

# Guide for Concrete Construction Quality Systems in Conformance with ISO 9001

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Additional recognition to C. Raymond Hays, who led the subcommittee that developed this document, Lawrence G. Mrazek, who actively participated, and Anthony R. Ameruso, posthumously, for his work on the committee.

*ACI Committee 121 developed this manual to provide ISO 9001:2000-based quality management system requirements and guidance to the concrete construction industry. Discussion is offered for each clause of the ISO 9001:2000, providing advice and construction-specific information that can be used as a reference to either produce a new quality management system compliant with ISO 9001:2000, or to upgrade an ISO 9001:1994 or other quality management system to meet the ISO 9001:2000 requirements.*

*Appendix A, "Model Quality Management System Manual for Designers, Construction Managers, and Constructors," is based on the "NYC MTA Bridges and Tunnels, Engineering and Construction Department," and is recommended for use as a template for any company beginning to write a quality manual.*

**Keywords:** quality assurance; quality control; procedures.

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Reference to this document shall not be made in contract documents. If items found in this document are desired by the Architect/Engineer to be a part of the contract documents, they shall be restated in mandatory language for incorporation by the Architect/Engineer.

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This manual has been developed to address quality management for design and construction, with particular emphasis on concrete construction. It is based on the requirements of the ISO 9001:2000, “Quality Management Systems—Requirements,” which is referred to herein as ISO 9001:2000 or the “Standard.”

As an internal advantage, basing the quality management system on the Standard brings the concept of process management to the forefront of an organization. Rather than using the production control methods as an end in themselves, the organization uses them as tools and measures of process effectiveness, aids to continual improvement, elements of employee involvement, and indicators of customer satisfaction.

As an external advantage, the ISO 9001:2000 has international recognition. Compliance with the Standard has become a necessity for conducting business internationally and, more recently, in the United States. Because it places the responsibility for quality management on the vendor, those in compliance are seen as well-managed organizations with methods of quality management that can be assessed against a recognized standard. International and U.S. government agencies and private companies are requiring

International Organization for Standardization (ISO) compliance or sometimes registration to conform to contract requirements or to become a preferred vendor.

Review of this publication and assessment of an organization’s quality management system may indicate that many of the requirements of the Standard are already in place. Therefore, the objective should not be to reinvent the organization’s quality management system in the image of the Standard, but rather to conduct a gap analysis to determine where compliance is already in place and in what areas it is weak or lacking.

**ISO history**

In the 1920s, statistical theory began to take shape and the first control chart was developed by Walter Shewart at Bell Labs for use in production. It was the first use of a formalized quality control technique. Out of this grew an approach to manufacturing that expanded after World War II. Inspectors had been a specialized function in production facilities since World War I, but the emphasis was on avoidance of the defects without a statistical basis.

In the 1950s, W. Edward Deming and Joseph Juran were invited to Japan by General McArthur to bring new life to a damaged industry by teaching a total management approach to production. By the beginning of the 1960s, the phrase “made in Japan” took on a new meaning, and the West began to follow suit.

Throughout the 1950s, manufacturing developed in the West without a formal quality management standard. In 1959, the United States developed MIL-Q-9858, “Quality Program Requirements,” for military procurement (U.S. Department of Defense 1959). Following this, NASA developed “Quality System Provisions for Space System Contractors” (NPC 200-2) in 1962, and NATO adopted the Allied Quality Assurance Publications for procurement of equipment in 1968 (NATO 1968).

Throughout the 1960s, various systems of quality assurance were required of the manufacturers in the United Kingdom and Canada. In 1971, to standardize the systems, the British Standards Institute (BSI) published the first UK standard for quality assurance. This was followed in 1974 by BS 5179 (British Standards Institute 1974). These publications placed the responsibility of quality management in the hands of the third-party inspection.

In 1979, after meetings and agreements with key industry bodies, the British Standards Institute published BS 5750. Key industry bodies agreed to drop their own standards and use BS 5750 as a common contractual document. Process improvement was not addressed; only production control was addressed. The requirements were enforced by audit. The BS 5750 carried the core 20 elements that would form the backbone of ISO 9000:1987, and were continued into the ISO 9000:1994 series.

ISO was originally created in 1947 to facilitate world trade. Its emphasis up to the late 1970s had been on technical standards, engineering practices, and manufacturing. The development of quality management and increasing international trade led to the need for an international standard, which was pursued by ISO Committee TC176.