ISO 9000 A USEFUL QUALITY STANDARD FOR THE ASPHALT INDUSTRY

DELMAR R. SALOMON, Ph.D.
Idaho Asphalt Supply, Inc.
Technical & Quality Director
800 N. Sugar Avenue
Nampa, Idaho, 83687 USA

Summary:

Conformance to customers' requirements is a tenet of quality systems. Requirements are industry specific and can be standardized for quality systems. *Ad hoc* quality practices are non-standardized and in many cases lead to inconsistencies and costly operations.

It is proposed the asphalt industry considers the ISO 9001 quality standard applicable to agencies, contractors and asphalt suppliers. In this way the core issue of quality would be targeted through standardization of quality assurance practices. The usefulness of the ISO 9001-quality standard would reduce traditional costly practices of state agencies and their suppliers. ISO 9001-quality standard will be compared with existing QC/QA, AASHTO's PP26, and R-18 programs.

Keywords: ISO 9001, Quality Management System, Customer, Supplier, Contractor, Subcontractor, SHRP.

I. Introduction

Meeting customers' requirements is a fundamental tenet of any quality management system. How requirements are met in a specific industry is determined by business practices. Where standard quality models do not exist industries agree on some type of *ad hoc* quality practices to improve product. Non-standard quality practices lead to product inconsistencies and costly operations for both suppliers and customers.

The asphalt industry not unlike other industries is undergoing major cultural change in technical specifications and quality requirements. Technical specifications, described in the Strategic Highway Research Program (SHRP), are now being implemented in the non-emulsion sector of the industry and in most cases clearly defined. On the other hand, quality requirements are not clearly defined or standardized and differ among state agencies. Presently there are two versions of the AASHTO PP26-97 *Standard Practice for Certifying Suppliers of Performance Graded Asphalt Binders* document, that of the Rocky Mountain Asphalt User Producer Group (RMAUPG) and the Pacific Coast Conference Asphalt User Producer Group (PCCAUPG). Quality Control/Quality Assurance (QC/QA) programs are in place, but no truly standard quality model exists. In many cases quality requirements take the form of the traditional quality control inspection-oriented approach.

The final product, a highway, consists of many activities, such as obtaining the right asphalt and aggregate for the job, product delivery, translating laboratory mix design to field applications, and so on. A demanding public, the ultimate customer, is requiring smooth roads, less maintenance, less down time on highway building. Each organization has 'their way' of conducting business that results in conflicts, delays, and monetary losses.

It is proposed that the asphalt industry consider the ISO 9001 quality standard as a more comprehensive quality management system model, applicable to agencies, contractors and asphalt suppliers. Standardization would address quality assurance practices and reduce costly traditional practices of state agencies and their suppliers. In this way the core issue of quality would be targeted: meeting the public requirements, addressing product nonconformance, and implementing continuous improvement quality processes. The applicability of the ISO 9001 quality standard in the asphalt industry is discussed in relation to existing QC/QA, and AASHTO's standard practice PP26, and R-18 programs.

II. Definitions and Terminology

Accepted definitions for quality management systems applicable to the discussion in this paper is used to map sections of AASHTO PP 26 document to ISO 9001 requirements.
Customer - is a recipient of a product provided by the supplier; for a contractual situation the customer is the purchaser.
Supplier - is one who provides a product to the customer; for a contractual situation the supplier is the contractor.
Subcontractor - is one who provides a product to the supplier.
Quality Management System - is the organizational structure, procedures, processes, and resources needed to implement quality management.

The schematic below illustrates the relationship of core players in this quality system model. The agency is the customer and by contractual agreement the supplier is the contractor. The oil supplier is now the subcontractor.

This quality assurance model requires that the contractor be an integral part of any quality system discussion. Discussed in the next section is the state-of-the-art quality in the industry, and the quality management system adopted in other industries.

III. State of the Practice of Quality in the Paving Industry

New quality requirements have placed tremendous pressures on state agencies to change and implement quality assurance procedures. These quality demands become the new requirements that state agencies must translate to contractors, the highway builders. These demands are downflowed from contractors to paving asphalt suppliers and other material and service suppliers. Each state has their own special requirements that contractors and asphalt suppliers must comply with. This push for higher quality has manifested itself in the form of various ***ad hoc*** quality control practices and has resulted in a proliferation of quality control plans. For example, the Rocky Mountain Asphalt User Producer Group (RMAUPG) subscribes to some of the guidelines outlined in AASHTO PP26 *Standard Practice for Certifying Suppliers of Performance Graded Asphalt Binders.* This document addresses only paving asphalts. Utah DOT, a member of RMAUPG, has a separate Quality Management plan for emulsions. The Pacific Coast Conference Asphalt User Producer Group (PCCAUPG) does not subscribe to all the guidelines in AASHTO PP26 and has proposed changes to these guidelines different from those proposed by the RMAUPG.

There are attempts to consolidate these regional documents, however no particular Quality Assurance model is being followed. Other User Producer groups are in the same dilemma and have proposed their own guidelines. At times the discussion on what quality procedures to use overshadows the fundamental tenet of quality: meeting and fulfilling requirements through a quality system that projects confidence and reliability of its products to customers.

IV. A Quality Assurance Model: ISO 9001

Their is a generic quality management system standard that we propose would simplify and standardize quality practices and bring standardization to the asphalt industry as a whole. The International Organization for Standardization has a set of Quality Assurance Models that should be reviewed by the industry since it brings into play quality assurance management system that encompasses all quality practices. These standards are denoted as ISO 9001, ISO 9002, and ISO 9003, where the prefix ISO is derived from the Greek word *isos* meaning equal. It is likely that in the year 2000 we will have one Quality Management System standard, ISO 9001. Compared below is the standard AASHTO PP 26 document with the ISO 9001 standard document. Comparison includes relationship of ISO requirements with the AMRL laboratory accreditation (AASHTO Designation: R18) document, *Establishing and Implementing A Quality System for Construction Materials Testing Laboratories*. This latter document is not unlike the ISO Guide 25, *General Requirements for the Competence of Calibration and Testing Laboratories.*

V. State of the Practice: ISO 9000 in other Industries

The ISO standard origins and evolution have been discussed widely in numerous sources. The American National Standards Institute (ANSI) is a member of ISO. In 1987 the first set of ISO standards were published. Specifically the ISO 9001 Quality Assurance model, outlines generic quality requirements that address different aspects of Quality Management:

- Management Responsibility
- Contract Review
- Purchasing
- Product Identification
- Process Control and Measurements
- Test Equipment and Calibration
- Control of Nonconforming Product
- Corrective and Preventive Action
- Product Handling
- Quality Audits
- Design Control
- Training

The Big Three, Chrysler, Ford, and General Motors adopted the ISO 9000 standards adding their particular requirements and denoted the standard as QS-9000. First-tier suppliers to any of these automotive companies must be QS-9000 accredited. In the past these automotive companies would spend an inordinate amount of time auditing their

suppliers to assure that their requirements were being met. Standardization has reduced the cost of business and improved the quality of products offered to customers.

Another important ISO standard is the environmental quality management system, ISO 14000 that addresses all aspects of environmental quality at manufacturing facilities. The aerospace industry used the ISO 9000 quality model to develop their standard AS9000. Similarly, workplace conditions are now using the ISO 9000 model to design their standard SA8000. Service industries such as hospitals have adopted the ISO quality model to increase their productivity and improved service to the public. Over 200,000 organizations worldwide are using the ISO 9000 Quality Management System as a way of doing business and improving the quality of the product delivered to their customers.

VI. Comparison of ISO 9001 and AASHTO PP26 Requirements

Table 1 is a mapping of ISO 9001 requirements with sections in AASHTO PP 26 and R-18. The numbering corresponds to the respective sections in each document. The AASHTO R-18 laboratory sections are included in the Table since this is another AASHTO document that could be consolidated in a quality management system standard.

Table 1

ISO 9001 Requirements	AASHTO PP 26 corresponding sections	R-18
4.1 Management Responsibility	**Not addressed**	**3.3**
4.2 Quality System	**Not addressed**	**3.3, 5.1, 5.3**
4.3 Contract Review	**Not addressed**	**Not addressed**
4.4 Design Control	**Not addressed**	**Not addressed**
4.5 Document and Data Control	**Not addressed**	**5.1**
4.6 Purchasing	**Not addressed/ briefly 9.2**	**6.8**
4.7 Control of Customer-Supplied Product	**Not applicable**	**Not applicable**
4.8 Product Identification and Traceability	**11.3**	**6.5**
4.9 Process Control	**9.6 Special Processes**	**Not addressed**
4.10 Inspection & Testing	**9.3**	**Not addressed**
4.11 Control of Inspection, Measuring, and Test Equipment	**Not addressed**	**5.4**
4.12 Inspection & Test Status	**9.2, 9.3**	**Not addressed**
4.13 Control of Nonconforming Product	**9.2, 11.4**	**6.6**
4.14 Corrective & Preventive Action	**13.5 (corrective only)**	**6.6**
4.15 Handling, Storage, Packaging, Preservation, Delivery	**9.5, 11.3**	**Not addressed**
4.16 Control of Quality Records	**9.5**	**5.6, 5.7, 5.8**
4.17 Internal Quality Audits	**Not addressed**	**6.7**
4.18 Training	**Not addressed**	**5.9, 6.2.4, 6.2.5, 6.2.6**
4.19 Servicing	**Not applicable**	**Not applicable**
4.20 Statistical Techniques	**Not addressed**	**Not addressed**

The sections on Control of Customer-Supplied Product (4.7) and Servicing (4.19) are not considered applicable to the asphalt industry as it now operates. If warranty roads become a practice in the industry then Servicing (4.19) would become an integral part of the quality system. The design Control (4.4) could in principle encompass mix design where the supplier (contractor) is directly responsible for the mix design.

The AASHTO PP26 as indicated above does not address any activity related to the management of a quality system. A quality system is needed as a basis to verify fulfillment of complex work processes of suppliers and subcontractors. Any quality system projects confidence and reliability to customers in an effective manner and avoids the bad faith and suspicion that sometimes plague the industry.

The AASHTO R-18 does address some of the quality management and quality system issues related to the ISO 9001 quality standard. We have compared R-18 to the ISO Guide 25 for testing laboratories. AASHTO may now assess and accredit bituminous laboratories according to the requirements of ISO Guide 25.

VII. Conclusions

Standardization of quality practices is needed in the asphalt industry to reduce operating costs of agencies, suppliers, and subcontractors. Adopting a quality assurance model like the ISO 9001 standard would clearly define and identify accountability in quality practices. The new technical requirements, defined in SHRP, can be an integral part of the proposed quality assurance model. This approach would contribute to the delivery of a high performance road.

To achieve this goal of quality system standardization leadership in quality management must be the order of the day, throughout organizations in the asphalt industry. The first step in this direction is to align and expand the AASHTO PP26 guidelines and R-18 requirements with the ISO 9001 quality assurance model as shown above. Any special requirements of the industry would be added similarly to what the automotive industry accomplished with QS-9000. This quality management system for the paving asphalt industry based on the ISO 9000 quality model could be called PQS-9000 (Paving Quality System-9000). The ultimate benefits will be a delighted public and improved roads as a consequence of quality management standards implemented at all levels in agencies, contractors, and paving asphalt organizations.

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