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Introduction to ISO 9000 Series

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PREFACE

Standards documents are an increasingly essential part of industrial operations and customer safety and satisfaction. For those involved in the supply of goods and services, in assuring the quality and safety of activities and operations, and in providing direction for future planning it is important that they be aware of standards provisions, use these provisions in their activities, and participate in the evolution of the standards that they use. In order to understand and appreciate the standards applied, it is essential to have a basic knowledge of the history of standards, an understanding of the standards development process, and an appreciation of the course of development that has been taken.

This course is intended to provide background information to show the foundation from which ISO quality standards were developed and to describe the early issues of ISO 9000 quality standards. The course is intended to be useful for those who –

- have recently become involved in using ISO 9000 documents and are interested in knowing how they came to be the way they are,
- are aware that they will soon become involved in the use of ISO 9000 documents and would like to have background information about their development, and
- are interested in a review of the standards development process as it relates to quality standards.

This course describes ISO 9000 quality standards produced up to the early 1990's. A second course will deal with the 1994 and 2000 standards and will comment on development of the next revision.

HISTORY of STANDARDS

People have employed standards since very early times. As used in this course, the term "standards" is used in the generic sense; in this sense a "standard" is perhaps best defined (by D. Reck) as "that which is set up as a unit of reference; a form, type, example, instance, or combination of conditions accepted as correct and perfect, and hence as a basis of comparison; a criterion established by custom, public opinion, or general consent; a model". The category of standards documents includes a number of conventions and more recently documents whose scope and approach are different, but which may be used in the context of standards.

Important early standards were languages; units of measure for length, volume, weight, and time. The exchange of labor and material goods such as wine, grain, oil, and fabric was facilitated by the use of agreed-upon conventions, measurements, or representations. Representations such as monetary values were frequently established by a ruling authority who had coins produced with a specified value (and often with the ruler's image). An example of the early recognition of standards importance was the provision included in the Magna Carta that was presented to King John by the English Barons in 1215. Article 35 of this historic document provided that "There shall be standard measures of wine, beer, and corn ----- throughout the whole of our kingdom ---".

These early standards were largely developed and used on a local or national basis. However, there were wider applications that did occur because of trading between localities or countries by means of ships and caravans. Military operations, too, caused the dispersal of locally-developed standards to new areas. In general fabrics, structures, tools, and other devices were produced by individual craftsmen and were not exactly uniform although they were, in many cases, consistent in pattern on a local basis. With the increase in the interaction of people and in technology development by the middle of the second millennium, there was a need for greater standardization.

The advent of the Industrial Revolution accelerated the need for coordination of local standards. In critical areas such as arms, railway equipment, and fire protection equipment, the situation became especially urgent because of the need for interchangeability of parts or connections. Important inventions involving the use of electricity also presented new demands for standards. Loss of life and property because of accidents with new technology led to a drive to establish standards that would provide protection and quality.

Quality of products and services has always been a principal concern. In the early days of trading, acceptable quality was generally decided by agreement (or resolution) between the giver and the receiver. With the wider extent of commerce and technology, some additional means of effecting acceptable quality became important. In the context of this course, "quality" refers to "The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs".

GROWTH of STANDARDS

In the United States, Eli Whitney's efforts early in the 19th century to effect production of standard musket parts using special machines was the beginning of national standardization in modern American industry. With the increase of engineering in technology, applications such as creating civil works, production of machinery, and developing use of electricity came the formation of engineering societies. Among the early efforts in these groups was the development of standards to effect product safety and quality. For instance the American Society of Mechanical Engineers (ASME) began working on standards for steam boilers because of numerous explosions that had occurred. This work led to the development of the ASME Boiler and Pressure Vessel Code.

On the international scene, groups concerned with the preparation of standards were formed in countries with industrial development such as Britain and Germany. Creation of the International Association for Testing Materials (IATM) in 1895 began a start of materials standards. The American Society for Testing Materials was the U. S. member of this group.

With the rapid increase in production and use of electricity in the latter part of the 19th century, the American Institute of Electrical Engineers began work in the U. S. on electrical standards. In 1904 at a meeting in St. Louis, MO, the International Electrical Congress (IEC) was formed. One of its subgroups would go on to develop international electrical standards.

In the early part of the 20th century then, many standards efforts were underway; in industrial countries such as the U. S as well as internationally. However, when World War One began in Europe, IATM ceased to function. But the demands of wartime made standards even more important. The AIEE had established a standards group in 1910 and in 1916 this group and other technical societies made efforts to set up a national standards body. On October 19, 1918 The American Engineering Standards Committee (AESC) was established. Work by this body met with success and after a few years of operation, its name was changed to the American Standards Association (ASA).

In 1926, the International Federation of the National Standardizing Associations (ISA) was set up to reestablish the voluntary standards movement on an international basis. Some 20 countries participated in this international cooperation; the ASA was the U. S. representative. War again intervened. With the advent of World War Two, various countries withdrew their membership so that by 1942 ISA had ceased to operate.

After WWII, establishment of the United Nations emphasized the importance of international cooperation. In October 1946, delegates from 25 countries met in London and successfully established a new International Standards Organization (ISO) and held its first provisional General Assembly. The ISO Constitution and Rules of Procedure were adopted by this General Assembly and its provisions began to be ratified by national standardization bodies.

NATIONAL STANDARDS ACTIVITY in the U. S.

In the U. S. after WWII, work on and use of standards began to increase substantially. Standards were found to have the utility characteristics described in Table I.

The work on standards documents was being done with the coordination of ASA which established a system of management boards and committees to oversee the development process. These groups were as shown in Table II.

Within these management boards and committees there were many subcommittees and working groups that did the actual work on standards documents. The individuals staffing these various Boards, Committees, Subcommittees, and Working Groups came as volunteers from technical societies, professional organizations, trade associations, companies, and agencies that had expertise in the subjects of the documents and possibly used the documents produced. The contribution on the part of these individuals and groups to the standards development process is substantial. First they make available a pool of technical expertise with varied backgrounds and specific interests. This helps assure more comprehensive and widely-acceptable standards. Secondly, the groups for which the individuals worked made an economic contribution by "donating" employee and clerical time and by helping to defray costs of communication, travel, and other expenses.

TABLE 1

The Utility of Standards; they can ••••••

1.Relegate problems already solved to the field of routine; leaving creative faculties free for new areas.

2.Provide a means of communications; a basis of understanding. In this way they can assist procurement and commerce.

3.Provide a degree of definiteness and precision for new methods; permit accurate results comparison.

4.Provide for the achievement of suitable quality and satisfactory performance in new designs.

5.Reduce the cost of design and of maintenance by use of developed, proven products and techniques.

6.Assist in the coordination of development by establishing methods and direction.

TABLE II
Standards Management Boards & Committees

A- Construction
B- Mechanical
C- Electrical and Electronics
D- Highway Traffic Safety
F- Food and Beverage*
G- Ferrous Metals and Metallurgy* (ASTM)
H- Nonferrous Metals and Metallurgy
J- Rubber* (ASTM)
K- Chemical
L- Textile
M- Mining
MC - Measurement and Control
MD - Medical Devices
MH - Materials Handling
N- Nuclear
O- Wood
P- Pulp and Paper
PH - Photography & Motion Pictures
S- Acoustics, Vibration, Mechanical Shock, & Sound Recording
SE - Security Equipment* (UL & NFPA)
W- Welding* (AWS)
X- Information Systems
Y- Drawing Systems
Z- Miscellaneous

*Approved procedures instead of Committees.

A significant change occurred in the name of the national standards coordinating group. In the 1960's there arose a concern that the ASA (American Standards Association) should have a name that more suitably related to the United States of America. Accordingly, in 1966, the name was changed to United States of America Standards Institute (USASI). However, it was soon found that this raised an international problem. People in other countries assumed that USASI was a governmental agency because of the United States of America in its name. To resolve this issue, the name was changed again, in 1969, to the American National Standards Institute (ANSI) which remains its name today.

It became apparent that various categories of standards-type documents would be most desirable and effective. The categories chosen (in the 1970's) were –

1. CODE - A system or collection of regulations or any systematic body of requirements relating to a particular subject and especially one given statutory force

2. CRITERION - A system of principles, rules, or requirements upon which judgments or decisions can be based

3. STANDARD - A prescribed set of conditions and requirements, usually in the form of a document, established by custom, general consent, or authority aimed at the promotion of optimum benefits and intended to satisfy recurring or anticipated needs

4. RECOMMENDED PRACTICE - A standards-type document comprising a procedure or method which includes a set of advocated conditions and requirements and which implies less authority than a standard

5. GUIDE - A document in which alternative approaches to good practice are suggested, but no clear-cut recommendations are made

6. SPECIFICATION - A document dealing with a product, material, or process indicating, wherever appropriate, the procedure by which the requirements given are satisfied. So far as practicable it is desired that the requirements be expressed numerically in terms of their appropriate units together with their limits.

The documents that were produced were “national consensus standards” meaning that they had achieved substantial agreement by concerned interests according to the judgment of a duly appointed authority. Consensus implies that –

-- all dissenting viewpoints have been considered and that an objective effort has been made toward their resolution, and

– substantial agreement means more than a simple majority, but not necessarily unanimity.

Of themselves, voluntary consensus standards have no force. They can, however, become forceful if they are applied by a governmental authority through a statute or by parties who agree to apply the standards through a contractual agreement. In this way they can establish minimum levels of safety, quality, or performance. The standards documents produced under the ANSI program are prepared and issued by the various groups or organizations, each of which has qualified as a standards developer using one or more of the three methods

sanctioned by ANSI for achieving national consensus. These three methods are –

A. Accredited Organization method - development by an organization whose procedures provide that the standards development activities result in standards which have the same degree of national consensus as those developed under the other methods approved by the Institute.

B. National Standards Committee method - development by a Committee formed to review standards prepared by non-accredited organizations, to develop consensus positions on these standards, and to perform, on areas within their scope, standards management functions. Each Committee shall have a secretariat and balanced representation of those who have interests in or concerns with the standards developed.

C. Canvass method - the review of a standard by members of a list developed by the sponsor organization and reviewed and approved by ANSI (the Staff and the appropriate Standards Management Board).

A generalized flow diagram of the standards development process for an accredited organization is shown in Figure 1.

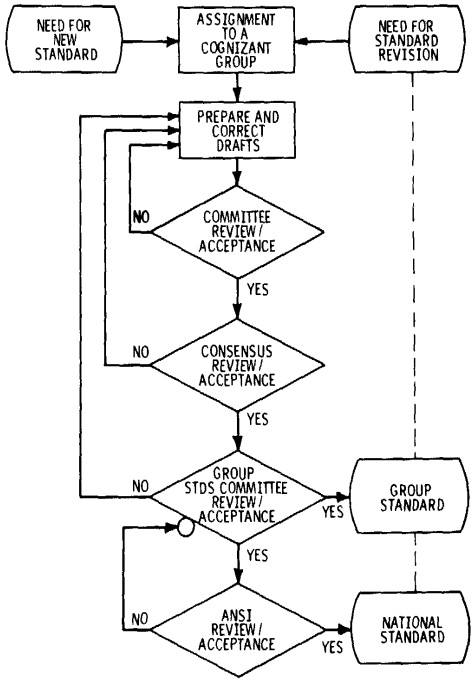

Figure 1

There are many steps in the process and producing the approved document may take a number of years. In the developer's operating procedure, it is important that there be –

- participation by all national interests concerned with the scope of the proposed document,
- balanced membership on each technical committee having potential concern with the specific project,
- consideration of all comments and objections to approval; response to the objections and reporting of the action taken,
- a supervisory body to see that the procedures are followed, and
- an appeal mechanism to hear appeals.

Because of changes and new developments in technology, it is important that standards documents be regularly updated. ANSI procedures require that a standard be revised or reaffirmed every five years. Time may be added if there is a valid reason for it. If a standard cannot be revised or reaffirmed, it should be withdrawn.

Another significant change to be noted, especially for those who wish to track a standards document's development history, is the change that has occurred in standards numbering. The national standards produced under the auspices of the National Management Boards and Committees had a number whose first letter was the letter assigned to that Board, e.g. ANSI C37.20-1969 Switchgear Assemblies Including Metal-Enclosed Bus. During the early 1970's, more of the standards began to be developed by technical organizations and the numbering practice shifted to a dual numbering system which presented both the developer's number for the group's standard and that of ANSI, e.g. IEEE 27-1974 (ANSI C37.20-1969) Switchgear

Assemblies Including Metal Enclosed Bus. This arrangement proved cumbersome and inconvenient and in 1977 the numbering procedure was amended to provide that the developer's number would be used, where available and appropriate, and would be preceded by ANSI, e.g. ANSI/IEEE C37.20-1969 (R1981) - Switchgear Assemblies Including Metal Enclosed Bus. Note that in this case the Standards Board letter (C) continued to be used. This practice was followed in numerous cases where the original document (and its number) was well known and used so that confusion would have arisen had the number been changed. An example of a number change to use the developer's number is ANSI/IEEE 446-1987 Emergency and Standby Power Systems for Industrial and Commercial Applications.

The quality of products and services had always been an important aspect of standards, but had generally been addressed within the documents that focused on the particular products or services. By the middle of the 20th century the need for separate documents focusing on quality became very great. The U. S. military especially had such a need. To fill this need, the Department of Defense prepared and issued a quality standard, MIL-Q-9858 in 1959. A related document, MIL-STD-109 provided a list of terms and definitions for quality applications. Another Federal Group, the Atomic Energy Commission's regulatory arm, (which later became the Nuclear Regulatory Commission) prepared a set of quality requirements that became part of the Code of Federal Regulations (CFR) in Title 10, Part 50. Appendix B. Consensus standards addressing these regulatory requirements were developed under the leadership of ASME and were instrumental in showing how those involved in building commercial, nuclear-powered electric plants should comply with the regulations. These regulatory and consensus documents provided a direction and an impetus for the development of standards that focused on quality.

By the latter part of the 20th century then, the standards development process in the U. S. had advanced, matured, and stabilized. Precedent had been set for the issuance of standards that dealt principally with quality issues. ANSI was established as the contact and coordinator for involvement in international standards work.

INTERNATIONAL STANDARDS ACTIVITY

The International Electrical Congress had started in 1904 with two committees. The first committee evolved into the International Committee on Weights and Measures (GPMU). The second committee evolved into the International Electrotechnical Commission (IEC) as it was concerned with standards for commercial electrical products. The IEC has continued to function without interruption because it is a specialized body serving a closely-integrated group of industries. While its work is performed principally by engineers from the more highly industrialized countries, the IEC also addresses the needs of underdeveloped countries. Its membership includes national committees from such countries; these committees provide information on their particular country's needs.

The International Standards Organization (ISO) began, as noted previously, in 1946 and is concerned with standards other than electrical. Its provisions were ratified by a number of National Standards Bodies (including ANSI for the U. S.) and these bodies became members of the new organization. For a country which did not have a National Standards Body, contact with ISO activities could be accomplished through a "correspondent member" status.
The object of ISO is to promote the development of standards in the world with a view to facilitating the international exchange of goods and services, and developing mutual cooperation in areas of intellectual, scientific, technological, and economic activity. The standards development work of ISO is carried out through its technical committees. In these committees, qualified representatives of industry, governmental bodies, international organizations, and research institutes are brought together to address international standardization concerns. The

detailed work of the technical committees is performed by subcommittees and working groups.

Outside the U. S. there were countries that saw the need for quality standards and had developed their own within their national standards systems. Examples were the British national standards for quality systems, BS 5750 and the Canadian national standards for quality systems CAN3-Z299. Differences, in terminology as well as in requirements, among the various national quality standards made for obvious difficulties in international commerce. And with the increasing globalization of markets, the situation was becoming more acute. It was recognized that the rapid increase in computer application and in world-wide communications also prompted the development of comprehensive quality standards.

INITIATION of INTERNATIONAL QUALITY STANDARDS WORK

ISO Technical Committee 176 (ISO/TC 176) was formed in 1979 to prepare quality documents that would be comprehensive in nature, would harmonize the requirements of the various existing national standards, would provide a framework for those wishing to develop quality plans and procedures, and would provide for the commercial and industrial needs of international trade. The 9000 series of numbers was assigned for the numbering of international quality standards. The Canadian Standards Council (SCC) was designated by the ISO Council to act as the Secretariat for TC 176. A Secretariat is responsible to the ISO Council for work done by a TC.

In planning its scope of work for quality documents, TC 176 had to –

- prepare to have provisions that would include the requirements of the various national quality documents presently in use,
- consider the various types of organizations, and their methods of operation, that would be using the international documents produced,
- establish agreed-upon quality terminology, and
- provide application guidance to assure a degree of uniformity in how the international quality standards were to be followed.

Once the scope of work was developed, appropriate Sub-Committees, Working Groups, and Task Groups were organized to implement the scope. Then the process of drafting documents, checking (verifying and validating) the results, balloting the drafts (more than one might have been required), and balloting of the final documents took place. During these balloting processes, it was necessary to consider and reconcile, insofar as possible, comments, recommendations, and objections.

Of prime importance was the establishment of agreed-upon terms and definitions. Common understanding of the provisions in other documents would depend upon this quality terminology.

ISSUANCE of the FIRST SET of INTERNATIONAL QUALITY STANDARDS

As the base for succeeding documents, International Standard ISO 8402 was issued in 1986. This document defined the basic and fundamental terms relating to quality concepts, as they apply to products and services, for the preparation of quality standards, and for mutual understanding in international communications. The focus of this document can be best expressed by quoting from the introduction in the Standard:

“This International Standard was developed by first screening existing quality standards and publications to determine the quality terms to be included and then by producing definitions. Many of the terms used in these publications have specific meanings and applications rather than the generic definitions found in dictionaries. Accordingly, it is intended that definitions contained in

this International Standard be used to improve communication and understanding. It was also found necessary to define certain general terms in order to clarify their usage in the quality field."

ISO 8402-1986 presented the definitions of 22 terms that are essential to the development and application of quality systems. As appropriate to international use and understanding, the terms and definitions were presented in English, French, and Russian; arranged in parallel columns to facilitate cross-checking and communications. Where appropriate, notes were included to add explanations and guidance for interpretation.

Following closely upon the issuance of the Standard on Terms and Definitions was the set of documents published in 1987. These documents were –

- ISO 9000:1987 - *Quality management and quality assurance standards – Guidelines for selection and use*
- ISO 9001:1987 - *Quality systems – Model for quality assurance in design/development, production, installation, and servicing*
- ISO 9002:1987 - *Quality systems – Model for quality assurance in production and installation*
- ISO 9003:1987 - *Quality systems – Model for quality assurance in final inspection and test*
- ISO 9004:1987 - *Quality management and quality system elements -- Guidelines*

The first of these documents, ISO 9000:1987, presented guidance for the selection and use of the various models for quality assurance. It also provided clarification for the distinctions and inter-relationships among the principal quality concepts such as the achievement and maintenance of an acceptable quality level, the development of an internal (for management) level of confidence in quality level achieved, and the establishment of an external (among customers) level of confidence in quality of products or services.

It was recognized that there were many types of organizational arrangements and product or service orientations that would use the quality documents. As an early note in ISO 9000:1987 stated "It is not the purpose of this series of International Standards (ISO 9000 to ISO 9004 inclusive) to standardize quality systems implemented by organizations." In other words, it was left to the organizations to determine which of the models (or what combination of them) would be appropriate for the particular organization and its operation.

The documents 9001, 9002, and 9003 presented the various models on which quality programs were to be based. As with other national and international standards, these documents in themselves had no force. However, if applied by contract or statute they could become obligations to be met. ISO 9001:1987 was the most comprehensive. Its intended application was "for use when conformance to specified requirements is to be assured by the supplier during several stages, which may include design/development, production, installation, and servicing." In contrast, ISO 9002 was "for use when conformance to specified requirements is to be assured by the supplier during production and installation" and ISO 9003 was "for use when conformance to specified requirements is to be assured by the supplier solely during final inspection and test." These models presented a series of quality elements, 20 in ISO 9001, on which compliance was based. 9002 and 9003 had fewer elements and some of the element requirements were not as stringent as those in 9001. In this way it was anticipated that all organizations could find a suitable set of requirements for the establishment of a quality system. These three models represented three distinct forms of functional or organizational capability and were intended to be suitable for contractual purposes between parties. ISO 9004 provided guidance on the selection and application of the quality elements. The quality elements for the 900N:1987 models are shown in Table III.

PREPARING A QUALITY PROGRAM

Using the information in ISO 9000:1987 as a guide, a first step was to establish a quality plan for the organization. Key aspects of this plan were the commitment, participation, and active support of all levels of management, the development of a quality policy by upper management, and the appointment of a management representative to participate in the quality system development. The next steps were to determine which model, or combination or elements, were suitable for the organization's operations and to proceed to develop documentation.

A quality system must be documented; it is done in a hierarchy. At the top level is the quality program document in which each of the model's elements (or the combination of elements chosen) is addressed. A brief statement indicated that the element applied and was being addressed in a procedure. If the elements in the model chosen did not apply, an explanation to that effect had to be made.

The next [lower] level of documents concerned the procedures; the detailed descriptions of how the organization's activities/processes were performed to meet the element's quality requirements. It was not the intent of the Standards to modify an activity or process unless such adjustment was necessary to achieve compliance with the element's quality requirement. Below the level of procedures were work instructions, drawings, and specifications that may be added to the program documentation if necessary for adequate description of operations. At the bottom of the hierarchy were the quality records. These records were essential in providing objective evidence that the quality requirements of the established system were met.

Special emphasis needed to be made in the organization in training of their members in knowledge of and compliance with the quality system adopted. Another important function was in the development of an internal audit arrangement. In order to assure that quality procedures were being followed and the quality policy was being implemented, it was essential to review application of the procedures, work instructions, and records preparation & retention on a periodic basis. This was accomplished by teams of selected members of the organization who usually would review the performance of a portion of the organization's operations in a given audit. Members of the audit teams would be changed to enlarge the list of qualified auditors and to broaden the quality knowledge within the organization. By establishing a plan for performing audits on a regular basis, changing the membership of audit teams, and acting upon the audit findings it was possible to increase the quality consciousness of the entire organization.

Once an organization's quality system was in place and performing satisfactorily, it was important to inform the customers or clients in order to increase consumer confidence in the products or services offered. This was customarily done by becoming certified. Certification was achieved by having an approved third party assess the organization's quality system and performance. When the quality system was judged to be suitable (and any deficiencies were corrected) the organization was added to the list of certified organizations. To maintain this qualified status, it was necessary to be recertified after a period of three years.

This 1987 set of documents enabled companies and organizations to develop quality programs and to become certified. International quality standardization was underway.

Table III ISO 900N:1987 Quality System Elements - Cross Reference List				
element		Corresponding Clause No.		
		ISO 9001	ISO 9002	ISO 9003
Management responsibility		4.1 X	4.1 Y	4.1 Z
Quality system principles		4.2 X	4.2 X	4.2 Y
Quality in marketing (contract review)		4.3 X	4.3 X	---
Quality in specification and design (design control)		4.4 X	---	---
Quality documentation and records (document control)		4.5 X	4.4 X	4.3 Y
Quality in procurement (Purchasing)		4.6 X	4.5 X	---
Purchaser supplied product		4.7 X	4.6 X	---
Material control & traceability (product identification & traceability)		4.8 X	4.7 X	4.4 Y
Quality in production (process control)		4.9 X	4.8 X	---
Product verification (inspection & testing)		4.10 X	4.9 X	4.5 Y
Control of measuring & test equipment (inspection equipment)		4.11 X	4.10 X	4.6 Y
Control of verification status (inspection & test status)		4.12 X	4.11 X	4.7 Y
Nonconformity (control of nonconforming product)		4.13 X	4.12 X	4.8 Y
Corrective action		4.14 X	4.13 X	---
Handling & post-production functions (handling, storage, packaging & delivery)		4.15 X	4.14 X	4.9 Y
Quality records		4.16 X	4.15 X	4.10 Y
Auditing the quality system (internally)		4.17 X	4.16 Y	---
Personnel (training)		4.18 X	4.17 Y	4.11 Z
After-sales servicing		4.19 X	---	---
Use of statistical methods (statistical techniques)		4.20 X	4.18 X	4.12 Y

Key
X – full requirement
Y – less stringent than ISO 9001
Z – less stringent than ISO 9002
— - element not present

CONTINUED DEVELOPMENT of QUALITY STANDARDS

During the development of the standards published in 1987, it was apparent that numerous other issues needed to be addressed promptly. As previously noted, internal auditing of the quality system was of prime importance to assure proper functioning and corrective action if problems were found. Work on a separate document related to internal auditing resulted in the issuance of ISO 10011-1:1990 - *Guidelines for auditing quality systems - Auditing*. (ISO had also reserved the 10,000 series numbers for ISO/TC 176 use.) Because of the importance of the auditing effort, two other guidelines related to auditing quality systems were produced. These were ISO 10011-2:1991 - *Qualification criteria for quality system auditors* and ISO 10011-3:1991 - *Management of audit programs*.

Another concern was that, as written, 9001, 2, & 3 did not provide well for suppliers of services. Work on a services-oriented document was initiated and ISO 9004-2:1991 was issued to provide *Guidelines for Services in quality management and quality system elements*. Also, it was recognized that the validity of the measuring equipment used to verify compliance of product with requirements needed special attention. To address this need, ISO 10012-1:1992 - *Metrological confirmation for measuring equipment* was prepared and issued.

These additional documents produced in the early 1990's strengthened the quality system documentation. More and more groups saw the advantage of using the International quality system in global commerce and developed their quality systems accordingly.

Also, in preparation of the 1987 series of documents it was noted that many improvements could be made. An Ad Hoc Task Force was created and commissioned to prepare a strategic plan for ISO 9000 series architecture, numbering, and implementation. The Task Force's report became known as "Vision 2000" and it presented objectives for continued development in the quality field. Work in many areas was underway and substantial revisions to the basic standards would appear in the forthcoming 1994 revisions.