Oregon
Department
of Transportation

Appendix A - Statewide ITS Quality Plan

Project Delivery QA/QC Program
Oregon Department of Transportation

August 2022

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This information can be made available in alternative format by contacting
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Oregon Department of Transportation

Statewide Project Delivery Branch – Engineering & Technical Services Branch

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Revision History (the current revision is first entry)

Release Date	Change made by	Section(s) Updated	Summary of what, why changed
8/18/2022	Doug Spencer, ITS	All	Add QC form in Appendix B; update to 6/2/22 discipline quality plan template.
12/23/2021	Doug Spencer, ITS	All	Updates and put into discipline template format.

1. ITS Quality Management

The ITS Quality Control Plan provides a comprehensive guide for the delivery of engineering design from the ITS Unit.

Quality in regards to engineering means the design is within the standard of care of the engineering profession. The standard to which engineers must practice is to exercise the skill, care, and judgment that a reasonable engineer from a similar location would have exercised under the same or similar circumstances.

2. Quality and Technical Standards

The ODOT Project Delivery QA/QC Program website provides an overview of the ODOT Project Delivery QA/QC Program, access to the quality standards of practice. The Project Delivery Statewide Quality Management Program Manual can be found there, as well as a listing of the quality plans and guidance documents, including the region Technical Center quality plans, the technical discipline quality plans, and the transportation project management statewide quality plan. There is also a listing of the associated quality forms and checklists.

The following is a list of standards, codes, regulations, and policies the ITS Unit uses in the design of ITS projects. The list is not all encompassing.

> AASHTO Standard Specifications for Structural Supports for Highway Signs, Signals, and Luminaires
>
> Aluminum Design Manual
>
> ANSI/EIA/TIA 455 standards for fiber optic cabling
>
> ANSI/EIA/TIA 598 optical fiber cable color coding
>
> AWS Structural Welding Code
>
> ASTM Standards for Dedicated Short Range Communications (DSRC)
>
> ASTM C857, Standard Practice for Minimum Structural Design Loading for
>
> Underground Precast
>
> Concrete Utility Structures
>
> AWS Structural Welding Code
>
> Institute of Electrical and Electronics Engineers (IEEE) 802 standards for networking

IEEE C62.41, Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits

IEEE Green Book on Grounding

IEEE 1609 Wireless Access in Vehicle Environments (WAVE)

IEEE National Electrical Safety Code

ITE ATC 5201 Advanced Transportation Controller (ATC)

ITE ATC Application Programming Interface (API)

ITE ITS Cabinet

ITE Traffic Management Data Dictionary (TMDD)

Manual on Uniform Traffic Control Devices (MUTCD)

Manual of Steel Construction Allowable Stress Design

NFPA 70 National Electrical Code

NFPA 70e Standard for Electrical Safety in the Workplace

National Transportation Communications for Intelligent Transportation Systems (NTCIP)

Oregon Electrical Specialty Code

ODOT Traffic Manual

ODOT Traffic Structures Design Manual

OAR Chapter 437 OSHA Fall Protection SAE J2735 Dedicated Short Range

Communications (DSRC) Message Set Dictionary Underwriters Laboratories (UL) for electrical product safety standards

3. Roles and Responsibilities

The roles and responsibilities for implementing ITS quality management are described in this section. The ITS Unit will only assign engineers to assignments in which they have the education and expertise for the technical nature of the project. ITS engineers will only accept assignments in which they can deliver the project successfully.

Table 1: ITS Quality Roles and Responsibilities

Roles	Quality Management Program Responsibilities
ITS Standards Engineer	• Review all consultant work for ITS and the networking aspect of Traffic Signal projects for agency • Review and sign off on all ITS electrical design specifications done by consultant as a technical expert for the agency.
ITS Senior Design Engineering	• Review all ITS structure specifications as a technical expert for the agency. • Review consultant ITS specifications per their role as technical experts for the agency
Project Manager	• Coordinate the review of consultant deliverables with the ITS Unit.
Consultants	• For consultant designed ITS projects, the consultant firms have and are expected to follow their own quality control/assurance process as part of their contract with ODOT

3.1.   Outsourced Work Products

If the ITS Unit does not have the expertise on staff to complete a project successfully, the Unit will hire an engineering consultant that does have the specialty skill.

3.2. Oregon Engineering Laws

The practice of engineering is an important and learned profession. Engineers are expected to exhibit the highest standards of honesty and integrity. The work they do has a direct and vital impact on the quality of life and safety for the public. Engineers must perform under a standard professional behavior that requires adherence to the highest principles of ethical conduct.

Many of the laws that govern the practice of engineering in the State of Oregon address the responsibility of the engineer in assuring that they only accept assignments within their area of expertise and education. Ultimately, the engineer responsible for the design is also responsible for the quality of their work.

OAR 820-005-0075 Responsible Charge

(1) "Responsible Charge", as used in ORS 672.002(9), means to have supervision and control over engineering work, land surveying work, and photogrammetric mapping work, as evidence by performing substantially the following:

(a) Establishing the manner of method by which services are rendered;

(b) Establishing quality controls for the services rendered;

(c) Communicating with clients;

(d) Reviewing designs, calculations, plans, surveys or maps;

(e) Supplying deficiencies found in or correcting errors contained in designs, calculations, plans, surveys, or maps;

(f) Making changes to documents, including but not limited to designs, plans, plats, surveys or maps.

OAR 820-005-0080 Supervision and Control

(1) "Supervision and control" as used in ORS 672.002(10), means establishing the nature of, directing and guiding the preparation of, and approving the work product and accepting responsibility for the work product, as evidenced by performing the following:

(a) Spending time directly supervising the work to assure that the person working under the licensee is familiar with the significant details of the work;

(b) Providing oversight, inspection, observation and direction regarding the work being performed;

(c) Providing adequate training for persons rendering services and working on projects under the licensee;

(d) Maintaining readily accessible contact with the person providing services or performing work by direct proximity or by frequent communication about the services provided or the work performed. Communications between the licensee and persons under the license's supervision and control include face to face communications, electronic mail, and telephone communications and similar, other communications that are immediate and responsive, and; (e) Applying the licensee's seal and signature to a document.

OAR 820-020-0015

Registrants or Applicants or Certification Shall Hold Paramount the Safety, Health and Welfare of the Public in the Performance of their Professional Duties

(1)   Registrants shall at all times recognize that their primary obligation is to protect the safety, health, property and welfare of the public. If their professional judgment is overruled under circumstances where the safety, health, property or welfare of the public are endangered, they shall notify their employer or client and such other authority as may be appropriate.

(2)   Registrants shall approve and seal only those design documents and surveys which are safe for the public health, property and welfare in conformity with accepted engineering and land surveying standards.

OAR 820-020-0020

Registrants Shall Perform Services Only in the Areas of Their Competence

(1)   Registrants shall undertake assignments only when qualified by education or experience in the specific technical fields of engineering or land surveying involved.

(2)   Registrants shall not affix their signatures or seals to any plans or documents dealing with subject matter in which they lack competence, nor to any such plan or document not prepared under their direction and control.

4.   Quality Control

The ITS Quality Control checklist (see Appendix B), intended to be filled out by the engineer and reviewer for each STIP funded design project, details what is to be checked at each design phase. Not every ITS project requires all of the deliverables listed; the scope and complexity of the project will dictate which deliverables are needed. The box to the left will be checked for each applicable deliverable.

This document is not intended for use by local agency ITS projects. Local agencies have a different organizational structure than ODOT's and also have different engineering expertise and projects that they deliver.

4.1. Quality Control Reviews

See the ITS QC checklist in Appendix B, and reviews listed in Table 2.

Table 2: Types of ITS Quality Reviews

Phase	Project Element Requiring QC Review
ITS Constructability Review	The ITS Unit's engineering review is more than just a peer review. The staff conducts a group review to ensure compatibility and consistency between the electrical and civil engineering design aspects. The group also reviews from a construction standpoint to ensure the design is easy to build by the construction contractor and maintain by state forces.
ITS Maintenance Review	ITS projects require the support of the agency's electricians, ITS support coordinators, TSSU technicians, and ISB networking staff. The ITS engineering group will often coordinate the review of ITS projects directly with these individuals for comments and coordination.

4.2. Authority of the Reviewer

See Section 4.1 for how ITS handles reviews.

4.3. Software, Tool, and Data Validation

Not applicable to ITS work.

4.4. Quality Control Documentation

As project QC work is done, quality records are created that provide reviewable evidence documenting that quality work was done. These quality records also provide the basis for QA reviews and/or audits (performed by professional auditors).

The ITS Unit will follows ODOT's guidelines on placing the applicable project documents in ProjectWise. Quality records in ProjectWise are stored in their regular discipline or milestone directory, with either "QC" or "QA" in the document title or description, to facilitate searches for quality documentation. A set of quality files from each discipline or milestone folder in ProjectWise will be created in the ProjectWise "7_quality" folder. The set naming convention will use the discipline code (TD) as follows:

*TD*_K#####_##

The ITS Unit uses the ITS server for much of the project development as many others involved with the maintenance and operations of ITS assets do not have or use Project Wise. Also since ITS projects involve more than just typical design and construction activities, the ITS server location is useful for capturing documents that are part of the maintenance and operations of the ITS asset but do not fit into the general use of ProjectWise.

ITS Server Document Storage

The ITS Unit has been using a server based filing system which includes records since the creation of the program. For engineering design projects, the Unit uses the following file structure:

ITS Unit

      Engineering

          Design

             Region 5

                <K##### and Project Name>

                    Calculations

                    Communications

                    Correspondence

                    Drawings

                    Estimates

                    Geotech

                    Photos

                    Quality

                    Schedule

                    Specifications

                    Systems Engineering

4.5.   QC Communications

Internal and external communications may be done by phone, email, in person, or video conferencing. Communication reasons include regular team meetings and reviews, and project interactions with the project managers (TPM or RE-CP) daily.

5. Quality Assurance

Quality assurance (QA) is a system undertaken to maximize the effectiveness of the quality program. The QA process will assist in measuring the effectiveness of the quality efforts in order to provide input into continuous improvement of the work and assist in identifying technical development needs.

ITS will work with feedback from the construction office on change orders to use as a basis for evaluating what could be done for quality process improvements.

Appendix A - Glossary

Table 3: Glossary of Terms, Titles, and Acronyms

Term	Explanation
QC	Quality control
QA	Quality assurance
POR	Professional of record
ITE	• Institute of Transportation Engineers
ITS	Intelligent Transportation System
AASHTO	American Association of State and Highway Transportation Officials
ANSI/EIA/TIA	American National Standards Institute/Electronic Industry Alliance/Telecommunications Industry Association
AWS	American Welding Society
ASTM	American Society for Testing and Materials
IEEE	Institute of Electrical and Electronics Engineers
ATC	Advanced Transportation Controller
NFPA	National Fire Protection Association

Appendix B – QC Checklist

ITS Unit
Quality Control Check List

Project Name	
Highway	
Region	
Key Number	

The ITS Unit has completed the design for the project listed. Notice is hereby given that a technical review has been conducted that includes applicability to the appropriate engineering codes, standards and laws and that the design is constructible and consistent with other ODOT ITS systems.

Scope

☐ Project's Business Case for ITS projects ITS _____

☐ ITS Systems Engineering Checklist ITS _____

Systems Engineering – Concept of Operations ITS _____
☐ New system, Con Ops needs to be developed
☐ Existing system defined by existing Con Ops
☐ Not applicable

☐ Site investigation and coordination ITS _____

☐ Utility coordination ITS _____

Traffic Control Device ITS _____
☐ Coordination with Region Traffic Office
☐ Coordination with Traffic HQ
☐ Not applicable

Design Acceptance Phase

☐ Site plans ITS Engineer _____
ITS Reviewer _____

☐ DAP cost estimate ITS Engineer _____
ITS Reviewer _____

Preliminary Plans

☐   Site plans   ITS Engineer   ☐
                               ITS Reviewer   ☐

☐   Preliminary Cost estimate   ITS Engineer   ☐
                               ITS Reviewer   ☐

Advanced Plans

☐   Site plans   ITS Engineer   ☐
                               ITS Reviewer   ☐

☐   Electrical Details   ITS Engineer   ☐
                               ITS Reviewer   ☐

☐   Structural and Foundation Details   ITS Engineer   ☐
                               ITS Reviewer   ☐

☐   Electrical Calculations   ITS Engineer   ☐
                               ITS Reviewer   ☐

☐   Poles Structures and Foundation Calculations   ITS Engineer   ☐
                               ITS Reviewer   ☐

☐   ITS Electrical Components and Systems - Special Provisions   ITS Engineer   ☐
                               ITS Reviewer   ☐

☐   ITS Structural Supports and Foundations – Special Provisions   ITS Engineer   ☐
                               ITS Reviewer   ☐

☐   Electrical Cost Estimate   ITS Engineer   ☐
                               ITS Reviewer   ☐

☐   Structures, Poles and Foundations Cost Estimate   ITS Engineer   ☐
                               ITS Reviewer   ☐

☐   ITS Project Constructability Review (with Maintenance)   ITS Engineer   ☐
                               ITS Reviewer   ☐

Final Plans

- [ ] Site plans   ITS Engineer

    ITS Reviewer

- [ ] Electrical Details   ITS Engineer

    ITS Reviewer

- [ ] Structural and Foundation Details   ITS Engineer

    ITS Reviewer

- [ ] Electrical Calculations   ITS Engineer

    ITS Reviewer

- [ ] Poles Structures and Foundation Calculations   ITS Engineer

    ITS Reviewer

- [ ] ITS Electrical Components and Systems - Special Provisions   ITS Engineer

    ITS Reviewer

- [ ] ITS Structural Supports and Foundations – Special Provisions   ITS Engineer

    ITS Reviewer

- [ ] Electrical Cost Estimate   ITS Engineer

    ITS Reviewer

- [ ] Structures, Poles and Foundations Cost Estimate   ITS Engineer

    ITS Reviewer

- [ ] ITS Programmatic Letter of Public Interest Finding and Anticipated Costs

- [ ] ITS Project Constructability Review – Final Plans Phase

ODOT provides a safe and reliable multimodal transportation system that connects people and helps Oregon's communities and economy thrive.

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