

DISERTATION

QUALITY CONTROL



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QUALITY CONTROL

VITUS BERING BTH
Autumn 2004

TITLE PAGE



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PREFACE



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1. INTRODUCTION

“The implementation of a quality management system is a clearly understandable system that the employees understand and can use for guide finish their work according to law and the company policy.”

When we were thinking about what we should write about in our dissertation, we found out that we were thinking about the same thing, Quality Control. But Baddi was thinking about Quality Control in a Design phase and Andreas in a Construction phase.

After reading books about Quality Control we thought about making a Quality Control system from brief to hand over of the building, with the possibility to split it in two parts, one for design phase and one for construction phase. The idea behind having it all in one book comes from Total Contracting, which we think is going to get more popular in the coming future, both for bigger and smaller projects.

This dissertation is build up in 5 phases. First part is about quality and quality control. Second part is about scrutinizing ABR 89 and GC 92 which are the laws about building process. Part three is about books and links that we have been looking at. The forth part are our explanations of Quality control manuals we scrutinized and the fifth part and also the biggest one; we show how we build up our Quality Control system and how it will work. The main Quality Control manual will be in A5 format. The idea behind that comes from G.J. Gardner’s Quality control manual which is in A5 format which we found to be very



handy book to use. We will have it in 3 different books, one with total Quality Control system and then we split it also up design phase and construction phase.

The Quality Control manual is build for New Zealand requirement, but on laws from Denmark.

2. WHAT IS QUALITY & QUALITY CONTROL

a. When did it start?

The first products where realitvely simple and a single craftsman was the only supplier in town for his specific products. Everyone knew where he lived so everyone could reach him at all times. The quality of his products (buildings) depended only on his skills and will to produce the quality that his clients wanted.

The mechanisation started when Samuel Slater arrived from England and started the first U.S. textile mill in Rhode Island. The main thing during those years was unskilled labor which worked at a very low salories. When Henry Ford started producing cars he looked at things differently. He “felt that his employees and costomers where one and the same, and unless an organization took care of its employees, it would distroy itself”. He also believed that satisfying his costomers whas the greates service he could provide. In other words he belived that skilled labor was the way to go. During his years he developed the concepts of Process Integrity, Total Quality Control and Just in Time. Among his acheavments was not only to improve the liablility of the car daramatacally, but also to lower material costs of his T-model from \$850 in 1908 to \$290 in 1924 by adobting those methods in his production.

According to this, even though quality gurus like Deming and Juran which are the father figures of Quality control and Just in time in Japan in the years after the war, it was Henry Ford who started developing the methods in the beginning of last century.

b. What is quality?

Quality may mean different things to different people. The International Organization for Standardization (ISO) formally defines quality as the “totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs”. Dr. J.M. Juran specifies it as “fitness for purpose”. In our minds Quality is the ability to fulfill the clients expectations. Quality of a construction is however a bit more difficult to describe as it is not a unique product that is not repeatedly done as e.g. factory made products. Taking a building construction as an example the product is either an entire building, a part of a building or a prefabricated element that is a part of the a building. The need to satisfy the client includes not only the building owner but also the future owners of the apartments or houses which during construction phase may be different persons. The construction cost and time of delivery are also important part of a quality. All these should be prepared in the designing phase and the outcome should be stated on the drawings and specifications.

The quality of building work is even more difficult to describe and sometimes impossible as there are many hidden parts in every building. Very often it is the look of the surface which determines the acceptable quality and often it is the matter of personal opinion on “how good is good enough”.

It can though be said that if a building functions as intended for its designed life it is of a good quality. Therefore, a quality product of a building is one that meets all requirements of the contract, including cost and time.

c. Quality in design, construction, products and use

I found a very good definition of quality in the building process. This comes from an overview of a book I found on amazon.com. Following are the definitions:

Quality of designing process derives from:

- Reliability of initial brief
- Reliability of all information used as basis of the design and selection of products
- Reliability of design solution and detailed specification
- Reliability of estimates of quantities of material and labours required and their costs, of management and site overheads and predictions of possible contingencies
- Reliability of calculations relating costs to benefits, including tangibles like economies in energy consumption
- Experience of designer in judging whether estimate of total cost of project is realistic, and will meet requirements of client

Quality of construction process derives from:

- Reliability of organization, procedures and skill of builder to interpret the design, marshal required resources and provide the end product in accordance with design and specification and at contracted price
- A workforce of appropriate skill
- Products of specified quality

Quality of products derives from:

- Reliability of all the materials, products, components and equipment supplied to the site, and their handling storage and protection on site

Quality of building in use derives from:

- Reliability of commissioning of installations and inspection of work on handing over, and making any corrections required
- Reliability of the maintenance programme
- Reliability of management of building in use, including assurance that any alteration to building or modification to installations will not impair performance or quality achieved

d. Quality control

Quality control refers to the activities that are carried out to prevent or eliminate causes of unsatisfactory performance.

In the building industry, it is not an unknown method to have a separate contract for a design and construction, with the designer also taking up the role of supervision of construction. The quality of the finished work is controlled with inspections and testings during the process. For example, the quality of concrete and other materials on site is checked by random samples and tests, and a thorough inspection of the finished work is performed without exception before final acceptance. The major drawback of this inspection system is that it identifies the mistakes after the event. Even concrete can be defective if it is not properly compacted and cured, and the possible hazard of steel corrosion will not show until years later. Many building defects are covered up during following construction so the quality of the finished works can not be valued by final

inspection. Defects in building work are very difficult, and in many cases impossible to replace.

Regular supervision by the contractors staff themselves is without doubt the key to quality. Without the participation of the staff it will become very difficult to keep up good quality in all aspects as so many things are hidden in the building constructions.

To show commitment to quality, management of the company must provide adequate resources on site to avoid anybody cutting corners. Furthermore, a comprehensive record of the process inspections is very important to ensure that the intended verification is actually done.

e. Quality assurance

It is assumed that throughout the world there is about one in ten building projects that lead to a dissatisfaction and complaints against the contractor. A survey conducted by the Building Research Establishment in the UK indicates that 40% of building defects occur during the construction phase. In most cases the defects are the result of:

- Misinterpretation of drawings and specifications
- Use of superseded drawings and specifications
- Poor communication with the architect / engineer, subcontractors and material suppliers
- Poor coordination of subcontracted work
- Bad instructions or unqualified operators
- Insufficient supervision and verification

Defects arising in constructions are mostly caused by poor management and communication. It can be assumed that mistakes appearing on site are actually made on site.



Consistent quality can only be achieved when avoidable mistakes are avoided in the first instance. Preventive measures must therefore be taken to minimize the risk of management and communication problems. This is the basic concept of quality assurance.

The performance of an individual in an organization could directly or indirectly affect the quality of the finished building. Responsibility for quality therefore stretches from the chief executive right down to the person on the site. To assure quality all staff in the organization, both in the head office and on site must:

Know what their authorities are:	Have appropriate organization structure, clear lines of responsibility and communication
Know what their duties are:	Have clear definition and description of duties
Know what to do:	Have correct specifications and drawings
Know how to do it:	Have proper training, appropriate procedures, ready access to necessary instructions
Want to do it:	Have proper motivation
Be able to do it:	Have the right resources, plant and materials

Quality assurance within a company must therefore describe all activities needed in the company including job descriptions, activity descriptions etc.

f. Performing quality control.

This question is set for the client or his representative. What is he ready to pay for Quality control in his project, and what kind of work method will he use. I can see 5 possibilities in Quality Control:

No Quality control:

In this case the client or his representative has no idea what is happening in unseen places in the house, e.g. is there some insulation in the wall, and is there some waterproof membrane in the floor and so on. He only knows what is on the surface. There are no expenses in Quality Control in this case, and the client has to rely on his contractor and his employees to finish the work right. Good craftsmen is always a good Quality Control. This can be used for minor work.

Contractor will supervise the Quality Control:

The contractor obligates him self to finish the project with Quality Control according to Building Specification and deliver a Quality handbook with the project. The Quality Control expenses will be included in tender.

Designer will supervise the Quality Control:

The Designer will obligate him self to have Quality Control inspection over the project and hand over a Quality handbook with the project. Generally the Quality Control expenses are a special tender with the design, or it can also be included with design costs.

An outsider of the project will supervise the Quality Control:

This company or person will obligate him self to have Quality Control inspection over the project and hand over a Quality handbook with the project. Usually expenses for that kind of Quality Control are made with special tender.



Representative of the client will supervise the Quality Control:

The Representative will have Quality Control over the project and will be paid according to that.

Quality control in the designing phase is mainly build up as a checklist with what shall be included in the drawing, and when designer hands over the drawings and Building Specification to owner or the contractor he has finished the Quality control in the design phase.



3. EXPLANATIONS OF CONCEPTS

Will com in the final version

4. EXPLANATIONS OF THE LAWS

a. AB 92

AB 92 § 5 subs 3

Neither party may transfer his obligations to a third party without prior consent from the other party.

The main contractor can sub-let work with in the contract but the responsibility is still his that quality will be as described in documentations

AB 92 § 5 subs 4

The contractor may sub-let unto others the performance of the work to the extent that it is customary or natural for such work to be performed under a sub-contract.

AB 92 § 10 subs 1

The work must be performed in an accordance with the provisions of the contract, with due professional care and skill or in accordance with any instructions given by the employer under § 15. To the extent that no special descriptions are made of the materials, they must be of a general, good quality.

It is the responsibility of the main contractor that all materials are of general good quality where not especially stated

AB 92 § 10 subs 4

Materials and other supplies for the work must be supplied with a 5-year suppliers' liability for defects, however cf. § 36, subs 3. (2). The liability period shall commence upon the handing over of the work and shall be limited to a maximum of 6 years from delivery to stock or for resale.

Moreover, the supplier must have accepted partly that claims of defects under the circumstances mentioned in § 5, subs 5, can be made directly against the supplier, partly that disputes concerning defective supplies can be brought before the Building and Construction Arbitration Court.

Supplier of material must accept that he can be held reliable directly if his materials are not of general good quality

AB 92 § 11 subs 2

During the performance of the work and upon handing-over the employer may demand that further tests be made. In this case, too, the contractor must make available the necessary staff for tests and test analyses, If such further tests show that the services provided are up to contract, the employer must be charged with the cost thereof as for extra work. Otherwise the contractor shall pay for the costs incurred by the employer.

If the client wants extra control of quality during the building process or during handing over procedures the contractor must supply the necessary staff to do so. If Quality is of general good conditions the client must pay the contractor the hours used as it was an extra job. Otherwise it is the cost of the contractor.



AB 92 § 11 subs 3

The contractor shall allow access for the employer and his supervisors to the building and production sites where the work is being carried out. Moreover, the employer may claim that such information be furnished as is necessary to evaluate the service.

The contractor must allow the clients and his supervisors access to the building site, as well as all his control plans of quality

AB 92 § 11 subs 4

During the performance of the work the employer and his supervisors may reject work or materials that are not up to contract. Such rejection must be made at the earliest possible time.

The Clients supervisors can reject materials that are not up to a general good quality but it must be done at earliest possible convenience

AB 92 § 11 subs 5

The contractor must arrange for regular tidying-up and clearing-away and for the immediate removal of rejected materials from the building site.

It is the responsibility of the contractor to keep the building site clean and safe as well as remove rejected material at is own cost

AB 92 § 12 subs 3

The contractor shall maintain the work performed until handing-over.

If the contractor completes work before delivery date he is still responsible for the quality until delivery date.

AB 92 § 15 subs 2 & 3

Where the contractor finds that the work can not be performed in accordance with the contract entered into, he shall immediately inform the employer thereof and follow the latter's instructions

If there are any discrepancies in the documentations or described material can not be used the contractor must take the clients side for a best possible solution

AB 92 § 18 subs 1

The contractor shall manage the work either in person or through an agent who acts as his representative towards the employer and the supervisors in relation to the organisation and performance of the work.

The contractor can hire a representative (Project Manager) to manage the work at site. He is though still responsible towards the client (§ 5 subs 3)

AB 92 § 19 subs 1

Site meetings shall be convened by the employer or his supervisors who shall also prepare minutes from the meetings to be sent as soon as possible to the contractor with whom the employer has concluded contracts.

It is the responcebility of the client to arrange site meetings and take minutes during those meetings aswell as sending out the minutes to the contractor as soon as available

AB 92 § 19 subs 2

The contractor himself or his agent shall attend all site meetings.



AB 92 § 29 subs 1

During the handing-over meeting a document shall be drafted (the handing over protocol) in which shall be listed any claims for defective work and any other circumstances pointed out by the employer in addition to any comments made by the contractor thereon. It must appear from the documents whether the parties consider the work as having been handed over or not.

All claims of defective work must be in written. It is the responsibility of the client to make those notes but the contractor is free to make any comments on them

AB 92 § 29 subs 2

The document shall be signed by the employer and the contractor.

AB 92 § 30 subs 1

If the work has not been performed in accordance with the contract, with due professional care and skill or in accordance with any instructions given by the employer under § 15, it shall be deemed to be defective. The same shall apply when ever the contractor has failed to provide other services agreed upon in relation to the work.

Client can demand that work that does not fulfill the set quality in the tender documents can be replaced unless the contractor has gone through procedure described in §15 subs 1 & 2



AB 92 § 30 subs 2

If the materials are not the agreed materials or are not of a general, good quality, cf. § 10, subs 1, they shall be taken to be defective. However, this provision shall not apply

Where, in case of a free choice of materials, the contractor substantiates that the materials stipulated in the contract do not exist or are not procurable because of war, import bans, etc., or

Where, in case the employer has ordered the use of specific materials, the contractor substantiates that it is impossible to procure such materials in which, at the conclusion of the contract, the contractor ought not to have foreseen.

In case of 1 and 2, the contractor must as soon as possible notify the employer of the actual or possible occurrence of obstacles, cf. § 15.

In situations like war, import bans or other situations where described materials can by no mean be supplied contractor can get other types of material in co-operation with the client

AB 92 § 30 subs 4

The time of handing-over shall be decisive for the establishment of defective work,

It is the responsibility of the contractor to inform if hidden materials are not accoring



whether the defects can be established at this point or are hidden to specifications

b. ABR 89 General Conditions For Consulting Services

ABR 89 § 1.

General.

ABR 89 § 1.0.1

These conditions shall apply to technical consultation and assistance in the field of building and constructions, including architectural, engineering, landscaping and planning consultancy.

There shall be consultant with knowledge/education in his technical work.

ABR 89 § 1.0.2

In the contest of these conditions the term “consultant” shall mean any party undertaken to solve a specific task with in the scope of the conditions, and the term “client” shall mean the party engaging the service of the consultant to solve the assignment.

Consultant shall solve the task from client with his knowledge. Consultant shall make his business engaging for the client, prove that he is doing his job, e.g. with quality control.

ABR 89 § 1.0.3

These conditions shall govern the legal relationship between the consultant and the client unless otherwise stipulated in the agreement between them. Deviations from

Consultant and client shall make a contract with all deviations. They shall both accede it and sign it.

the conditions shall not be valid unless it is clearly and explicitly stated for which points the deviations are valid.

ABR 89 § 1.1

Work of the consultant.

ABR 89 § 1.1.1

The consultant is the representative of the client and safeguards the interests of the latter inasmuch as these are not at variance with the requirements of his professional standards. In the event of such a conflict, he shall duly inform the client. The consultant is bound to observe discretion with regard to special circumstances and trade secrets of his clients enterprise which may come to his knowledge in the course of his work for the client.

Consultant shall inform the client about his work. The client shall be informed regularly about consultant work, e.g. in meetings or written letters with drawings.

ABR 89 § 1.1.4

Where the consultant holds a license or similar rights in respects of a building, building component, material, fixture component, etc. which it is planned for use in connection with solutions of the assignment, he is bound to notify the client to this effect.

If consultant is importing or manufacturing product which will be used in the building, then he has to induct the client about that.

ABR 89 § 1.1.5

The consultant shall help to ensure that reasonable agreements are concluded

The consultant shall use his knowledge to point for good contractors to execute the

between the client and those contractors whom the client and those contractors whom the client appoints to execute the project.

project, and he shall know what reasonable agreement for the client is.

ABR 89 § 1.1.6

Where in the course of his performance of an assignment the consultant becomes aware of matters which according to their nature may constitute a serious risk or danger to their surroundings, he shall duly inform the client thereof and, as the case may be, take such measures as are necessary in order to expose the risk or obviate the danger.

Consultant shall collect all information about the plot and the building and inform the client about what is not good or what can go wrong in the building.

ABR 89 § 1.2

Work of the client.

ABR 89 § 1.2.1

The client shall be responsible for the contractual study of drafts prepared by the consultant for tender documents, acceptances, contracts etc.

Client shall be informed what he is going to get from the consultant.

ABR 89 § 1.2.2

The client shall nominate a person authorized to act on his behalf in relation to the consultants.

The client shall nominate person to act on his behalf in relation to the consultant, and there is nothing that says that the client can't be this person.



ABR 89 § 2.1

Consultation agreement.

ABR 89 § 2.1.1

The consultation agreement shall stipulate the extent of consultation and the form of fee; the basis (including the financial basis) which consultation shall take place; which decisions the client will be required to make in the course of the project, and the form in which the assignment shall be finally presented. In the event that the client wishes one more of the consultant's staff to be specially appointed for the provision of specific services, this must be explicitly stipulated in the agreement.

Client shall inform the consultant what he wants in his project. This shall all be written in an agreement.

ABR 89 § 2.1.2

The agreement shall contain provisions for the financial framework fixed for the assignment.

Client shall decide a fixed framework price for the project and the consultant shall work out from that frame.

ABR 89 § 2.1.3

Any amendment in factors mentioned under pts. 2.1.1 and 2.1.2 shall be explicitly agreed and stipulated.

Client shall know about all extra work in the project, he shall also know the price of it and he have to agree that it will be done.



ABR 89 § 2.1.5

In the event that the consultant considers that the carrying out of the risk will require special consulting services beyond those he undertakes to provide, he shall notify the client accordingly before entering into an agreement. Same as 2.1.3.

ABR 89 § 2.1.6

The client is at liberty to amend the assignment or the basis thereof. Where an amendment implies a not inconsiderable volume of extra work, the consultant shall be entitled to a corresponding adjustment of fee. The consultant claim shall be forwarded immediately after it is realized that the extra work is not inconsiderable. Same as 2.1.3.



ABR 89 § 2.3

Phases of consultation

ABR 89 § 2.3.1

The provision of consulting assistance for an assignment may be given in the following main phases:

Programmed phase

Proposal phase

Planning phase

Execution phase

Operation phase

The project shall be broken up few phases. So the project can be few individual projects.

Also that the client can give his approval to go to next step.

Description of contents and sub-divisions, if any, of the individual main phases shall be contained in the consultation agreement.

ABR 89 § 2.4.2

The project manager will normally be the consultant who in connection with the start-up of the assignment is responsible for basic design work to which the other consultants each contribute within their special fields.

There has to be project manager over every project and he have to nominate other consultants in their special fields. But he will not have any liability of their works.

The project manager/builder manager shall not assume liability for errors and omissions in the work of individual consultants.



If during the planning phase a consultant considers that his views are being substantially ignored by the project manager, he and the latter shall submit the problem to the client.

If during execution a consultant considers that his views are being substantially ignored by the project manager/building manager, he and one of both of the latter shall submit the problem to the client.

ABR 89 § 2.4.4

The consultant shall participate in meetings and negotiations with authorities and others as required for carrying out the assignment.

Consultant shall be on all big meetings that touch the project. He shall also inform client about all assignment that are going on.

The consultant shall keep the client informed of the progress of the assignment at all times and shall notify him without delay in the event of difficulties occurring which may prevent discharge of the assignment as agreed.

ABR 89 § 3**Fees****ABR 89 § 3.0**

General – The consultant shall receive a fee discharging the duties entrusted to him by the client, the basis of calculation or amount of such fee being fixed in the agreement with the client.

Consultant and client have to agree about payment for the project.

ABR 89 § 3.4

Payment – Where a consultant is subject to penalties for exceeding time-limits in conjunction with a previously estimate design time schedule, a payment plan must be drawn up to accompany the time schedule. The consultant is entitled to claim reimbursement of expenses monthly in arrears.

ABR 89 § 5**Time-limits****ABR 89 § 5.1**

The agreement may stipulate time-limits for the consultant's completion of the assignment or parts thereof, for the clients provision of material necessary for carrying out the work, and for the clients own work in connection with the assignment.

If the client wants a time-limit on his project, then that have be stated in the agreement.

Time-limits stipulated by agreement are not normally appropriate in the proposal phase.



ABR 89 § 5.2

The consultant is entitled to demand extension of agree time-limits when the completion of the assignment is delayed:

If there is a time-limited on the project and something happen in the project like here attachment 5.2 A to F, then the consultant has a right to delay the time-limit.

A

In case of the change in the assignment requested by the client.

B

Because the client or one of his other consultant fails to make decisions or to present material or services within the agreed time-limits.

C

Because the clients contractors fails to present material services within the agreed time-limits.

D

Because the public authorities do not inform of approvals, decisions or replies or do not present material or services within the agreed time-limits.

E

By order of a public authority.



F

By events beyond the control of the consultant, and which he could not have anticipated or be expected to anticipate.

ABR 89 § 5.3

The consultant can resort to the provisions of 5.2 above only to the extent that he himself by virtue of reasonable action has attempted to prevent or limit the delay.

ABR 89 § 5.4

The consultant shall notify the client promptly and in writing when he considers he has a justified claim for extending a time-limit, and shall prove on demand that the delay is due to justifiable circumstances.

Consultant shall notify the client with letter if there will be some delay on the time-limit.

ABR 89 § 5.6

Where extension of a time-limit extends beyond two years, the consultant is entitled to consider the assignment as terminated.

5. LITERATURE WE READ

Title; **Understanding just in time**
Author; **Malcolm Wheatley**
Published; **1992**
Pages; **91**
Read by; **Andreas**

This book is about Dr. W. Edwards Deming's theory about how to reduce storage space in a factory. It talks about the methods how to maximize the productivity in a factory and minimize the area needed. It describes why this method was developed for Toyota and the concept behind it.

In many ways this can be transferred to the process at a building site where we have limited space for storing materials. We would make a delivery plan for all materials where dates and location on site are specified. This helps us minimize storage space at site.

3 kiwi birds

Title; **Beyond total quality management**
Author; **Larry Reynolds**
Published; **1994**
Pages; **114**
Read by; **Andreas**

This book is as the name says, about quality management. It explains what quality is and how to measure the existing quality with simple questions through different charts. It also describes the quality circle as a small group of workers who work together on similar or identical tasks.



In total the book is good and describes well various situations.

3 kiwi birds

Title; Quality Circles Handbook
Author; David Hutchins
Published; 1985
Pages; 272
Read by; Andreas

This book describes the functions of quality circles, how to start them, what is the ideal size and how to run them. It explains the pros and cons of Taylorism and why it is necessary to get people involved in the quality control. Quality will not be reached without the involvement of the people and a system with self-control is therefore the most ideal thing possible.

It comes up with real examples on how quality meetings were run, proposals they made for improvements, what the result was including calculation on savings, whether that was in time, quality or money.

Quality circles can in my opinion be compared with lean construction where a "group of people" meet to discuss the working process and find a way to do things better than they are being done.

In total this was a good book to get the idea about the function of quality circles and getting examples from the real world helps a lot. Also there is a chapter with 152 of the most frequently asked questions about quality circles and the answers to them.

4 kiwi birds



Title; **A quest for quality – ISO 9000 standards**
Author; **William Minchin**
Published; **1994**
Pages; **20**
Read by; **Andreas**

A short book about the ISO 9000 standards. It describes in short words what companies need to do to get any of the ISO 9000 standards. It does not describe the methods but only the tasks that need to be fulfilled before you are allowed to use the ISO 9000 approval.

3 kiwi birds

Title; **Achieving Quality standards**
Author; **Lesley Munro-Faure, Malcolm Munro-Faure, Edward Bones**
Published; **1994**
Pages; **209**
Read by; **Andreas**

This book describes the methods behind a quality management system and its connection to ISO 9000 standards. It goes through the phases needed to achieve to have a good quality assurance within your company. Among other it says that companies waste about 25% of its turnover on ineffective or inefficient processes which result in errors and waste. It goes through document control and has checklists on what to do to achieve good quality standards within the system.

This book has not much to do with quality control itself. It handles much more about quality assurance system and how easily it can be made for every company. If I would have been writing about quality assurance this would have been the best book for that purpose. As it is my intention to develop my quality control system into a quality assurance system later on I must rate this book as one of the best.



4 kiwi birds

Title; **Kvalitetssikring i byggeriet**
Author; **PAR & FRI**
Published;
Pages; **52**
Read by; **Andreas**

Coming later

Title; **Byggeri og planlægning**
Author; **Erhvervs og boligstyrelsen**
Published;
Pages; **27**
Read by; **Andreas**

Coming later

Title; **GC 92**
Author;
Published;
Pages;
Read by; **Andreas**

Coming later



Title; **Quality manuals – Guide to preparation AS/NZS 3913:1992**
Author; **Standards Association of New Zealand**
Published; **1992**
Pages; **45**
Read by; **Sigurbjartur**

Main subject: “NZ standards about quality (regulations). All main parts of standards issued in one book”. - This book is about how to build a Quality manual for a company, there is alot about Quality Control and it shows how and where the Quality control shall be placed in Quality manual. I liked to read it and it gave me overall view on what shall be in Quality manual.

4 Kiwi birds.

Title; **A foundation for success**
Author; **Barbara Chase, Bob Oliver, Thomas G. Schafer, Kelly Vaverek,**
Published; **1995**
Pages; **70**
Read by; **Sigurbjartur**

Subject: “A Leaders Guide provides all his necessary support to arrange and lead a session, and offers guidance for tailoring the modules to the organization”. - This book is not much about Quality Control, but it gives you an idea how to understand your employees. How to understand, find out what they think and what they are best in. Like someone said “Good employees can be good Quality Control”. Yes it is about how to build a winning team. This book was ok, but not so usable for Quality control that we are thinking about.

3 Kiwi birds



Title; **A leader's journey to Quality**
Author; **Dana M. Cound**
Published; **1992**
Pages; **184**
Read by; **Sigurbjartur**

Subject: "This book will lead you to a journey in Quality" – **This book didn't give me much, it was heavy and dived too much into some of the subject, that I lost interest of the subject. I think I have to read it two or three times to understand it totally.** So I'm not going to waste more on it and I will give it 1 Kiwi bird. Like he wrote in the book "If you are looking for a cookbook, look elsewhere. This book is more about cooking than it is about recipes". He was talking more around Quality Control, and then goes straight into the subject.

1 Kiwi bird

Title; **Quality solution (TQM)**
Author; **Dr. John Blakemore**
Published; **1989**
Pages; **145**
Read by; **Sigurbjartur**

Subject: "Total Quality Control is an all embracing management and employee involvement philosophy aimed at continuous improvement in productivity, quality and worker harmony". TQC emphasises people, processes, product, performance, planning and perfection. I think this is the main parts in TQC. This is a good book and it answers questions like: What do we mean to the market?, What do we mean by the process?, What



can be the cost of quality?, What?, Why?, When?, Where?, How?, and many more. This was not about design or buildings but I could connect it to our Quality Control. The book has a few charts that I can change to design phase, and description how to make a check list. This is a usable book.

4 Kiwi birds

Title; **ABR 89**
Author;
Published;
Pages;
Read by; **Sigurbjartur**

Coming later

In our final edition we will also give comments on the various websites and literature we have read.

6. QUALITY CONTROL AT A DRAWING OFFICE

a. Introduction

“Quality system: Requirement that the supplier establishes and maintains a document quality system as a means of ensuring that product conforms to specified requirements.”

I think this sentence is a big thing in Quality Control. When I started to do my Quality Control dissertation in design phase down here in New Zealand, I found out that companies are not using anything like this. I was trying to get Quality Control system from some design companies to scrutinize, and all the people that I was talking to, said that they didn't want to spent time and money on it, the answer was “it takes to long time, and is the client ready to pay for that”.

In the end I contacted the office that I was doing the practical placement for here in NZ TI used that guideline to scrutinized (see enclosure no XX).

When I started to read about Quality Control, I thought about the people who didn't want to use it because it was too complicated and too much time was spent on it. I thought that it have to be something easy to use and not to big. So I made a book in A5 format with all the information about the project and in the end of that was checklist for every drawing that have to be included in a normal project here in New Zealand. To make it easier for the company and the employees, I made also a homepage about the check list. This homepage will not be published on the internet, it will only be on the server for the company. For example, if an employee has finished a drawing and wants to check if everything is on it, he just goes into this homepage and clicks on the drawings checklist. The drawing can now be checked if anything is missing, and if he forgot for example the bracings, there is a link on the check list that directs you directly to a program that calculates theirs size and

quantity. This can be copied and pasted on to the drawing. I think this system is easy and ensures that everything that needs to be on the drawing is on the drawing. The homepage is on a CD in the last page before enclosures.

b. Scrutinizing the guideline from NZ institute of Architects.

When I read this guideline first I liked it, but when I really went through it I saw something that could be done much better. Like there was only one check list for all the phases like Pre design, Preliminary design, Developed design and working drawings (outline, scheme design, detail 1 and detail 2). This is not good specially for someone that is new, he would not know how much he has to do in Preliminary design and so on. Time is money and if the employee has made too much, and the client did not like the plan, or want to make some changes of the design, then this extra work that he has made is just waste of time, and who is going to pay for that? I see that the project has to be broken down to every phase, so the employee can see what he has to do in each and every phase. When people talk about Quality Control, being too big and taking too much time that is probably because the checklists are not well enough organized. If the checklists are well organized and they are brought to meetings they can be of great assistance. The guideline I got had its good parts. E.g. the contract guide was good one and also the tender guide. So over all it seems to be a good guide, but needs to be categorized more. You can always make good things better.

c. My Quality Control manual.

When we (Baddi & Andreas) started to make the layout for our Quality Control in our 4th semester we started making them in A3 format which you could break down to A4 format. On that format was everything that we could think about. We however wound out that it was too much paper (see enclosure XX). We really wanted it to be smaller and more handy to use. After we saw the Quality Control from G.J. Gardner, (that Andreas was

scrutinizing) which was made in A5 format, we decided to do the same and after few hours of thinking we found a way to use the same layout for both design phase and construction phase.

When I started making the checklist I contacted Dimensions Architects and asked them what they could possibly see in Quality Control Manual for design phase. They gave me some formats that maybe would be good to have all in same place and also drawing set that they thought was the best one that they have made. I picked out what I thought would be nice to have in the handbook, looked over the drawing and wrote everything down that I could see that has to be in the checklists. Then I looked in to the Guideline from NZ institute of Architects and took out the best point there, and in the end I used my own common sense what I thought should be in there. At last, I used these notes from a book that I read to see if anything was missing.

Where the manufacturing or services organization is responsible for the design and development of products and service, the quality assurance procedures must involved the design state. The extent and manner of the involvement should be clearly set out in the Quality manual. The following points should be covered:

- (a) Policy and procedures relating to feasibility studies, design and development, design practice, design review, design verification, value engineering, standardization, reliability and maintainability.
- (b) Preparation and maintenance of drawing and specification.
- (c) Design resources (such as staff and technical facilities).
- (d) Analysis of customer requirements prior to design.
- (e) Requirements for component parts or supporting service.
- (f) Document number and Title.
- (g) Purpose and scope (why, what for, area covered, exclusion).
- (h) Responsibility (Who will implement the procedure to achieve the purpose).
- (i) Procedure to achieve system element requirement (List step-by-step, the details of what needs to be done. Use references, if appropriate. Keep in a logical sequence. Mention any exceptions or specific of attention).
- (j) Are the requirements written in user language? Do the users think so?
- (k) Do all the requirements avoid conflicts with other requirements?



- (l) Are the requirements at a fairly consistent level? Should any requirement be specified in more detail? Should any requirement be specified in less detail?
- (m) Are the requirements clear enough to be turned over to an independent group for implementation and still be understood?

We have worked from these points and I think we have all these items in our Quality Control Handbook.

Homepage.

The homepage will only be placed on the company server and will contain the checklists from the handbook. I look at this homepage only for the employees to look at, and they can see that they are handing over drawings with 100% Quality.

This homepage could be big in the end and have everything that project needs, like standard contracts, documents, calculation programs and so on. You open the homepage and there are links to everything, e.g. if you were making a contract for a project you would click on "contract" and it will open a "read only" file that you will fill in information and then in the end save it in the project file. The homepage would be built up like the flow in the project so everything is done in the right order.

I'm just going to let the homepage talk for itself. Here are all the frames from the homepage and on page XX is a CD with the homepage, then you can see how it works in computer. Click on Index on the CD.

7. J.G. GARDNERS (building site) QUALITY CONTROL

As a part of this disertation I have scrutinized the quality control handbook from the building company J.G. Gardner. They are a phranzise company working in Australia and New Zealand, building one family houses meeting every clients demands.

The consept behind this book is of my opinion fantastik. It is published in A5 format and included are all Quality assurance forms needed for a building of this type, including records of meetings, phonecalls, site instruction (extra work) etc. This is they're 3rd edition of the manual so there can not be found many faults in it. However, I found 3 things which are discribed here belove.

The manual includes all documentations needed for records of communication with the client and others involved in the project. However, nowhere in the manual is anything mentioned about new drawings or update of drawings. What are the procedures when a new drawing is issued. How whould they be handled and by whom?

On the Quality inspection sheets there are 2 things that I think can be improved. First is the columns for completion. You can only make one check, meaning that if task has not been completed as expected you would mark a no in the column. In that case you would need to check again? Do you then mark it as rectification work. We think that there is missing a second completion column to recheck things that did not pass in the first check.

Also we think there is missing a column for a date when the task is checked. It is very unlikely that you check everything at the same date, besides, registering the dates can help you with the future planning of simular houses.



Other things in this manual, are really in my opinion, just perfect. It fits perfectly it's purpose of being a quality control for the construction of a one family house. There are no extras in it yet, there is nothing missing in it.

As this manual could not be improved much we decided after discussions with G.J. Gardner to make a Quality control manual for a multi storey apartment building. It is the future plan of the company to start building that kind of buildings and today they do not have any Quality control manual for that kind of buildings.

The manual would be based as a general manual which can be adjusted very quickly to each and every project they would do. E.g. when doing a sheet for the external cladding the task can only be referred as "Is cladding fixed according to manufacturers instructions" as when this manual is made it is not known what type of cladding there would be used. We have also tried to include in it meeting forms, record of photos, extra work etc.

In the future it is my plan to make a total Quality assurance system for a construction company. It would however be too much for this dissertation as that would include all job descriptions and working process within the company. This manual includes only Quality control at a building site but does not include Quality control at the office, which of course is a very important part of the total process. That part would include the working process from receipt of tender documents, including price calculations, choice of suppliers and subcontractors, Quantities of materials and delivery dates e.t.c.

We showed this manual to several people during its construction and got good comments on what to use and what to change.

8. CONCLUSION

After writing this dissertation we believe that our understanding of Quality control has improved greatly.

We have read quite a lot of books and looked at even more homepages and literature. Even though there are quite a few books about quality in constructions in Danish there are very few in English. Mostly we found books about total quality management, quality control and quality circles in general. I remember seeing 2 titles at amazon.com which handled especially about Quality control for constructions but due to prices we did not buy them

In reality, quality is set by your client. If your building fulfills his demands, that would be considered a quality building. To reach the set quality standards it is very important to involve everyone working at the building site. Quality should be reached from bottom up. If every one is aware of what is expected the outcome can only be a good quality.

Here in New Zealand quality control and quality assurance in the building industry is almost an unknown thing. On most places it is mostly in the head of the project/site manager and he is the one that goes around and checks if things are ok. It is not common that things are written down for records. We have however learned about the importance of all written Quality Assurance sheets as they are a legal document. If there are any faults during liability time that sheet can be showed as a proof that things were done according to drawings and specification and the contractor can therefore not be held liable. It is there for not only for the image of the contractor that they need to do a quality control, it is also to protect themselves against faults claims.

During the time we wrote the dissertation we have got a lot of information from the locals, both from the construction sites and from the drawing offices. We have had assistance



where locals have looked through our work and commented on what was not so good and we needed to change and what was good and needed no further thoughts.

When discussing with people involved in the construction business, there is only one thing that everyone says when we discuss quality control. **Keep it simple.** No one wants it to be too much bureaucracy and that it takes too much time. If so, no one wants to be the one that does it.