Introductory Overview To AS 3905.2-1993

- John Spencer,
Spencer Consultants Pty Ltd, ACT.

Synopsis

The new Australian/New Zealand Standard AS/NZS 3905.2, Guide to quality system standards AS 3901/NZS 9001; AS 3902/NZS 9002; AS 3903/NZS 9003 for construction, has been prepared at the request of the Building and Construction Industry. Its purpose is to facilitate and improve communication between the various organisations which constitute the Construction Industry, on matters relating to quality. It provides the basis for a better overall understanding of quality systems and a consistent interpretation of the requirements of the Standards when applied to the industry.

This paper introduces the new Guide by providing some insight into its background, how and why it was conceived, its preparation, contents and how it can be used to greatest advantage.

Introduction

The key to achieving successful quality management is effective communication. To have effective communication we must speak a common language. Also the simpler we keep the concepts and terminology, the more effectively our ideas will be communicated.

The purpose of preparing AS/NZS 3905.2, Guide to quality system standards AS 3901/NZS 9001; AS 3903/NZS 9002; AS 3903/NZS 9003 for construction, referred to in this paper as the "Guide", is to facilitate and improve the effectiveness of communication between the various parties which constitute the Construction Industry, on matters relating to quality. It seeks to do this by defining the terms used in the Standard using words familiar to the industry, and by establishing a basis for consistent interpretation of the Standard throughout the industry. In other words, it seeks to establish a simple common language.

The paper provides a general overview of the guide, its background, how and why it was conceived, its preparation, its format and how to use it to gain the greatest benefit.

First Principles

Before describing the Guide, it is necessary to clarify, right from the start, the meaning of some of the terms used, as they apply to the construction industry.

Terms such as "quality", "quality control", "quality assurance", "quality management" and "quality systems" have been defined in various ways in the National and International Standards, such as ISO 8402, and the numerous books written on the subject. The definitions adopted in the Guide are set out in Section 1.3 and it is recommended that the reader studies these before reading the body of the document.

There is also a simple definition for "quality" which is most appropriate. That definition is - "value for money".

The question is of course, "value to whom? - and for whose money?"

Ultimately it is the customer, or end user, who will determine whether value has been delivered. But what does the customer perceive as value? It is not normally gold plating, not a Rolls Royce. It is much more likely to be a wellbuilt Holden.

A customer will obtain value when it gets the maximum benefit from spending the money it has available. A supplier will obtain value when it can reduce its costs, especially overheads, to the minimum practical level. For either, the aim will be to optimise the use of the available resources - money, people and time. If not properly planned and controlled, in each of these resources, money, people or time, there will be waste, and there is no value in waste.

The two prime objectives are therefor:

- maximise the benefit - the usefulness of the facility
- minimise the cost - the waste

For a facility such as a bridge, a laboratory, a power station or an office building, the greatest use, and hence the maximum value, will be obtained when it fulfils the user's needs and expectations. To achieve this, these needs and expectations must have been properly ascertained, defined, discussed, evaluated, and effectively translated into the entity by skilled designers and builders.

The waste can be minimised by:

- reducing the amount of rework or unproductive time in the design office;
- reducing the amount of scrap or rework by the contractor, the cost of which is built into the overheads and hence the contract price;
- reducing the amount of unproductive supervision of contractors by the customer.

What has been described above is, in essence, "quality assurance".

In its simplest form, quality assurance is the series of actions which a contractor supplying some product or service must take to ensure that the product or service will meet the customer's stated requirements.

There are two elements of quality assurance which are distinct but interrelated. These are:

- assurance that the product or service will conform to the technical specification - "quality control", and
- assurance that the delivery of the product or service is being effectively managed.

"Quality control" may be no more than a simple check of the product before handing it over to the customer. It could also be a complex series of inspections, tests and measurement. These all focus on the processes and are based on inspection of the finished product. Products which don't pass are either reworked or scrapped.

While "quality control" may ensure that the customer will get a satisfactory product, it does not necessarily mean that the customer is paying the optimum price for it. To achieve this, the contractor must be able to reduce its costs by preventing mistakes which incur costly and time consuming rework and scrap.

Prevention of mistakes and problems is a management function. It should be a major requirement for any party suppling products or services, anywhere in the contract chain. Prevention requires a documented quality system which will permit the faulty procedures which allowed the mistake to be made, to be identified and corrected in order to prevent the same mistake from being repeated. This preventive action, combined with "quality control", constitutes "quality assurance".

It also provides the mechanism by which both the quality system and the product or service can be progressively improved.

What is a quality system? It is the combination of the policies, the people, the processes and the documents which determine the way in which a product or service will be delivered or the requirements of a contract will be met. The quality system includes:

Policy	- the company's policy regarding quality
	- the commitment of senior management to the quality policy
People	- senior management
	- organisation structure
	- lines of responsibility and authority
	- key personnel
	- all employees
Processes	- technical processes
	- administrative processes
	- verification and review processes
Documents	- quality manual
	- quality management procedures
	- work instructions
	- inspection & test/verification plans
	- records

A quality system need not necessarily conform to any particular Standard. A very simple system may be all that is required by a small subcontracting organisation for example. However, where other parties, such as a customer, require evidence of the effectiveness of the system, there is considerable advantage in being able to relate it to a recognised Standard.

The AS 3900 series of Standards has addressed each of the factors listed above by means of a number of quality "system elements". AS 3901 lists 20 system elements which provide the generic framework around which individual industries or organisations can develop a comprehensive quality system which will meet their requirements.

The Standard does not prescribe how to achieve these requirements. The Guide has been prepared to assist organisations in the Construction Industry to interpret the system elements of AS 3901 and to tailor a quality system which will meet their needs. Such a system need not include all of the 20 system elements in the Standard. Most however, should include at least half of them.

An organisation may develop a quality system as a corporate system, to provide on-going quality management which is independent of any contracts which it may enter into. Alternatively, it may put in place a quality system to address the quality management requirements for a specific contract.

In the latter case, in order to obtain the full benefit of quality assurance, both parties to the contract must be actively involved. The contractor's quality system should be able to provide a customer with confidence that it will get what it specified. To achieve this it must create and maintain records of the activities identified in the quality system documents.

To gain that confidence however, the customer must first clearly define its requirements. It must then audit the contractor to obtain, from its records, objective evidence that the agreed checks and inspections have been carried out and that the results were satisfactory.

In the manufacturing industry, quality assurance of this type, in the form of supplier quality systems, has been practiced for many years.

Likewise, in some sectors of the construction industry, such as those involved in the construction of electricity power stations, both customers and contractors have applied quality assurance conforming to Standards such as AS 2990 or Canada's CAN3-Z299, for some ten years.

For the majority of customers and contractors in the Building and Construction Industries however, formal quality assurance is a new concept with which they must come to grips.

The results reported in the technical literature suggest that there are significant benefits to be realised by both customers and contractors, from applying quality assurance. In an ideal world, the desire to attain these benefits would be sufficient to persuade such organisations to implement an effective quality system. Unfortunately, the reality is that most will be reluctantly forced into implementing a quality system by external factors over which they have little or no control.

Government Attitude to Quality Assurance

A major factor in the move towards quality assurance

has been the introduction of legislation or regulation by several state governments, requiring quality assurance for all contracts involving the supply of goods or services to a government department. This has compelled building materials suppliers and contractors, both large and small, who wish to do business with the government in those states, to at least start to implement a quality assurance system.

The Commonwealth Government released its Quality Assurance Policy in May 1992. This requires all Commonwealth departments to identify the goods and services for which they require quality assurance and to specify that quality assurance in their tender documents from 1 July 1993 **1**.

The objective is that, in the not too distant future, any organisation wishing to supply goods or services to the Commonwealth, for which evidence of conformance to quality systems Standards is required, will have to be registered with the Joint Accreditation System-Australia and New Zealand (JAS-ANZ).

All state governments, together with the Commonwealth and New Zealand governments, are currently developing a set of Uniform Guidelines for Quality Assurance. When ratified, these will form the basis of all future procurement of goods and services by government agencies in Australia and New Zealand.

These government policies and regulations will almost certainly be the catalyst which promotes the introduction of quality assurance into the building and construction industries in Australia. Market pressures will eventually ensure that a builder, contractor or supplier implements a suitable quality system, or goes out of business.

In time all of Australia will benefit from this development. The ones who will benefit the most are those who are the quickest to embrace it.

Although factual data is not readily available for this country, the few studies which have been undertaken indicate that for an up-front investment of about 2 per cent of the contract price, on prevention and appraisal, some contractors have been able to reduce the cost of rework and scrap from an average of about 10 per cent of the contract value to approximately 2 per cent. This gave them a net saving in the order of 6 per cent, which is a significant benefit that can be repeated and improved upon on future projects **2**.

The aim of this guide is to assist other organisations, from all parts of the construction industry, to achieve similar benefits.

Background to the Guide (AS 3905.2)

In order to understand why the guide is structured in the way it is now presented, it is necessary to examine the industry environment within which it evolved.

In May 1990, a Joint Working Party established by the National Public Works Conference (NPWC) and the National Building and Construction Council (NBCC), published a report entitled "No Dispute"**3**. The report addressed several matters which were of concern to both the public and private sectors of the Building and Construction Industry. With reference to Quality Assurance, the report stated:

> "Traditionally, Quality Assurance requirements specified in both the public and private sectors of the Building and Construction Industries in Australia have encouraged contractors to rely on the Principal to assume responsibility for Quality Control which, under the Abrahamson principles of risk allocation (see page 2 of the paper entitled "Risk Allocation"), should arguably be the Contractor's responsibility. The industry generally has not encouraged an acceptance by Contractors and Subcontractors of an obligation to carry out the Quality Control of the delivery of their work."

In November 1987, Standards Australia had published a new Australian Standard for Quality Systems for the Project Industry. This Standard, AS 2990-1987, Quality systems for engineering and construction projects **4**, had been developed by Committee QR/1, to be, in the words of the Preface to the Standard:

> "... suitable for application to contracts placed by customers undertaking projects of varying sizes including mining, building construction, power station construction, oil and gas ventures, railway projects, etc."

It was prepared for use:

> "... within industries where procurement is undertaken project by project as opposed to the procurement of products from service, batch or mass production activities."

In September 1987, Standards Australia adopted the International Standards ISO 9000 - 9004 published by the International Organisation for Standardisation (ISO) as a replacement for the then current Australian Standards AS 1821 - 1823. The ISO Standards were published in Australia as Australian Standards AS 3900 - 3904 **5** respectively, and were released in December 1987, one month after AS 2990.

In the major project area, especially for power station construction, AS 2990 proved to be very successful and led to improved quality and significant savings for both Principals and Contractors. However, in other parts of the industry, especially that relating to building work, it found very limited acceptance. The NPWC/NBCC Joint Working Party reported in 1990 that AS 2990:

> "... was not "user friendly", nor appropriate for the industry."

The Joint Working Party recommended that a new document should be developed for the Building and Construction industries.

An Ad-hoc Working Group drawn from representatives of NPWC and NBCC, under the Chairmanship of Mr John Spencer, was set up to investigate the needs of the industry and draft a suitable document.

The Working Group commenced this task in January 1990. In May 1990, at the request of NPWC, Standards Australia convened a Subcommittee (QR/1/1), to prepare a new Standard for Quality Systems for the Building and Construction Industry. The members of the Working Group were co-opted to this committee and other industry bodies and organisations were invited to participate. This Subcommittee was chaired by Mr John Spencer.

The new Subcommittee adopted and built upon the work of the Working Group. The proposed new Draft Standard was completed and issued by Standards Australia for Public Review in November 1990 as DR 90192 **6**.

The Public Review generated a large amount of comment. Many of the organisations which submitted comment indicated that they did not want yet another Standard for Quality Assurance. They indicated a clear preference tor the International Standards ISO 9000 - 9004 which had already been issued as Australian Standards AS 3900 - 3904. A number of comments also recommended that a guidance document on the application of these Standards to the Building and Construction Industries should be prepared.

Preparation of the Guide

After detailed consideration of the Public Review comments, Subcommittee QR/1 /1 abandoned the proposed new Standard and commenced the preparation of a guidance document.

In July 1991, the Metal Trades Industry Association of Australia (MTIA) National Construction Council wrote to Standards Australia and recommended that it reconvene Committee QR/1, the committee which, under the Chairmanship of Mr Allan Marshall, had prepared AS 2990. The purpose of reconvening this committee would be to undertake the preparation of a guide for the application of the AS 3900/ISO 9000 series Standards to the Building, Engineering and Construction sector. It also recommended that, upon completion of the guide, AS 2990 should be withdrawn.

Standards Australia convened a meeting of QR/1 in July 1991 to consider the MTIA request. It also invited members of QR/1/1 to attend the meeting. The meeting, after considerable debate, decided to combine the two committees, QR/1 and QR/1/1, to prepare a single guide, based on the draft document which had been prepared by QR/1/1.

By combining the two committees, it was possible to obtain input from all sections of the Building, Construction and Project Industries. The 28 organisations who have had input to the new Guide are listed on the fly sheet of the document.

The meeting also decided to recommend to Standards Australia that AS 2990 should be progressively withdrawn in the same way as AS 1821 -1823 had undergone staged withdrawal.

Following further extensive debate by the combined committees at subsequent meetings, Standards Australia confirmed through its October 1991 TAS Journal that AS 2990 would be withdrawn by January 1995.

In January 1992, Standards Australia issued for public review the draft guide prepared by the combined committee, as DR 92003 **7**.

A large amount of comment was received and assessed by the combined committees and, where appropriate, incorporated into the final committee draft. After a postal ballot of members of the two committees had confirmed unanimous acceptance of the document. The Guide was published by Standards Australia in February 1993 as AS/NZS 3905.2 **8**.

Content of the Guide

The objective of the guide is to assist people working anywhere within the construction industry to understand and apply the quality systems detailed in the Australian/International/New Zealand Standards.

The guide is not intended to be light reading, something which can be quickly skimmed through from cover to cover. It deals in detail with the application of an unfamiliar set of requirements within a diverse and complex industry. It is intended to provide both an overall understanding of those requirements and a detailed reference for the practitioner who is specifying or implementing a quality system.

The Guide is divided into five sections as follows:

Section 1	Scope and General introduction
Section 2	Responsibilities and System se lection
Section 3	Quality System documentation
Section 4	Commentary on quality system requirements
Section 5	Specifying quality systems

Sectlon 1. Together with the foreword, this provides an outline of the foundations upon which the document is based. It describes the scope and application of the AS/NZS/ISO Standards which establish the parameters upon which the quality systems are based. It also provides a comprehensive list of definitions, which, although it adds a few pages to the document, saves the reader from having to continuously refer to other documents to ascertain the exact interpretation of terms which has been adopted for this guide. Where definitions used in other Standards, such as ISO 8402, have been adopted, this is indicated in brackets.

Section 2. This section addresses the responsibilities of both a purchaser and a supplier of products or services, with respect to quality. Although the Standards outline the responsibilities of suppliers only, within the construction industry it is imperative that both parties to a contract recognise and fulfil their roles in achieving a quality result.

Within this industry tangible products, intellectual material and services are provided and purchased in a complex arrangement of interacting contracts and subcontracts. This section provides guidance on the actions which a purchaser, such as a principal or head contractor, should take and the factors which must be considered when selecting an appropriate quality system for a contract.

Having selected the quality system, the purchaser is referred to Section 5 for detailed guidance on how to specify it in order to gain the maximum benefit for both parties.

It also provides guidance for a supplier of products or services on the selection of a quality system for its organisation, which is appropriate for third party certification.

A series of flow charts are provided to guide purchasers and suppliers through the complex process of selecting a suitable system.

Section 3. This describes the various documents, such as procedures, instructions, design and verification plans, inspection and test plans, and quality records, which are normally required for a quality system.

Section 4. Section 4 is the major part of the Guide. It is a self contained commentary on each of the 20 quality system elements referenced in AS 3901. It provides a comprehensive reference book for the application of the quality Standards to a wide range of organisations within the construction industry.

Not all of the 20 system elements are necessarily relevant to a particular organisation. A matrix is provided in Figure 4.1 to illustrate the degree of relevance of each system element to 12 of the major sectors within the industry. It can be seen from this matrix that only 10 of the system elements are usually required in all sectors of the industry.

These 10 system elements provide the basis of a quality system. A particular organisation may need to include one or more additional elements to ensure it has a conforming quality system which covers its operations. For example, a designer would need to add "Design Control".

Clause 4.0, the Introduction to Section 4, provides an explanation of the interpretations of the terms "product" and "service" which have been adopted in the Guide. It also provides guidance on how this Section should be applied to AS 3902/NZS 9002 and AS 3903/NZS 9003. It is important that the reader studies this Clause before proceeding to the detailed guide notes in the remainder of the Section.

From Clause 4.1 onwards, Section 4 is presented in landscape format to provide a side-by-side display of the text of AS 3901/NZS 9001 and guide notes on the way in which it should be interpreted generally and for each of the following sectors of the industry:

- Design services
- Construction and installation services
- Project services

Section 5. This final section of the Guide provides practical assistance to the practitioner who is writing the specification for quality systems in tender and contract documents. It provides a detailed check-list to ensure that no important aspect is overlooked, and standard clauses which can be used and if necessary adapted, to effectively specify the purchaser's requirements.

Appendices. The appendices to the guide provide information about third party certification and samples of typical Inspection and Test Plans and Quality Assurance Schedules. This information has been placed in the appendices, as it is not specifically referred to in AS 3901/NZS 9001 - AS 3903/NZS 9003.

Using the Gulde

How the Guide is used will depend upon the needs of the reader. A person who is unfamiliar with the concept of Quality Assurance should first study Sections 1 and 3. He or she should also read AS 3900/NZS 9000 and AS 3904/NZS 9004 - Parts 1 & 2.

A person wishing to select a suitable Standard upon which to base a corporate quality system should read Section 2 followed by Section 4 to obtain guidance on the relevance of each quality system element.

A person wishing to specify an appropriate complete quality system for a construction contract should first study Sections 2 and 3. Reference should then be made to Section 5 for guidance on suitable text for the specification of the quality system requirements. If they wish to specify a tailored quality system, they should refer to Section 4 to obtain guidance on the selection of specific quality system elements.

A person seeking information on third party certification should refer to Appendix A.

Summary

The Building and Construction Industry in Australia is being pressured to adopt a quality assurance philosophy for the delivery of projects, including services, to its customers. The Commonwealth Government, and most of the State governments have recently established either policies or regulations which set target dates for the implementation of suitable quality systems. These have caused many contractors concern and have lead to a demand for information on how to implement an acceptable quality system.

The Industry has clearly indicated that it does not want a new Australian Standard for such quality systems. It does however urgently require a suitable guide to help it apply the current International Standards.

This new guide, AS 3905.2, has been prepared in response to that request, by a joint committee of Standards Australia, comprised of representatives from a wide cross section of the Industry. It is a comprehensive commentary on the requirements of the Australian/New Zealand/ International Standards for quality systems, which will provide the industry with a uniform interpretation of those requirements.

It will also identify the most cost effective way of applying the Standards to the many and varied activities within the industry which are simply referred to in the title as "Construction".

One of the main objectives of the Guide is to provide a common language which, because it uses familiar terminology, can be readily understood by people throughout all parts of the Construction Industry. This must surely lead to better and more effective communication on all matters relating to quality.

References

1. Australian Department of Administrative Services, 1992, Quality Assurance Policy, Australian Office for Better Buying, AGPS, Canberra.
2. Roberts Richard, 1991, Masters Thesis, University of New South Wales, Sydney.
3. National Public Works Conference & National Building and Construction Council, 1990, No Dispute, Report by Joint Working Party of NPWC/NBCC, Canberra.
4. Standards Australia, 1987, AS 2990-1987, Quality systems for engineering and construction projects, North Sydney.
5. Standards Australia, 1987, North Sydney

AS 3900-1987,	Quality systems - Guide to selection and use
AS 3901-1987,	Quality systems for design/development, production, installation and servicing
AS 3902-1987,	Quality systems for production and installation
AS 3903-1987,	Quality systems for final inspection and test
AS 3904-1987,	Quality systems - Guide to quality management and quality system elements.

6. Standards Australia, 1990, DR 90192, quality management systems for the building and construction industries, Public Review Draft, November 1990.
7. Standards Australia, 1992, DR 92003, Guide to quality system Standards AS 3901, AS 3902, AS 3903 for construction, Public Review draft, January 1992.
8. Standards Australia, 1993, AS/NZS 3905.2, Guide to quality system Standards AS 3901/NZS 9001; AS 3902/NZS 9002; AS 3903/NZS 9003 for construction, North Sydney.

- **First presented at a Standards Australia seminar on quality assurance. The kind permissions of the author and Standards Australia to reproduce this paper are gratefully acknowledged.**