

# Appendix N

## Digital Design Quality Control

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## N.1 DIGITAL DESIGN QUALITY CONTROL (QC)

It is recommended that a qualified roadway designer independently review the digital design data “at the Advance Plans review milestone. For large or complex projects, it may also be beneficial to provide a review of digital design data at earlier milestones, such as DAP or Preliminary plans.” It is recommended that these earlier “pre-bid” reviews include evaluation of the digital data elements needed to prepare the eBIDS Handoff package. Comments provided by the reviewer at the DAP, Preliminary, and/or Advance Plans milestone may then be incorporated into the digital design prior to creating the draft eBIDS Handoff package. Although this Appendix is limited to review of roadway digital data, a qualified reviewer will typically request additional information from the designer, such as:

- Latest set of plan sheets (DAP, Preliminary, Advance, Final, Mylar)
- A no-cost estimate providing quantities only
- The original ground surface digital data file (provided by the Project Surveyor)

It may be helpful to the review if the designer anticipates the need for the additional items listed above and provides them to the reviewer with the roadway digital design data package.

“Pre-bid” items to review are described in Section N.1.1 and N.1.2. The [Pre-bid Roadway Digital Data Quality Control Checklist](#) also summarizes these items as well as provides suggestions on how to review the data. Review of the Construction Survey Handoff package includes elements requested by the Construction Coordinator based on the specific needs of each project. Often the elements requested include the items listed in Section N.1.1 and N.1.2 as well as N.1.3. A summary of these items, as well as suggestions on how to review the data, are provided on the [Construction Survey Handoff Roadway Digital Data Quality Control Checklist](#). These digital data QC checklists are not required, but are provided as tools to assist with organization and communication between designer and reviewer when evaluating roadway digital design data.

The information provided here is offered to assist the reviewer in providing feedback to the designer regarding the quality of the data as it pertains to the bid process and/or construction. As design and construction technologies continue to evolve, the review process will also evolve. The following subsections provide guidelines and best practices on how to perform a QC review of roadway digital design data. It is the intent that the discussion, checklists, and examples provide a solid foundation for the reviewer to begin the work.

## N.1.1 DAP/PRELIMINARY/ADVANCE MILESTONE

Review of “pre-bid” roadway digital data at DAP/Preliminary/Advance Plans milestones may include the following:

### 2. Alignment Data

- Horizontal bearings and curve data match plan sheets
- Profile grades and vertical curves match plan sheets
- PC, PI and PT stations match plan sheets
- Vertical alignment profile grades match Finish Grade (FG) surfaces
- Integrity of each horizontal and vertical alignment

### 3. Surface Data

- Sufficient surface detail to define project R/W and easements, including ditches, ponds, finish ground at abutments and other graded areas
- Displayed features match horizontally against design file plan view
- Surfaces reviewed for triangulation errors
- Adjacent corridor model FG surfaces tie into each other
- FG surface ties into Original Ground (OG) surface
- FG cross slope/curbs match OG elevations at project limits
- Ensure positive drainage to inlets and low points
- Component depths match typical section thicknesses

### 4. Surface Quantity Calculations

- Quantity calculations for earthwork, asphalt, aggregate, drain rock, etc.
- Hand/spreadsheet calculations match quantities on plan sheets
- Surface-generated quantities (inroads volume reports) match quantities on plan sheets
- Quantities on estimate match quantities on plan sheets for earthwork, asphalt, aggregate, drain rock, etc.

## N1.2 EBIDS HANDOFF PACKAGE

The eBIDS Handoff package review is the final stage of the “pre-bid” roadway digital data review. The items reviewed include elements listed on the [eBIDS Handoff Package Checklist](#) as well as other items related to soliciting quality bids at the bid advertisement milestone. The data reviewed typically includes all items listed in Section N.1.1 as well as the following:

### 1. Computer File Index

- Files listed are included in submittal
- Alignment file names listed in the computer file index match the alignment names on plan sheets and inroads files
- Project data (name, highway, county, contract number, key number, project limits and bid date) provided
- File naming is consistent, logical and no longer than 28 characters plus the 3 character extension (total 31)
- Files do not include restricted characters (see section m.1.2)

### 2. Alignment Data

- Horizontal and vertical alignments not used for final design removed from alignment data, such as alternative or "working" design alignments

### 3. Cross Section Data

- Cross sections included for each alignment
- Cross sections include labels to identify associated alignments and station
- Spacing no more than 25 feet apart, matches spacing used for quantity calculations
- Cross sections included at key stations (typical section changes, alignment cardinal points, drainage facilities, taper start and stop locations, guardrail/barrier start/stop locations, centerline of approaches, curb/pavement return points, luminaire and signal pole locations)
- Key features labeled with offset and elevation (centerline, edge of pavement, top face of curb, etc.)

### 4. Corridor Map Index

- Surface boundaries and names and locations on map index match surface names shown on map

### 5. Corridor Data

- Superelevation data matches horizontal curve information on plan sheets and superelevation diagrams

### 6. Surface Data

- Separate landxml files provided for each surface created
- Feature names appropriate and consistent with ODOT naming convention

As stated in Section M.1.1, submit the eBIDS Handoff Package to the ODOT Project Leader no later than 1 week prior to the project Advertisement milestone. A schedule showing the approximate durations for preparing and reviewing the eBIDS Handoff Package is shown on Figure M-1 in [Appendix M](#).

## N.1.3 CONSTRUCTION SURVEY HANDOFF PACKAGE

As stated in Section M.1.1, the roadway designer and construction coordinator agree on deliverables needed to administer the project. The Sample Roadway Construction Survey Handoff Deliverable Checklist provides a good starting point for this discussion. Items that are often requested by the construction Project Manager's office include the following:

- Final original ground surface (.dtm and .dgn) from Survey
- Design files included for roadway, storm, structures etc.
- Final CAD sheet files (.dgn) included for all sheets in plan set
- CAD Files (.dgn) which show triangles, features and contours included for all surfaces
- CAD Alignment files (.dgn) included showing all primary alignments and profiles
- Inroads .xin, .ird, .lfl and .alg files (if requested by the PM office)
- ADA ramp grade exhibits
- Driveway grade exhibits
- Additional documents such as rendered views and labeled field photos, which communicate the intent of the designer or illustrates use of the design files

Once the roadway designer and construction coordinator agree upon the deliverables, the roadway designer prepares the draft Construction Survey Handoff package for QC review. This package is often tailored to meet the needs of the awarded contractor's surveyor as well as the needs of the associated Project Manager's office. In addition to the elements described in Sections N.1.1 and N.1.2, the following items are recommended to be reviewed:

1. Alignment Data
  - Items listed in N.1.1
  - Additional secondary alignments included and checked against plan sheets
  - Temporary traffic control alignments (i.e., alignments for barrier, striping, traffic diversions, etc.) Match plan sheets
2. Bid Item Quantity Calculations
  - Quantity calculations for roadway-related bid items
  - Linework on cad files (.dgn) files match quantities on plan sheets
3. Grade Reports
  - Offsets and elevations match cross sections and plans
  - Features checked against surface data
  - Additional surface (top of rock, subgrade, etc.) Elevations (depth below fg) checked against typical section thicknesses

As stated in Section M.1.1, the Construction Survey Handoff Package is submitted to the assigned ODOT construction PM's office within 30 days after Bid Opening and generally coincides with

Notice to Proceed for the Contractor. Figure M-1 in [Appendix M](#) shows the approximate durations needed for developing the Construction Survey Handoff Package.

## **N.1.4 EXAMPLE QUALITY CONTROL (QC) REVIEWS**

The following provides links to example projects that utilized QC guidelines described above on roadway digital design packages prepared for the purpose of bidding and construction.

### **N.1.4.1 OR38: LUDER CREEK CULVERT REPLACEMENT (KEY #18264)**

This project was designed to a 4R design standard. This project is located in Douglas County on Highway 45 (OR 38) between mile points 11.67 and 11.98. The Umpqua Highway (OR 38) crosses Luder Creek. This project constructed a new bridge for the highway to cross Luder Creek, and realign the creek to a more historic flow location.

Click on the links below to access products generated from an independent QC review of roadway digital design data related to this project.

[QC of "Pre-bid" package for Key #18264](#)

[QC of Construction Survey Handoff package for Key #18264](#)

### **N.1.4.2 I-5 SB: BROADWAY-WEIDLER EXIT RAMP (KEY #18262)**

This project was designed to a 4R design standard. This urban Interstate exit ramp project is located in the vicinity of four closely spaced intersections (within 300 feet) in the City of Portland. The project reduced conflicts between bicycles, pedestrians, transit (buses and streetcars), and passenger vehicles.

Click on the links below to access products generated from an independent QC review of roadway digital design data related to this project.

[QC of "Pre-bid" package for Key #18262](#)

[QC of Construction Survey Handoff package for Key #18262](#)