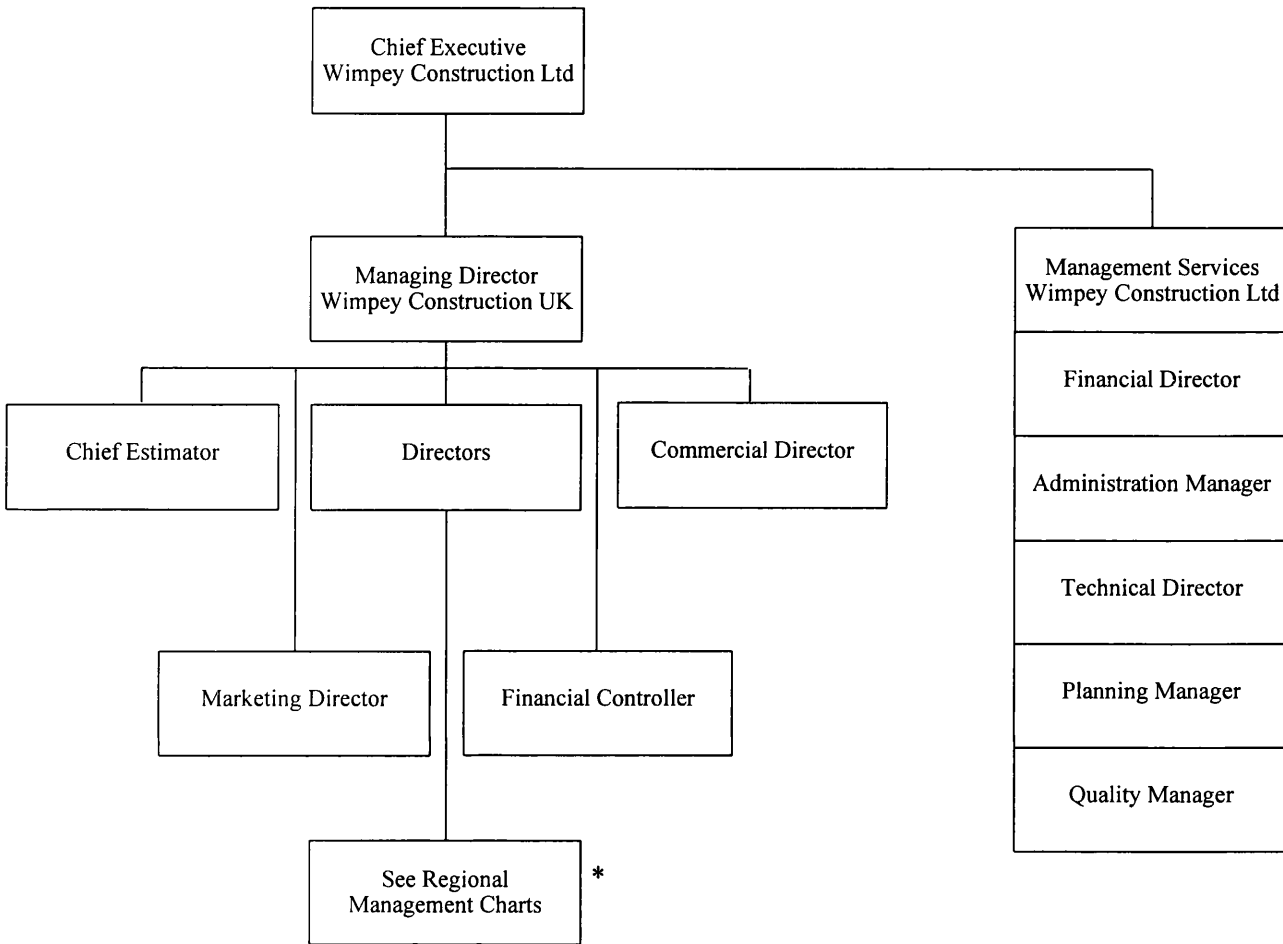
- 4.17 Internal quality audits

- 4.18 Training

- 4.19 Servicing

- 4.20 Statistical techniques
 - 4.20.1 Identification of need
 - 4.20.2 Procedures

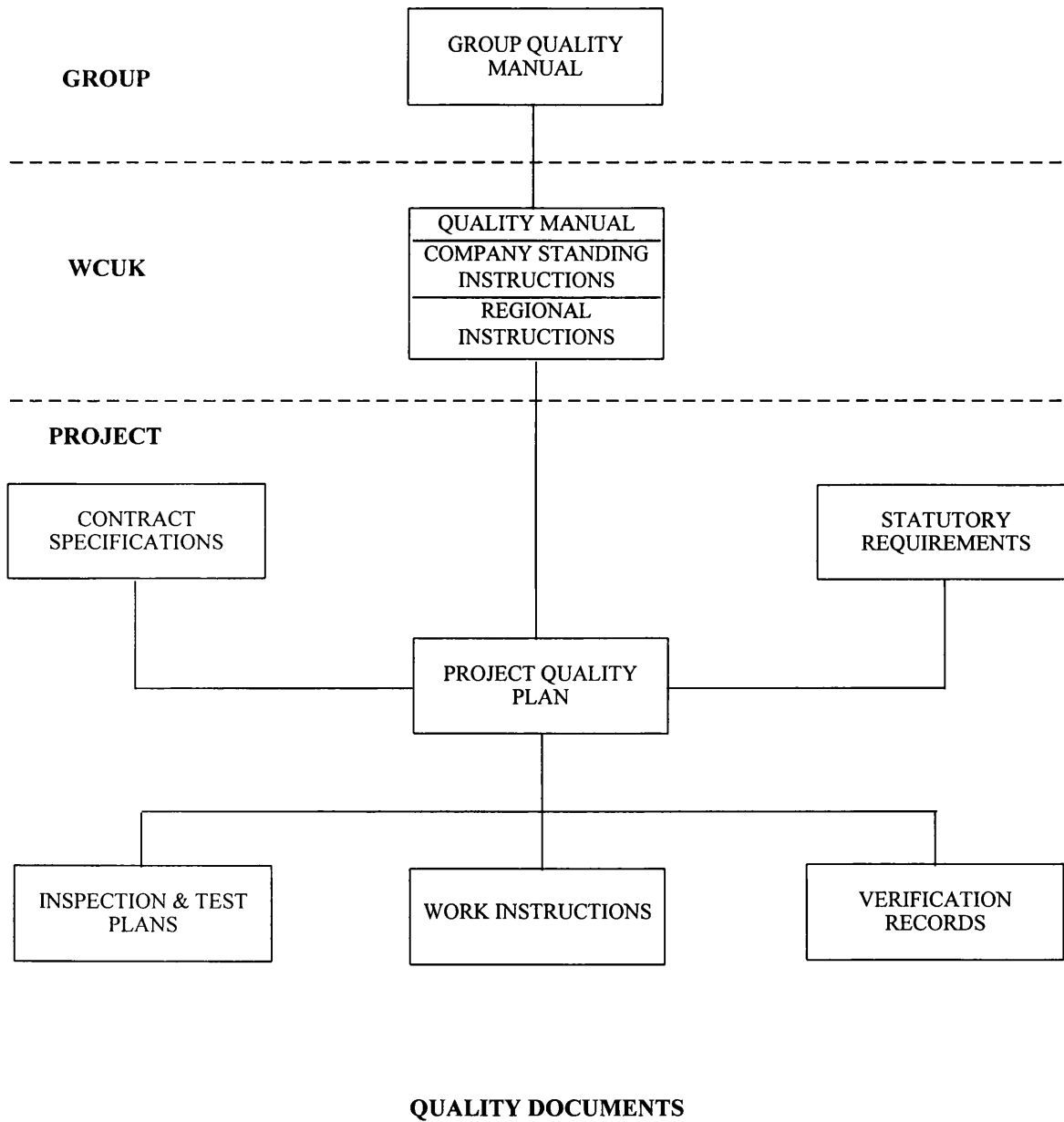
Appendix 4: The Organisational Structure of WCUK



* See Regional Management Chart (next page)

Appendix 4: The Organisational Structure of WCUK, cont.

Regional Management Chart



Appendix 5: WCUK Matrix

 <p>WIMPEY CONSTRUCTION UK</p>	<p>Company Standing Instruction QUALITY MANUAL</p>	<p>CSI-QA-01 Page 12 of 12 November 1994</p>
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6.3 Compliance with BS EN ISO 9001 : 1994

The following matrix shows the cross reference of each CSI with the relevant ISO 9001 clause number.

CSI -	QA-01	QA-02	QA-03	QA-04	COM-01	COM-02	COM-03	COM-04	ADM-01	ADM-02	OPS-01	OPS-02	OPS-03	OPS-04	OPS-05	OPS-06	OPS-07	OPS-08	OPS-09	OPS-10	OPS-11	
ISO 9001																						
4.1	X																					
4.2	X		X																			
4.3															X				X	X		
4.4														X								
4.5												X										
4.5						X	X	X														
4.7									X													
4.8									X													
4.9															X							X
4.10									X													
4.11													X									
4.12									X													
4.13																X						
4.14																					X	
4.15									X													
4.16				X																		
4.17			X																			
4.18										X												
4.19	NOT APPLICABLE - SEE NOTE																					
4.20	NOT APPLICABLE - SEE NOTE																					

Note: Clauses 4.19 and 4.20 are not generally applicable to our normal business. This is regularly reviewed and requirements implemented if applicable to specific contracts by Regional Instructions or Project Quality Plans.

Appendix 6: Construction Industry in Greece

Construction industry in Greece is one of the most significant parts of the Greek Economy and its input to the development of the country is very important. The construction output for the last five years is about 5-5,5% of the Gross National Product. The Construction industry employs more than 230,000 persons, representing about the 6,5% of the total labour force, and comprises of 2,250 companies. The industry's activities can be divided into two groups:

- Building Works (about 70%)
- Technical Works (about 30%)

The first sector includes Housing, School, Hotel, Office and Shop construction projects and the second Road, Hydraulic, Irrigation, Harbour, Industrial and Electrical engineering projects.

The major and biggest client of the industry, especially for the Technical Works, is the public sector. Public bodies, controlled by the Ministry of Public Works and organisations owned by the government, each year announce a series of projects all over Greece. The undertaking and completion of these projects demand good organisation, investments and high technical expertise. They take place under certain conditions especially for the projects in the public sector. Those conditions refer to the size and assets of the company, the size of projects for the public sector. Those conditions refer to the size and assets of the company, the size of projects undertaken and the experience required for the specific projects. In other words, the contractor can undertake contracts according to the category and class for which he is licensed. The basis of classification is the sufficient number of suitably qualified and licensed engineers on his staff, past experience in the category of work and sufficient assets. The classification is from A to G and for S.A. or Ltd companies it is from D to G.

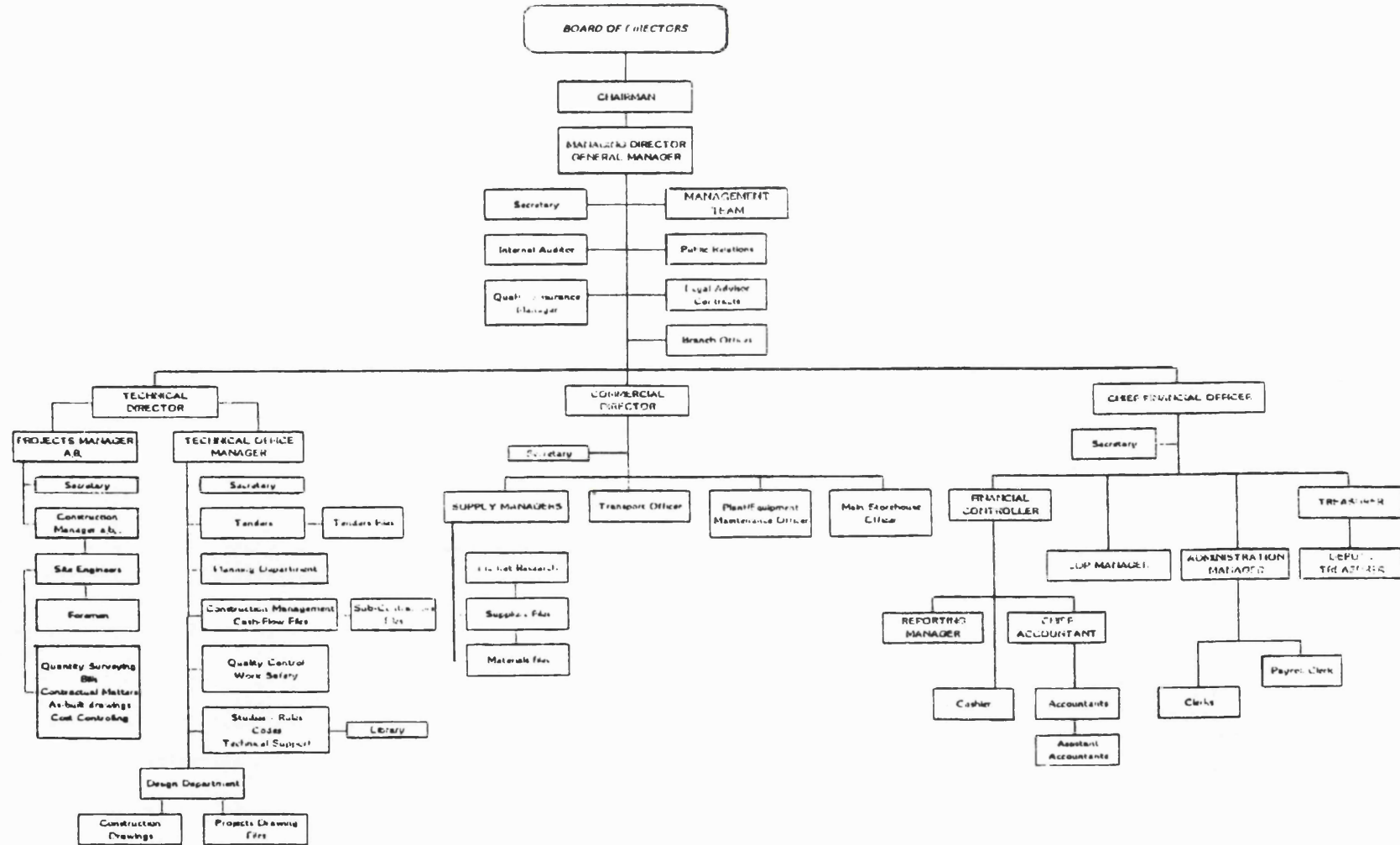
The size of project that a certain class of contractor can bid for, is decided by budgetary considerations. One of the main characteristics of the construction industry is that there are many projects which are undertaken by usually two or more companies acting as one contractor that is in a partnership. It is also noticed that although the number of projects undertaken is small the budget of each project is big.

In Greece, the construction industry experienced a boom in 1989-1991, followed by a slump which continues until today due to the fiscal policy of the Greek Government. Also many factors have had their influence, such as the general slump of the whole economy, legislation which eliminates housing loans, increase in interest rates for those loans etc., which has prevented organisations from investing in big projects. However, the prospects in the construction industry in the future seem to be promising, due to the following factors:

- Greece has to make large investments in infrastructure projects in order to approach the level of economic development of its EU partners.
- A significant inflow of funds is expected during the period 1994-1999 through the Jacques Delors II funds package.

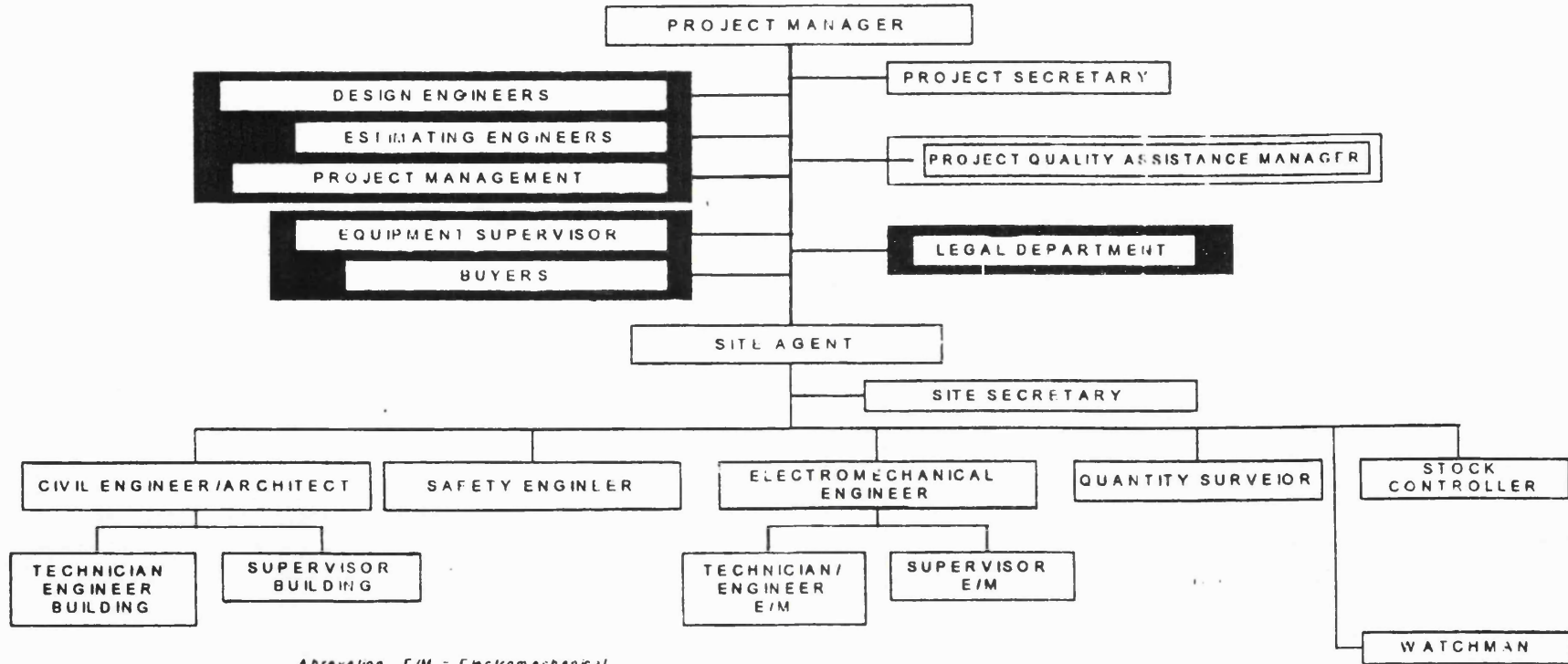
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ANNEX II : ORGANIZATION CHART OF GEK S.A.



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		ISSUE & DATE 2/05.05.96

ANNEX III : TYPICAL ORGANIZATION CHART OF BUILDING PROJECT



Abreivation : E/M = Electromechanical