**INTRODUCTION**

The KDOT’s research projects were evaluated in response to advancements in technology and industry. Industry Expert was invited to share electronic design data between contractors, consultants, and other project partners. A unique aspect of this study was contractors, who for GPS machine controlled grading and construction staking. The results from additional electronic design files become more frequent as construction projects seek to be created in the solid 3D models.

**Goal of Initiative**

- Evaluate release of Electronic Design Files
- Determine Type and Format of Files to Provide
- Determine Appropriate Time to Release Files
- Evaluate impacts to Construction Inspection and Design Processes
- Address Legal Considerations

**DATA COLLECTION**

- Practice and Policy Development of the data collection. Practical experience was obtained through a pilot project and previous practice under an interim policy.

**Practical Experience**

- Initial Electronic Deliverables Policy Created
- Electronic Design Files Released for Pilot Project
- Pilot Project Feedback Meetings
- Intern Policy Established
- Construction Staking Specification Updated
- New Policy and Disclaimer Developed

**Data Collection**

- Surveys: Contractors
- Obtained Input from Industry Experts
- Obtained Input from Consultants
- Obtained Input from KDOT Surveyors
- Surveyed KDOT and Consultant Designers
- Obtained Input from Internal Designers
- Collected Input in Timing of File Release
- Type of Files and Method for Releasing Files
- Literature Review: 3D Models and 2D design files with the current design process.
- Additional Quality Control necessary
- Preferred to have paper plans control

**Existing Policies**

KDOT’s initial electronic policies were released based on pre-existing benefits (improved accuracy of the digital design environment). These benefits were provided to contractors prior to letting on KDOT’s website.

**Pilot Project**

- Plan and Profile Sheet Files
- Existing Ground Survey (tin format)
- Cross Section Files
- Base File
- Profile Section Files
- Existing Survey
- Profile and Plan File Sheet (as shown in plans in Microstation format)

**Surveyor Input**

KDOT’s final electronic policies were provided along the perimeter of the project. These files were valuable to construction staking, because it allowed the surveyor to provide critical calibration points for GPS. Additional files provided include GPS construction staking:

- High-Way of Way Staking Package (coordinate for all the right of way)
- Cross Section Coordinate Detail Sheet (coordinates for all cross sections located in the project survey)

**Final Policy**

Files released under the final policy included those from the existing policy, the interim policy and identified through surveyor input.

**Relieving Flies Prior to Letting**

- Contractors can more accurately and efficiently bid project

**Relieving Flies After Letting**

- Allowable liability concerns of contractors using flies for bid preparation

**GPS MACHINE CONTROLLING GRADED**

GPS technology has been used to create a 3D model of a construction site. The contractor was required to place the existing design files and contractors were required to notify KDOT of any errors. Contractors were required to provide surveyors with data as a part of the 3D model created. KDOT did not review and approve the contractor’s 3D model.

**GPS Training for Construction Inspectors**

Contractors were required to provide the electronic design files and contractors were required to notify KDOT of any errors. Contractors were required to provide surveyors with data as a part of the 3D model created. KDOT did not review and approve the contractor’s 3D model.

**SUMMARY OF CHALLENGES**

- **Challenge**
  - Surveys
  - Industry Expert Input
  - Pilot Project
  - Literature Review
  - Surveys
  - Literature Review
  - Surveys
  - Literature Review
  - Surveys
  - Literature Review

- **Input**
  - Surveys
  - Industry Expert Input
  - Pilot Project
  - Literature Review
  - Surveys
  - Literature Review
  - Surveys
  - Literature Review
  - Surveys
  - Literature Review

- **Decision**
  - Provide construction inspectors with GPS overview
  - Provide inspection training
  - Paper plans control
  - Liability considered by specifications and litigation
  - Project benefits
  - Not practical to obtain quantitative benefits
  - Qualitative benefits were identified

**CONCLUSION**

- **Documents Created**
  - Updated construction specification addressing GPS machine controlled grading and liability
  - Releasing electronic design files

- **Solutions**
  - Non-road design policy for the release of two-dimensional design files created during the design process and used in the construction process.
  - Updated Exploratory and Project Documents website disclaimer and bidding contract specification to cover the release of electronic design files.

- **Future Recommendations**
  - KDOT has continued to evaluate the use of electronic deliverables by contractors and possible improvements to the policy.