In today’s economic times, with federal and state budget shortfalls, the public sector is challenged to continue to provide high quality projects to its customers and stakeholders. The high demand for public accountability cries out for efficient processes, consistently deployed, that generate continual improvement. Implementation of a Quality Management System is a proven method to allow public transportation agencies to fulfill these expectations and demands consistently.

In 2008, RKI set out to establish a Quality Management System in compliance with ISO 9001. In the years since, we’ve made continual improvement to our documented processes based upon customer feedback, internal recommendations, results of audits and changing business needs. Our employees have grown in their understanding of the impact and import of their activities on customer satisfaction. As our system has matured, we continue to receive customer satisfaction ratings that exceed expectations.

The term Quality Management System (QMS) refers collectively to the series of inter-related processes intended to manage the planning, design and construction activities necessary to deliver projects. The QMS serves as the vehicle to communicate and ensure understanding of the contractual requirements and the processes to be followed for successful project delivery.

ISO (International Organization for Standardization) is a global network that identifies, develops and delivers international standards required by business, government and society. (http://www.iso.org)

ISO 9001, the standard defining Requirements for Quality Management Systems, serves as the basis for a majority of quality management systems. The ISO 9001 standard provides sound and flexible baseline quality requirements intended to achieve predictable outcomes, and consistent customer satisfaction in the execution of projects. A QMS based on the ISO 9001 standard is much more than an incidental focus on meeting customer requirements; it is an intentional and structured approach to exceeding customer requirements.

Quality management systems structured around ISO 9001 requirements are based upon the following eight quality management principles (International Organization for Standardization):

- **Customer Focus**
Customer focus begins with a commitment by top management to meet and exceed the requirements of its customers; an acknowledgement that above all else, the “customer is king.” This focus is more than a mere statement; it becomes a way of life. Such is the case with the RKI QMS. Our Chief Operating Officer frequently and emphatically expresses, to all levels of the organization, the importance of exceeding our customer’s expectations. This is exemplified in our Quality Policy which states our commitment to the success of our customers through personal responsibility. Our QMS is designed such that in each and every transaction, our employees remain focused on doing it right the first time, to the delight of our customers. Additionally, as part of our internal audits, employees are routinely asked to describe how their day-to-day activities result in the success of our customers.

The RKI QMS includes periodic customer satisfaction surveys conducted by the Project Manager (PM) as well as a member of our Corporate Management Team. The purpose of these periodic surveys is to document and proactively address any potential issues of dissatisfaction. In other words, we don’t wait for our customers to report a problem; we query our customers in advance. One such survey with a toll authority customer highlighted the customer’s need to have electronic, searchable access to project data well after project conclusion. RKI responded and has begun work on a data migration vehicle to meet this need upon project closeout.

- **Leadership**

  Leadership involves establishing unity of purpose and providing a vision for the organization, such that all employees are striving in the same direction. A QMS based upon ISO 9001 requirements places the responsibility and authority for leadership clearly upon executive management.

  Establishing unity and direction begins with top management defining and then committing to a quality policy (a “Golden Rule”) which then sets the framework for the establishment of quality objectives. The key to a successful QMS is ensuring that both the policy and the objectives are easily understood by everyone involved and continually reinforced by top management. Once overall quality objectives are defined; then they should be converted into more focused and measurable objectives, relevant to each department or function.
This all seems fairly elementary, but it’s surprising how many times in an organization employees make decisions or take actions, that in a vacuum seem right, but wind up being contradictory to the overall goal of the organization. RKI used to suffer from this as well, but not anymore. Our Corporate Management Team has established a quality policy and quality objectives for the organization through the strategic planning process. These objectives have been communicated and deployed down through the organization such that each employee can relate their own actions to the achievement of those objectives. Employees are able to use the policy and the objectives as a measuring stick when decisions are necessary. On specific projects, performance objectives are defined, based on customer requirements and expectations, and communicated to the project team. RKI PMs make regular reports to our customers, project team members and the RKI Corporate Management Team on project performance against those objectives. This makes it clear to everyone, including the lowest level employee contributing to the project, how we’re doing and what changes if any need to be made.

On a recent fast moving design-build project, RKI had a requirement to complete, review, approve and transmit daily inspection reports to the customer within 48 hours. By tracking and reporting actual cycle time, the team was able to pinpoint bottlenecks, and take corrective actions. Since the PM regularly reports these metrics to the customer, as well as the team, it keeps the team on track and has promoted a healthy internal competition; spurring on continual improvement.

RKI has also gained considerable customer confidence due to the appropriate assignment of roles and responsibilities. On a majority of our design-build projects, RKI has been granted engineering judgment delegation on behalf of the owner. This means that engineering decisions can be handled by RKI, keeping the project moving while maintaining transparency and traceability in all project records.

- **Involvement of People**

  Historically, the public sector has suffered from inefficiencies associated with limiting employees to those activities specifically listed within their job descriptions. Not only does this silo approach result in inefficiencies, it can also lead to a loss in creative thinking and teamwork that is so vital to rapid improvement.
RKI utilizes talented internal resources and customers to define best practices for our QMS. This involvement has resulted in essential buy-in, commitment and empowerment. RKI employees own the procedures and they have the power and freedom to change them to achieve continual improvement and enhanced customer satisfaction.

A recent example involved the use of key RKI resources to make enhancements to our web-based project management software to support iPad use in the field. This project has resulted in real time access anytime, anywhere to project data, plans, specs, nonconformances and other relevant information to enable critical decision making in the field at a pace that supports construction.

Another successful example of involvement of people lies in the partnering activities that exist on many of our design-build projects. These partnering sessions involve qualified representatives of the owner, stakeholders, contractor, designer, and the quality assurance firm (RKI). Best practices for the project, enabling the fulfillment of safety, quality, and stakeholder objectives, are determined by these highly talented committed individuals. On the Utah I-15 CORE design-build project, partnering has been cited as one of the keys to project success, specifically, the willingness of these individuals to put their own agendas aside and work together for the benefit of the project.

- **Process Approach**

Thinking about any series of business processes, where do the problems occur? Generally the problems don’t occur within the defined activity, but rather problems occur during the “hand-off” from one activity to the next. To ensure that these “hand-off” problems don’t occur, the QMS should be designed using the process approach. This means that the QMS is based upon a series of processes, the output of one process serving as the input to the next process.

RKI uses the process approach to develop the QMS on our projects. We collectively determine the best practices necessary to execute our services, as well as the services of others, and we depict them in linear flowcharts so we can easily see the termination of one process and the start of another. This allows us to identify the necessary inputs to successive processes and make sure the outputs of the previous process meet those needs. This also allows us to make sure processes are properly sequenced to ensure
necessary steps aren’t skipped, and that required project records are developed along the way.

For example, on a recent design-build project, utilizing the process approach allowed our team to identify potential bottlenecks and delays in the resolution of nonconformances. Working with the owner and the design-build contractor, RKI instituted a proactive construction deficiency process. This process facilitates the earliest handling of potential nonconformances at the lowest level possible. In this way, issues are corrected before they become true nonconformances, eliminating the need for costly and time consuming approvals.

- **Systems Approach to Management**

To achieve a satisfied and confident external customer, as well as satisfied internal customers, the ISO 9001 standard specifies the use of a systems approach. The systems approach involves looking at the QMS as a whole and managing it as such, rather than discrete management of the individual processes. This approach serves to ensure that all employees are “rowing in the same direction” and have a role-specific understanding of the customer requirements and the overall objectives of the organization.

RKI takes a systems approach to the management of services on projects. Our QMS requires that following a detailed project requirements review and establishment of necessary processes, the PM holds a project kick-off meeting. This meeting, chaired by the PM is attended by RKI team members and any subconsultants. The purpose of this kick-off meeting is for the PM to orient the team to the project requirements, customer expectations, and performance objectives associated with the project. During a project kick-off meeting, during the review of contract requirements, team members were able to identify a way to automate, through the use of software, the verification of technician certification. RKI was then able to provide a traceable record of technician qualification status at the time the test was performed, meeting federal oversight requirements with no additional labor cost.

- **Continual Improvement**

One of the most valuable results of the implementation of a QMS in accordance with ISO 9001 requirements is continual improvement. Almost every organization establishes continual improvement as a goal or objective, but without mechanisms to ensure that
continual improvement efforts are conceived, tracked, and verified; real continual improvement is impossible to sustain. ISO 9001 requirements dictate that a QMS addresses corrective and preventive action at the system level to ensure that root causes are identified, and that actions are taken sufficient to prevent recurrence. ISO 9001 also requires a follow-up verification to ensure that these actions are proven effective to eliminate the issue. Today most organizations don’t have time to solve issues once, let alone multiple times, so identifying the root cause, addressing that cause instead of a symptom, and verifying effectiveness are paramount.

RKI has within its corporate QMS a documented process for continual improvement. This process requires that as nonconforming or potentially nonconforming issues are discovered, they are documented and issued to the responsible party for the determination of the root cause and the development of an action plan to prevent recurrence. Once the action is taken, independent verification based on objective data is performed by the Quality Manager and issues are not closed out until successful verification is achieved. The status of continual improvement activities is reported at quarterly management review meetings. In addition, RKI PMs report on the status of continual improvement activities to customers during customer satisfaction surveys to keep customers informed of progress and the impact of these actions.

One such continual improvement activity resulted in the RKI QA team inserting punch list items directly into the Released For Construction plan documents. Rather than just operating off a typical punch list, the contractor and the QA firm were then able to pull up the drawings on remote devices in the field and easily identify the location and exact details of punch list items. This facilitated a much quicker and more accurate closeout process.

- **Factual Approach to Decision Making**

  An ISO 9001 compliant QMS facilitates and reinforces decisions based upon facts rather than perception. The QMS requires periodic assessment by executive management of actual data such as results of audits, status of corrective and preventive actions, customer satisfaction, and compliance of services with contract requirements.

  The RKI QMS requires quarterly management review meetings which are attended by PMs and the Corporate Management Team. During these meetings, we review customer satisfaction data, response to and implementation of corrective or preventive actions
(continual improvement), audit findings, upcoming changes and recommendations for improvement. These reviews are also conducted on projects with management representatives of the customer to ensure project decisions are made based upon objective data.

On another design-build project in which RKI is serving as the Owner Verification firm, RKI leads the way in immediate real time investigation of the causes of non-validation in test results. Rather than waiting until the end of the statistical validation period, RKI analyzes material test results daily to identify potential instances of non-validation immediately. Through immediate investigation, and analysis of the facts, the team has been able to identify and correct root causes of non-validation before the statistical results are documented. These proactive efforts have consistently resulted in the achievement and maintenance of statistical validation on over 92% of material categories used in construction, maintaining critical federal funding to the project.

- **Mutually Beneficial Relationships**

  With budget cuts and reduced headcount, many organizations, both in the public and private sectors are placing an increasing reliance on multiple contractors, consultants and inter-agency support to accomplish projects. In this environment, it is essential to have an established QMS which clearly documents roles, responsibilities and acceptance criteria of the varied processes involved. Without a documented system, in many cases, the various consultants end up duplicating efforts, or even worse, missing critical responsibilities leaving the agency in a position of over paying and under receiving.

  RKI assisted the North Texas Tollway Authority (NTTA) with the development and deployment of portions of the NTTA’s ISO 9001 compliant QMS (North Texas Tollway Authority, 2008). This QMS was deployed so the NTTA could successfully manage the work of multiple consultants and contractors providing planning, design and construction on 9 corridors in the DFW Metroplex. The QMS has been essential to allowing the NTTA to deliver these projects to the traveling public within budget and on schedule, while at the same time meeting the diverse needs of the stakeholders. The QMS has empowered the consultants and contractors to execute their contracted services through clearly defined processes, allowing decisions to be made at the lowest appropriate management level. This has contributed to faster project delivery and minimized claims.
The successful implementation of a QMS is critically important in design-build projects where the contractor is typically making acceptance decisions on behalf of the owner. While alternative project delivery methods transfer risk, they also minimize the owner’s control. Therefore, to ensure design-build projects meet the owner’s operations and maintenance requirements, the RKI recommendation is always to execute these projects within a defined and documented QMS, using the ISO 9001 requirements as its base.

ISO 9001 compliant and certified QMS’ are being utilized within a variety of Departments of Transportation (DOT), Toll Authorities, Regional Mobility Authorities (RMA), and individual design-build projects.

RKI developed and is managing the ISO 9001 compliant QMS being utilized to deliver Texas DOT’s first ever concession project, the $1.2 billion SH130 Segments 5 & 6 project in Central Texas. This QMS documents the processes and responsibilities associated with the developer’s Facility Concession Agreement and Facility Management Plan, as well as the activities of the RKI Independent Engineer. The QMS has been credited with keeping this highly scrutinized project in compliance with quality, budget and schedule requirements, as well as setting the basis for contractually required independent audits.

RKI also developed and manages the ISO 9001 compliant QMS being used by Provo River Constructors to deliver the $1.7 billion I-15 CORE design-build corridor. The QMS is being utilized to manage the design and construction work of a large joint-venture firm, including RKI as the construction QA firm. This project was fast tracked and its award was based on the successful contractor’s commitment to take a full year out of the schedule. Currently the project is scheduled to complete on time, within budget and in compliance with Utah DOT requirements. This would not be possible without the implementation of a project wide QMS providing consistent processes and empowerment of qualified individuals to make decisions at the lowest possible levels. Routine audits against the established QMS provide transparency and owner confidence.

The Illinois DOT realized the benefits of developing and executing an ISO 9001 certified QMS in 2006 (Baranzelli, 2008). An emphasis on customer focus helped Illinois DOT realize they weren’t involving the public in bridge and road maintenance early enough. Going through the design process and then holding a public meeting often resulted in major expensive changes to the design, or the forced acceptance of an undesirable design. Illinois DOT changed this process to involve the customer early on, so the design could incorporate stakeholder needs up front. This has resulted in a less costly process and one with higher end user satisfaction. Illinois DOT used
the *process approach* to identify five core processes, and then depicted these five processes in a linear fashion with the assignment of measurable goals and objectives for each process. This has helped their employees, consultants and contractors identify where they fit in the big picture and how they contribute. Once they established measurable objectives, they’ve been able to drive toward continual improvement and greater customer satisfaction.

**Conclusion:**

The effective implementation of an ISO 9001 compliant QMS is one of the best ways to ensure that quality projects are delivered on-time, within budget, and in accordance with stakeholder expectations. These systems are capable of producing these results because of an emphasis on the customer, direction by responsible and accountable leadership, and the collective involvement of customers and project team members to determine best practices. Even with the most rigorously designed processes, problems and nonconformances occur. An established process for continual improvement thus becomes one of the most valuable pieces of the QMS. Problems can be solved, never to recur again, and processes can be continually improved through root cause analysis and the implementation and verification of an effective solution.

RKI has the proven experience necessary to execute an effective and efficient QMS on design-build, public-private partnerships (P3), and other alternative delivery projects. We have successfully done so throughout Texas and Utah for customers such as Texas DOT, North Texas Tollway Authority, Central Texas RMA, Alamo RMA, and Utah DOT representing approximately $8 billion in construction costs. RKI served as the first construction QA firm on the first ever design-build project for Texas DOT, and then based on that success, served as the independent engineer on the state’s first ever concession project. RKI has continued to pioneer the way in quality management and successful project delivery.

**References**


*Micki Ellis, Raba Kistner Infrastructure Quality Manager, is an American Society for Quality Certified Quality Engineer and an ISO 9001 Certified Lead Auditor with 20+ years’ experience in Quality Management and Quality Engineering. She has a B.S. in Chemistry from Michigan State University and an M.S. in Applied Technology Performance Improvement from the University of North Texas. Micki has successfully lead quality organizations in the transportation, aerospace and semiconductor industries to the achievement of greater customer satisfaction, continual improvement, and decreasing costs of poor quality through QMS deployment. She and her husband of 20 years live in the DFW area, where they enjoy driving the very roads her skills have helped to improve!*

*Questions or comments, contact Micki at mellis@rkci.com.*