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Chapter 7 - CADD QUALITY ASSURANCE/QUALITY CONTROL

CADD Production Criteria Handbook

7.1 GENERAL

Offices under the direction of the Florida Department of Transportation (FDOT) Chief Engineer are responsible for determining the critical Quality Assurance (QA) requirements for their functional areas and have developed plans to monitor those requirements. The Engineering/CADD Systems Office (ECSO) defines the critical Quality requirements for electronic deliverables in the Computer Aided Design and Drafting (CADD) Manual and this Handbook. These include standard file formats and components for data delivery, adherence to a standard project directory structure, file naming conventions and standard graphic symbology for electronic plans. ECSO also establishes a QA monitoring plan for CADD in FDOT to facilitate compliance with these electronic deliverable requirements.

FDOT standards require that graphical elements in all critical design files which are shared across disciplines, or used in quantity calculations for pay items, or used in automation by downstream applications meet a minimum of 95% threshold compliance for standard level symbology. The threshold percentage is the number of graphical elements in the design file on the prescribed level symbology divided by the total number of elements in that design file. If submitted critical files do not meet threshold requirements, a written variance from the FDOT Project Manager with supporting documentation shall be included within the project Journal. A minimum 80% threshold compliance for level symbology is targeted for non-critical design files.

Every design file shall meet the threshold of compliance as defined in any CADD Quality Control (QC) plan or scope of work approved by the Districts. Within these compliance thresholds requirements, FDOT provides an allowance for up to ten (10) exceptions to prescribed level symbology standards. A Standard Rule defines the prescribed level symbology of a design file. An allowable exception is a deviation from standards defined in a Standard Rule for a given project directory. For example, if a municipality required a special symbology for an element needed that was not covered in a Standard Rule, that element could be drawn on the special symbology, and all occurrences of that symbology would be counted as only one exception.

7.2 THE PROFESSIONAL OF RECORD

Whether it be product or management practice, what must occur is sound, uninterrupted legal record of the project data. Therefore it is important that both the data producer and the FDOT make a sensible effort to ensure the documents supporting the signing and sealing of files electronically by a professional signatory and the securing of the electronic delivery be preserved in a manner consistent with those responsibilities under the rules of the Boards of Professional Regulation in Florida.

Districts should emphasize all the practices implied by the rules of the Florida Boards of Professional Regulation and implemented in the Professional's Electronic Data Delivery System (PEDDS) software and in certificate based Digital Signature. For example in PEDDS, the Signature Documents are as important as the data, since without these documents, the data is not considered signed and sealed electronically under Board rules. As such, the Signatory's seal cannot be authenticated. Likewise, the Manifest Document speaks to the integrity of the entire delivery, and should also receive attention and care for its preservation as part of the delivery of data.

For these reasons, some data producers have begun the practice of scanning the final signed paper version of Manifest Document, and the paper signed and sealed Signature Documents into PDF format, including them in the _meta_info folder of the project before delivery to FDOT.

Since the _meta_info folder is treated differently during the securing and authentication process by PEDDS, it is possible to place files into the _meta_info folder after a project data set has been secured without violating the security paradigm PEDDS uses. The person responsible should take special care not to overwrite PEDDS files managed in this _meta_info folder, including adding files without file extensions, zero-byte files, or files whose file name might conflict with the operation of PEDDS.

The practice mentioned above does not excuse the data producer or the Department from their responsibility to preserve the paper records of the Signatory Documents or Manifest Documents for a project since these bear the wet ink signature and impression seal. FDOT shall maintain the paper copies of these documents until it is determined how these records may be preserved in other media that meets the requirements of the Florida Boards of Professional Regulation.

For Digital Signing and Sealing, Adobe Acrobat Portable Document Format (PDF) supports certificate signatures that allow one to sign PDF files with a certificate-based digital ID. The approach is to work with a certificate ID issued by a trusted third party certificate authority. Certificate signatures are known as Digital Signatures.

Regulated transactions such as the development and submission of engineering plans, specifications, reports, surveys, and etcetera require high assurance when signing documents. When documents are distributed electronically, it is important that recipients can:

- Verify document authenticity – confirming the identity of each person signing the document
- Verify document integrity – confirming that the document has not been altered

Certificate-based signatures provide both of these security services. FDOT has chosen to use certificate-based digital signature infrastructure using third party certificate authorities to provide independent identity validation.

Once certificate-based digital IDs are acquired by professional Signatories, they can use the Adobe Acrobat software (or other PDF editors) to sign PDF files and validate files received from others. Digital Signature allows one to:

- Sign documents
  - Sign PDF files using certificate IDs
  - Place a signature box anywhere on the appropriate page or sheet
  - Add multiple signatures to a document, or page
  - Add a time stamp to the document
  - Certify a document with a visible (or hidden) signature so that recipients can verify authenticity with or without seeing a visible signature on the page currently being viewed
  - Automatically embed certificate data to support long-term validation
- Validate documents
  - Validate all signatures, confirming the identity of everyone who signed the document
  - Validate document integrity by tracking all previously signed versions of a document to verify changes made during the document's lifecycle
- Set privileges and permissions for others
  - Certify a document while leaving portions of it available for form filling, additional signatures, or comments
  - Use Acrobat software to enable users of Reader 9 or later add additional signatures with certificate IDs
  - Use Acrobat to encrypt a PDF document with a certificate ID to restrict editing, or copying.

7.3 ELECTRONIC DELIVERY PROCESS MANAGEMENT

Each district is responsible for having a management plan for quality control of the electronic delivery. It is expected that quality control plans comply with the CADD Manual and this Handbook.

7.4 QUALITY ASSURANCE (QA) – CENTRAL OFFICE ROLE

The Central Office role for Quality Assurance (QA) is to monitor the districts' individual Quality Control (QC) Plans in accordance with the *CADD Manual*. This involves establishing procedures and standards for electronic deliverables and reviewing district compliance with these items. QA also encourages continuous improvement through sharing both ideas and improved technology advances.

Note Districts will be expected to ensure that their own Process Management Plan is in place for Electronic Delivery and that projects comply with that process.

7.4.1 QA Reports

The CADD Quality Assurance Reviews (QAR) of the districts' will be conducted according to the Department procedure and will be based on the published CADD QA monitoring plans of both the districts and ECSO. Reports are distributed to the district Secretaries and other affected offices.

7.5 QUALITY CONTROL (QC) – DATA PRODUCERS' ROLE

Each district shall maintain an established review process to determine and report the quality and compliance levels of project data as it relates to CADD.

FDOT provides tools to help ensure the creation of the standard project directory structure, standard file names and the standard symbology of all design files, in accordance with the specifications in this Handbook. QC software is also provided to check a design file's adherence to the FDOT level-symbology standards at any time during the production phase of the project. The main tools are listed below with further detailed explanation in the sections to follow.

- *FileChecker* – Provides reporting for certain portions of the Electronic Delivery compliance with standards and business rules.
- *QC Software* – The *QC Inspector* is software that contains tools used to check, correct and report the compliancy of elements within any design file against the FDOT CADD Standards. Aside from any corrective functionality in relation to elements, QC Inspector tools do not write any additional information into the design file. All checking and reporting is performed in real time and the results recorded into reporting documents that are saved to the current active project. The following functions of QC Inspector are included:
    - *QC Overwatch* – Runs during the closing of a design file checking all elements within all models of the current design file against the FDOT CADD Standards, then displays the percentage of compliancy.
    - *QC Check* - Runs a check on all elements within all models of the current design file against the FDOT CADD Standards, then displays the percentage of compliancy.
    - *QC Quick* –Interactive QC checking and correction tool. This displays all Invalid (non-standard) element information in a QC Quick report.
    - *QC Batch Report* – Interactive tool that runs a check on all elements within all models of the current design file against the FDOT CADD Standards, and then creates a Quality Control (QC) Summary Report required for the electronic delivery of all FDOT Project submittals. An optional QC Detailed Report is also available for the user to produce to detail any errors within the selected group of design files.

Important: The FDOT2010 version of the CPCH serves as the transitional and final period for moving from the old GDM QC Process and Software to the new QC Inspector Process and Software described above.

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