Development of this Guidebook

This Project Development Quality Program for Providers Guidebook was developed by the Oregon Department of Transportation (ODOT) Quality Assurance (QA) Guidebooks Committee. The information in this book is intended to ensure the delivery of quality plans and documents by providers of engineering services to ODOT. This book will work in conjunction with other QA guidebooks that are currently under development. The program and all program guidebooks work together with all design manuals with the intent of communicating expectations of quality and standards for all facets of project development.

What You Will Find in this Guidebook

This is the beta version of a document that will be a “Work zone” for a while. At this point, you will find information about the philosophy of ODOT’s Quality Assurance Program, a model Quality Control effort, selection of projects for review, levels of review, how Quality Assurance and Quality Control work together, review elements and reference materials for standards. This information will be at primary levels of detail while the program continues to evolve.

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DEFINITIONS

Quality is defined as the degree to which a product or service meets or exceeds a customer's requirements and expectations.

Quality Management is all activities of the overall management function that determine quality policy, objectives, and responsibilities, and implement them by means such as quality planning, quality assurance, quality control, and quality improvement within the system.

Quality Control (QC) refers to the operational activities put in place to control the quality of a product or service. These include such activities as providing clear decisions and directions, constant supervision by experienced individuals, immediate review of completed activities for accuracy and completeness, and accurate documentation of all decisions, assumptions, and recommendations. Quality control procedures, if followed, should ensure that the work is done correctly the first time. Essentially, QA is what is done to confirm that a QC program is effective and provides feedback upon which further development of the QC program can be made.

Quality Assurance (QA) refers to the certainty that products and services meet the requirements for quality. The objective of quality assurance is the continual improvement of the total delivery process to enhance quality, productivity, and customer satisfaction. Essentially, quality assurance describes the process of enforcing quality control standards. When quality assurance is well-implemented, progressive improvement in terms of both reducing errors and omissions and increasing product usability and performance should be noted. Quality assurance should function as a "voice" for the customer who expects a certain level of quality to be provided.

Quality Control Plan is a comprehensive, well-defined, written set of procedures and activities aimed at delivering products that meet or exceed a customer's expectations, as expressed in contract documents and other published sources. A quality control plan will identify the organization or individuals responsible for quality control and the specific procedures used to ensure delivery of a quality product. A quality control plan will also detail quality assurance measures and the method of accountability and required documentation. The quality control plan contained in this manual is a model only and should be expanded upon and tailored to fit a particular provider’s organization.

Overview of ODOT's Quality Assurance Program

Quality is the result of a cooperative partnership between the providers of project development services (engineering services and technical reports) and those responsible for Quality Assurance. Those providing project development services must implement Quality Control to ensure that products and services meet or exceed expectations of quality. Those responsible for Quality Assurance must review or audit these products and services to ensure the Quality Control efforts are achieving desired results. The overall outcome of these efforts is continuous improvement in the ongoing quest for the highest quality engineering products and technical reports with the most efficient use of resources.

ODOT's Quality Assurance Program has been established to ensure continued high standards of quality for transportation projects. It will seek to provide tools and to manage provider performance for the benefit of all concerned, but especially the citizens of Oregon. The program will seek to meet Federal Highway Administration requirements as well as those of the Oregon Department of Justice. Timely reviews will be one method used to manage quality. These reviews will, in effect, be an audit of a provider's Quality Control Program. While Quality Control is performed for every project, Quality Assurance reviews will occur only for a representative sampling of projects. While Quality Control is ongoing through the development of a project, a Quality Assurance review will usually occur after project development has been completed and is under construction. Occasionally, projects will be reviewed even after construction has been completed. Conversely, a few projects will receive a Quality Assurance review while still in the project development phase. This will occur only for those projects considered to be "high profile" or "high risk." This type of project is yet to be defined.

Quality Assurance reviews will consist of more than one level of review. A QA "Lite" review will involve representatives from all disciplines to review a shorter list of project elements that are considered to represent the overall quality of the work. A QA "Detailed" review will involve a larger group of representatives from all disciplines and specialty areas for an in depth assessment of the quality of the work. There is also the possibility of a "Lite" review with a discipline focus. This means that the review will be fundamentally based on the elements and process of a "Lite" review, but will also include a detailed review in only a particular discipline or specialty area. There also exists the possible approach of one of these types of reviews being performed on a collection of work from a provider – meaning more than one project – when this is felt to be appropriate. The details on the criteria to determine the type of review are yet to be determined.

All QA reviews or evaluations of quality will be done in a consistent, objective, programmatic manner based on the *Quality Assurance Review Guidebook*. This guidebook will document standards and criteria for all types of Quality Assurance reviews. These reviews will not be a factor in a project schedule.

More about QC/QA

Quality is the result of several ongoing processes. It requires many individuals performing appropriate activities at the correct time during the plan development process. Quality control does not just consist of a review after a work product is completed. Quality requires performing all activities in conformance with ODOT requirements and expectations.

Quality control is an ongoing deliberate process, planned and carried out by the provider of design services. Quality control is based on the belief that:

- Quality control should ensure that the work is done correctly the first time.
- Quality is achieved by focusing on preventing problems or errors rather than reacting to them.
- Quality is achieved by qualified individuals performing all work functions.
- Quality is achieved by providing proper training of personnel and ensuring that all personnel remain current on the knowledge and skills needed for their position.
- Quality is controlled by adequate planning, coordination, supervision, and technical direction; proper definition and a clear understanding of job requirements and procedures; and the use of appropriately skilled personnel.
- Quality is verified through checking, reviewing, and monitoring of work activities, with documentation by experienced, qualified individuals who are not directly responsible for performing the work.

To implement a quality control plan, a project leader/manager:

- Selects and assigns qualified professionals to perform the project tasks.
- Assigns qualified specialists to oversee all elements of the work and carry out a consistent, deliberate program of quality control.
- Instills a sense of ownership and personal concern felt by every person on the design team towards quality and continually improving the quality process.
- Makes certain that all personnel involved in performing the work have a clear understanding of the scope and intent of the overall project, and the appropriate design criteria and environmental concerns, in order to ensure that the work product meets or exceeds ODOT expectations.
- Makes certain that all personnel involved in performing the work are aware of the project schedule, and understand the importance of meeting intermediate deadlines as well as final completion dates.
- Makes certain that designers and reviewers have a clear understanding of the work requirements and of their responsibilities.

- Arranges for peer reviews to be conducted by qualified personnel outside of the design team.
- Documents the quality control process properly, to the degree appropriate to each project.

A quality process must adhere to three basic principles:

- Prevent errors from being introduced. At least as much effort should be placed in preventing errors as in finding the errors later.
- Ensure that errors are detected and corrected as early as possible. Therefore, quality controls, which include checking and back-checking procedures, must be implemented during all phases of the work.
- Eliminate the causes of the errors as well as the errors themselves. By removing the cause, the quality process has been improved.

All providers of engineering documents for ODOT shall have a documented Quality Control (QC) plan in place. Sub-providers shall either agree to comply with the providers QC plan or have their own documented QC plan in place.

The Design Quality Assurance (QA) Program will provide an objective review of projects to ensure consistent quality and standards for all ODOT projects and to provide feedback to all design providers. It will not delay nor prevent project schedules from being met. It will be a tool for providers (regions and consultants), and Quality Assurance staff to work together for ODOT's success in delivering all transportation projects in the coming years.

The Design QA Program will use defined methods of project selection to conduct reviews. These methods will also ensure that all providers are scheduled for reviews on a consistent and fair basis. Reviews will be performed based on objective and defined standards. These standards will be documented both for reviewers and providers. Design providers will be managed according to standard application of expectations and how reliably these are met.

Project Sampling

The project sampling model, or how projects are selected for reviews, is under construction. Quality Assurance "Lite" reviews will occur on a regular cycle for providers, as will QA Detailed reviews, but this cycle is yet to be determined. Many other factors to be considered in the sampling model are known now. These factors fall into three main categories: sampling-based, indicator-based and hot items-based. The factors for selection criteria are, in no particular order:

- Feedback from project leader
- Change orders on prior projects
- Delayed bid openings due to contract changes
- First time work
- Funding source
- Alternative contracting
- Level of effort for quality control
- New technology
- Representative of provider mix (higher percentage of work equals higher percentage of review)
- Random
- Representative of project mix
- Feedback from other agencies

Project source categories to include are:

- Design/Build
- Bridge Options Package
- Regions:
  - Predominantly work by region staff
  - Predominantly work by consultant staff
- Local Program

The completion goal for the QA "Lite" reviews is ten days. Reviews will usually occur during a window of six months to one year after the project is let. This is to allow for timely feedback to providers and timely corrective programmatic action for any chronic errors or omissions.

As development of the Project Development Quality Assurance Program (PDQA) continues, other factors will be added to the sampling model. The historical level of demonstrated quality will be incorporated in that a provider that has consistently delivered high quality work will receive less review while lower quality work will receive more frequent review. Generally though, projects will be selected for review on a quarterly basis to reflect the population of projects and providers for that quarter.

About half a dozen projects contracted through the Alternative Delivery Unit will be part of a summer 2004 review pilot. This pilot is intended to evaluate QA Lite reviews so it is desirable to include work from all disciplines and specialty areas if possible. Other projects may be included in order to do this.

Review Teams, Work Plans & Reports

Quality Assurance (QA) Review Teams will have a primary point of contact in a review coordinator. “Lite” review teams will be smaller while "Detailed" review teams will include representatives from all appropriate disciplines or specialty areas appropriate for the project that will be reviewed. The review coordinator will most often come from the Technical Services Roadway Section Quality staff, but may come from another area that represents the dominant discipline in the project. For example, a Technical Services Bridge Section staff member may be asked to coordinate a review of a bridge project and a Technical Services Traffic Section staff member may be asked to coordinate a review of a safety or operations project. Region staff may also be tasked to review projects occasionally. The coordinator and review team will be selected based on workload and expertise and to reflect the dominant disciplines in the project.

Work plans for each review will be determined by the review teams and led by the review coordinator. These will be developed on a quarterly basis for each project that will be reviewed for that quarter.

QA review reports will be in a standard format and will be based on consistent, objective criteria. Project and discipline specific feedback will be provided to providers about each project element reviewed. The purpose of the reports is to facilitate a cooperative effort to maintain or improve quality. The tone and content of the reports will reflect this goal.

Statewide Consistency and Supporting Standards

Consistency across the state for all highways is important for several reasons. Safety can be compromised whenever driver expectations are compromised. Efficiency in design, construction and maintenance is enhanced whenever standard drawings, components and materials are used. However, because consistency has so many facets, often there are difficult choices to be made when important values for consistency collide.

The Statewide Consistency Committee is working on a model that will help providers in the decision process when faced with conflicting standards and/or values.

Quality Control Plan Model

The quality control plan model outlined below is based on the project development process shown in Appendix A.

This document provides a model Quality Control (QC) plan for ODOT projects. This QC plan is a model and represents the minimum requirements for quality control activities. Providers are strongly encouraged to develop their own QC plan specifically tailored to their organization. There may be specific situations for large, complex, or politically sensitive projects where the provider is encouraged to develop a QC plan for an individual project.

Quality Control plans shall meet or exceed all ODOT standards for project development activities.

QC PLAN

- The provider shall submit a QC plan to ODOT's Office of Specifications and Pre-letting that incorporates quality control for all sub-provider design services for review and approval.

- The QC plan shall include a minimum of:

    - Project quality control requirements
    - Project Deliverables and schedule
    - Organizational chart showing responsibilities for design services and quality control checks. Quality control checks shall be conducted by an independent person qualified in the specific area of review that is not directly associated with the development of the project.
    - Communications plan. The communications plan will outline the protocol for all communications related to the QC plan.
    - Format and schedule for checking design reports, calculations, plans and specifications. The QC plan shall make provisions for review of reports, plans, specifications, and estimates provided by sub-providers.
    - Format and procedure for documenting all comments, issues, and responses provided as part of the review process.
    - Format and procedure for certifying that all of the requirements of the QC plan have been met and that all comments and issues have been resolved to the satisfaction of the reviewer (Statement of Technical Review).
    - Check all documents for accuracy and completeness by using prescribed checklists, standards, policies, and procedures. Discipline specific QC checklists are provided in Appendix B.

The provider is fully responsible for all sub-provider's work as if it was the provider's own work.

SCOPING PHASE

- All necessary disciplines shall be included when scoping a project.
- Keep a list of scoping attendees on file.
- Perform a QC review by all necessary disciplines on a project prospectus to insure completeness and adequate funding is provided.

PROJECT DEVELOPMENT PHASE

- The provider or sub-provider shall provide written certification (Statement of Technical Review) for each report or product that the appropriate reviews have been conducted and the requirements of the QC plan have been met.

- The ODOT Project Leader, Consultant Project Manager (CPM), or other contracting authority may at their discretion, and is encouraged to, submit any intermediate or draft report or product to the appropriate technical discipline experts for review.

    - The provider shall respond to all comments and issues as part of the overall QC process.

    - The reviewer shall provide the ODOT Project Leader, CPM, or other contracting authority a written statement certifying that all comments and issues have been resolved to their satisfaction.

- Required documentation

    - The provider shall keep a record of all comments and responses provided during QC review in the project file.
    - A statement of technical review shall be submitted with each design report or product. The statement shall be signed by the designer, the QC reviewer, and the Project Leader/CPM.

- Peer Review (PR)

  This is an independent technical review of any and all reports or products developed within each discipline. The review shall be conducted by a peer that is not directly involved with the project and shall be independent of the final review and/or approval by the managing engineer or lead worker.

  Each discipline should develop a process or form to document all PR comments and responses. The reviewer shall sign off that all comments have been adequately addressed before proceeding to the next review phase.

- Product Approval Review (PAR)

  This review is conducted by the managing engineer, lead worker responsible, or Engineer of Record (EOR) for the technical products produced within each discipline. Each discipline should develop a process or form to document all comments and responses made during the review process.

  For products developed and stamped by a Registered Professional, the managing engineer or lead worker shall signify review and approval of the product by signing the report.

  For products developed by an Engineer in training or other un-licensed person, the managing engineer or lead worker shall signify review and approval by stamping, certifying, or signing the product (as applicable).

- Required documentation

  - Each discipline shall keep a record of all comments and responses provided during the PR and PAR review in the project file.
  - Each project file within each discipline shall contain a PAR / PR review log documenting, the date of review, the reviewer's name, and any comments regarding the review.
  - A statement of technical review shall be submitted with each design report or product. The statement shall be signed by the designer, the PR reviewer, and the managing engineer or lead worker. A sample statement is attached in Appendix D.

PRELIMINARY PLANS (70%) FOR CONSTRUCTION

- Preliminary Plans for Construction should be distributed to the appropriate technical discipline, district maintenance, and construction offices for a QC review to insure compliance with ODOT standards and policies and to check for fatal flaws and or construction and staging issues.

  - The Provider shall respond to all comments and issues raised as part of the overall QC process.

  - The reviewer shall provide the ODOT Project Leader, (CPM), or other contracting authority a written statement certifying that all comments and issues have been resolved to their satisfaction.

- Issues may come up during review that will require a change to the technical design report due to construction, staging or other issues. Any modifications to an

existing design or additional design work that is required due to comments made at this stage are required to go through the QC review process outlined in the QC plan.

ADVANCED PLANS (95%) FOR CONSTRUCTION PHASE

- The provider is responsible for the primary QC of all work provided by the provider and sub-providers in accordance with the QC plan.

- Advanced Plans for Construction should be distributed to the appropriate technical discipline, district maintenance, and construction offices for a QC review to insure compliance with ODOT standards and policies and to check for fatal flaws and or construction and staging issues.

    - The Provider shall respond to all comments and issues raised as part of the overall QC process.

    - The reviewer shall provide the ODOT Project Leader, (CPM), or other contracting authority a written statement certifying that all comments and issues have been resolved to their satisfaction.

- Issues may come up during review that will require a change to the technical design report due to construction, staging or other issues. Any modifications to an existing design or additional design work that is required due to comments made at this stage are required to go through the QC review process outlined in the QC plan.

FINAL PLANS, SPECIFICATIONS AND ESTIMATES (100%) FOR CONSTRUCTION PHASE

- The provider is responsible for the primary QC of all work provided by the provider and sub-providers in accordance with the QC plan.

- Typically comments received at this point require an addendum letter to fix any last minute errors, omissions, corrections, etc.

- All final reports, products and required deliverables are on file with the appropriate ODOT technical discipline. Electronic format is strongly encouraged whenever possible. For example, Final pavement design report and associated deliverables shall be provided to ODOT Pavement Services Unit for pavement management system use and permanent record keeping purposes.

- Providers shall sign a statement of technical acceptance (See Appendix D). The letter signifies that all intermediate and final QC reviews have been conducted in

accordance with the QC plan and that there are no outstanding issues or comments associated with the plans, specifications and estimates.

LESSONS LEARNED

Improvement to the Project Development Process is one of the principles behind ODOT's QA/QC program. Lessons learned in the Project Development Process should be documented in the forms contained in Appendix E. The completed forms should be copied and sent to the Senior Design Quality Engineer. Lessons learned should be shared at provider staff meetings. The Department will be briefed on lessons learned and will participate in discussions intended to make improvements in policy and procedures. ODOT's Quality Assurance staff will also incorporate Contract Change Orders into the lessons learned files when it may add useful knowledge to future projects.

These activities are being developed to enable design teams to have the benefit of the most current information and ideas generated from the collective experience of ODOT, Consultants, and Contractors.

REFERENCES

Section Websites

Roadway	http://www.odot.state.or.us/tsroadway/index.htm
Bridge	http://www.odot.state.or.us/tsbbridgepub/index.htm
Specs and Pre-Letting	http://www.odot.state.or.us/tsspecs/
Traffic	http://www.odot.state.or.us/traffic/index.htm
Construction	http://www.odot.state.or.us/tsconstruction/index.htm
Environmental	http://www.odot.state.or.us/eshtm/
Geology and Hydrology	http://www.odot.state.or.us/geohydro/
Local Government	http://www.odot.state.or.us/lgs/index.html
Geometronics	http://www.odot.state.or.us/tsgeometronicspub/
Right of Way	http://www.odot.state.or.us/tsrowpropmgt/construction.htm
Preliminary Design	http://www.odot.state.or.us/techserv/engineer/pdu/

Reference Guides

Bridge Manuals	http://www.odot.state.or.us/tsbbridgepub/BrStds.htm
Traffic Design Manuals	http://www.odot.state.or.us/traffic/design.htm
Traffic Publications	http://www.odot.state.or.us/traffic/publicat.htm
Standard Drawings	http://www.odot.state.or.us/tsspecs/std-dwg-02.htm

Pavement Design Guide
http://www.odot.state.or.us/tsconstruction/documents/PavementDesignGuide.pdf
Survey Manuals
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