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Chapter 7- CADD Quality Assurance / Quality Control

CADD Production Criteria Handbook

7.1 GENERAL

Offices under the direction of the 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 Computer Aided Design & Drafting Systems Office (ECSO) has defined the critical Quality requirements for electronic deliverables in the CADD Manual and the CADD Production Criteria Handbook (CPCH). 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 as defined herein. The ECSO has established a QA monitoring plan for CADD in Florida Department of Transportation (FDOT) to facilitate compliance with these electronic deliverable requirements.

FDOT standards recommend that all critical design files, shared across disciplines and used in quantity calculations for pay items or used in automation by downstream applications, shall meet a minimum 95% threshold of compliance for level-symbology. If submitted critical files do not meet these requirements, a written variance from the FDOT Project Manager with supporting documentation shall be included within the project Journal. A minimum 80% threshold of compliance for level-symbology is recommended for non-critical design files. Every design file shall meet the threshold of compliance as defined in any CADD Quality Control plan and scope approved by the Districts.

Effective utilization of the automated quality monitoring tools, as part of the quality control plan of the designer, will ensure: the delivery of data that can be effectively used by others in automated routines during later project phases, an acceptable compliance rating, and keep projects on schedule by diminishing the incidents of product rejection by those responsible for monitoring the data.

7.2 PRESERVATION OF THE PROFESSIONAL OF RECORD

Whether it be product or management practice, what must occur is to have a sound, uninterrupted legal record of the project data. Therefore it is important that both the data producer and the Department 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. For example: Signature Documents - they are as important as the data, since without them, the data is not considered signed and sealed electronically under Board rules and without these documents, the data and the Signatory's seal cannot be authenticated. The Project CD and the Signature Documents should be looked at in concept as one entity. 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, and including them in the _meta_info folder of the project before delivery to the Department. 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 <u>after</u> a project data set has been secured without violating the security paradigm PEDDS uses. The person doing so 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. The Department 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.

7.3 PROCESS MANAGEMENT

Each district is responsible for having a management plan for quality control of the electronic delivery. Realizing that each district has a slightly different workflow, it is expected that district management plans follow the CADD Manual, accepted practice for electronic delivery and the process chart published by the State Roadway Design Office.

7.4 QUALITY ASSURANCE (QA) – CENTRAL OFFICE ROLE

The Central Office role in the Quality Assurance Plan is to monitor the districts' individual Quality Control Plans for electronic files 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 CADD design/delivery components monitored for compliance:

- Project Directory Structure
- File Naming Conventions (Graphic, Input, Criteria & Geometry, etc)
- Seed File Settings (Working Units & Global Origin)
- DGN Format of graphics files
- Symbology (Fonts, Levels, Colors, Line Style & Weight, Cells) of graphics files
- Plan Sheet Formats
- PostScript / PDF Plot Images
- Certain ASCII Data Files
- CADD Project Journal File
- Project Index(es)
- Compliance Reports for Quality Control
- PEDDS Manifest Document
- Signatory Reports from all professionals responsible for any legal set portions of the project data

7.4.2 QA Reports

The CADD Quality Assurance reviews 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 ASSURANCE (QA) – DISTRICT OFFICE ROLE

Through product quality assessments, each district monitors adherence to established electronic file creation and management procedures, standards and guidelines. 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. This process includes review of elements to ensure that sound project data management practices are being followed.

FDOT provides tools to help ensure the creation of the standard project directory structure, standard file names and the standard symbology of all MicroStation design files, in accordance with the specifications, as defined in this CPCH document. In addition, 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, particularly and importantly, just prior to delivery of the project. The main tools are listed below with further detailed explanation in the sections to follow.

- The ***FileChecker*** program is a tool designed to assist with the Quality Control of Electronic Delivery projects. It is used to examine projects both during development and ready for submission, in order to provide reporting that certain portions of the project follow standards and business rules for the Electronic Delivery.

- The CADD ***QC Software*** components are tools designed to assist the CADD user with the checking, correction and reporting of compliancy of drawing files to FDOT CADD level-symbology standards. The QC Software includes the following components:

  - *OverVuQC* – Automated QC process that automatically performs a Compliance Check upon the closing of an active design file. The compliance percentage displays in a dialog box and is written to the design file for reporting purposes with the QC Reporter process described later.
  - *QCCompliance* - User initiated QC process that performs a Compliance Check at any time during an active design session. The compliance percentage displays in a dialog box and is written to the active design file for reporting purposes with the QC Reporter process described later.
  - *QuikChek* – User initiated QC Checking and Correcting process that compares the elements in an active design file to the level-symbology standards, identifies all non-standard elements, allows for correction of the non-standard elements and performs a Compliance Check on the active design file upon closing of the process. The compliance percentage displays in a dialog box and is written to the active design file for reporting purposes with the QC Reporter process described later.
  - *QCChecker* – User initiated automated Batch QC and QC Reporting process on a user selected group of design files that performs a Compliance Check, writes compliance percentage within each selected design file, and initiates the QCReporter to produce and record an updated QC report on that user selected group of design files.
  - *QCReporter* – User initiated automated QC Reporting process that reads each design file of a user selected group of design files and creates and saves a QC report on the compliance percentage and monitored component status written in each selected design file. The QC report produced by this tool is a delivery requirement and is read by the FileChecker program.

- The **Batch QC** program is a user initiated FDOT batch tool designed that performs a Compliance Check of a user selected group of design files and writes the compliance percentage in each of that selected group of design files for reporting purposes with the QC Reporter process described earlier.

7.5.1 FDOT Filechecker

FileChecker uses data already present in the project to provide broad reporting, such as pre-existing QC reports (*.txt) from CADD QA/QC software (see previous section), and attribute data mined during SheetNavigator runs. The program performs a variety of checks in the project, related to Electronic Delivery, and presents those in color coded reports to the user. The program also provides a powerful search utility

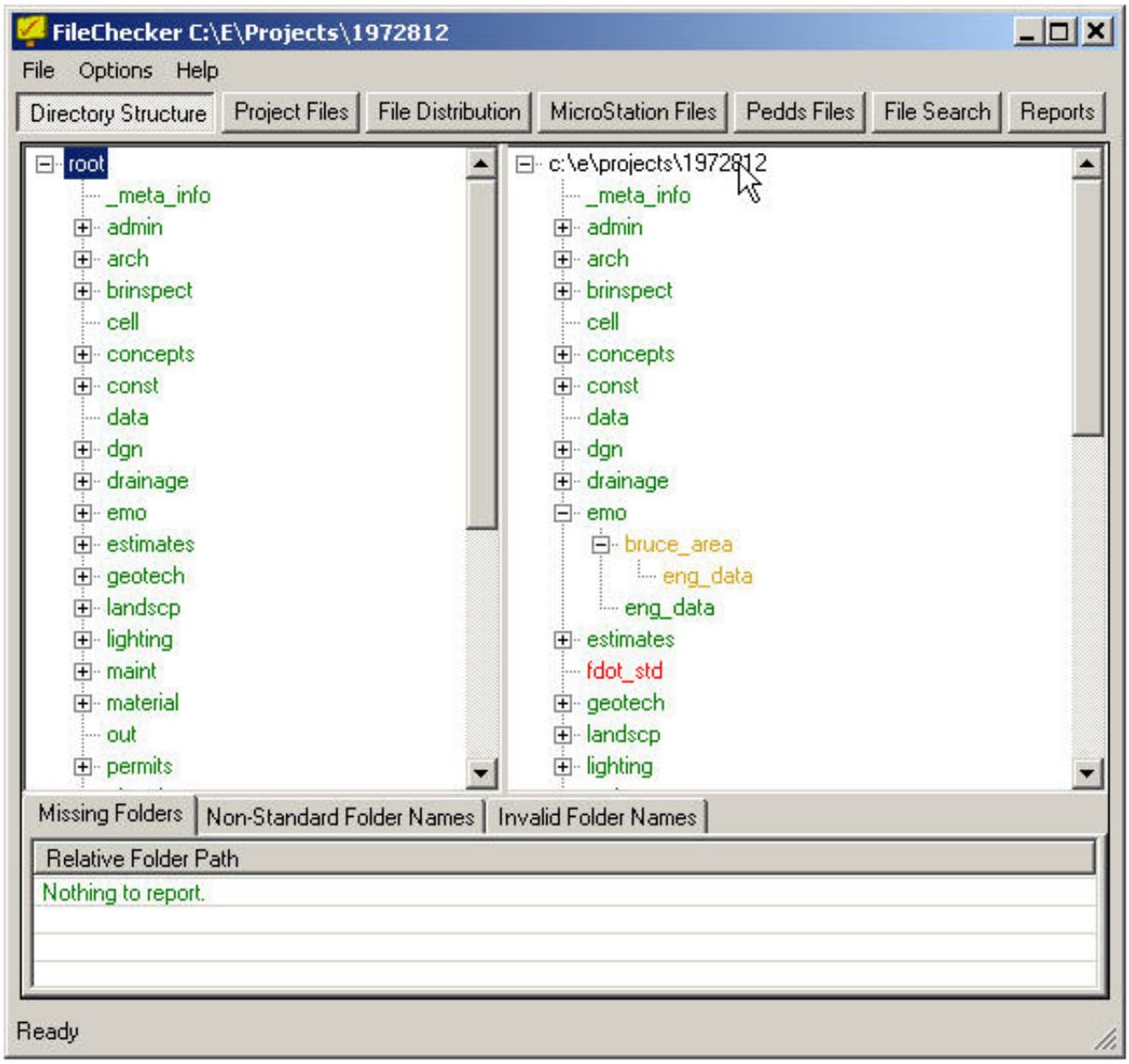
The following list is only a few of the items checked by FileChecker:

- FDOT directory structure (directories added / deleted / and non-standard directories)
- Reports directories greater than 16 chars, containing spaces, multiple consecutive spaces, or special characters in their names
- Full paths to files are 255 characters or less
- Reports file names with spaces, multiple consecutive spaces, long file names, and containing special characters
- Looks for same file names, found in different paths, with same or different file content noted
- Looks same file content, but with different file paths / file names
- Looks for large files (could indicate a problem file?)
- MicroStation files that do not meet FDOT file naming conventions
- Looks for Sheet files that have been signed / sealed, but are not included in the index
- Looks for Indexed sheets that are not signed / sealed
- Determines presence of key ED component files (SheetNDX.htm, ProjectIndex.XML, Project.pdf, Projectfiles.xml)
- Checks that the Indexes validate, and that the Indexes validate against PEDDS data, and against data on-disk
- Searches for QC reports, extracts data into sortable tables, including QC reporting of Critical files

.

IMPORTANT NOTE: FileChecker is only a tool to assist in the examination and reporting of potential issues in projects for the items it checks. This tool does NOT check everything! One should not consider FileChecker a "black box" that will uncover all potential problems. Likewise, the responsible party should always read the reports carefully to determine if items reported are indeed problematic for the project.

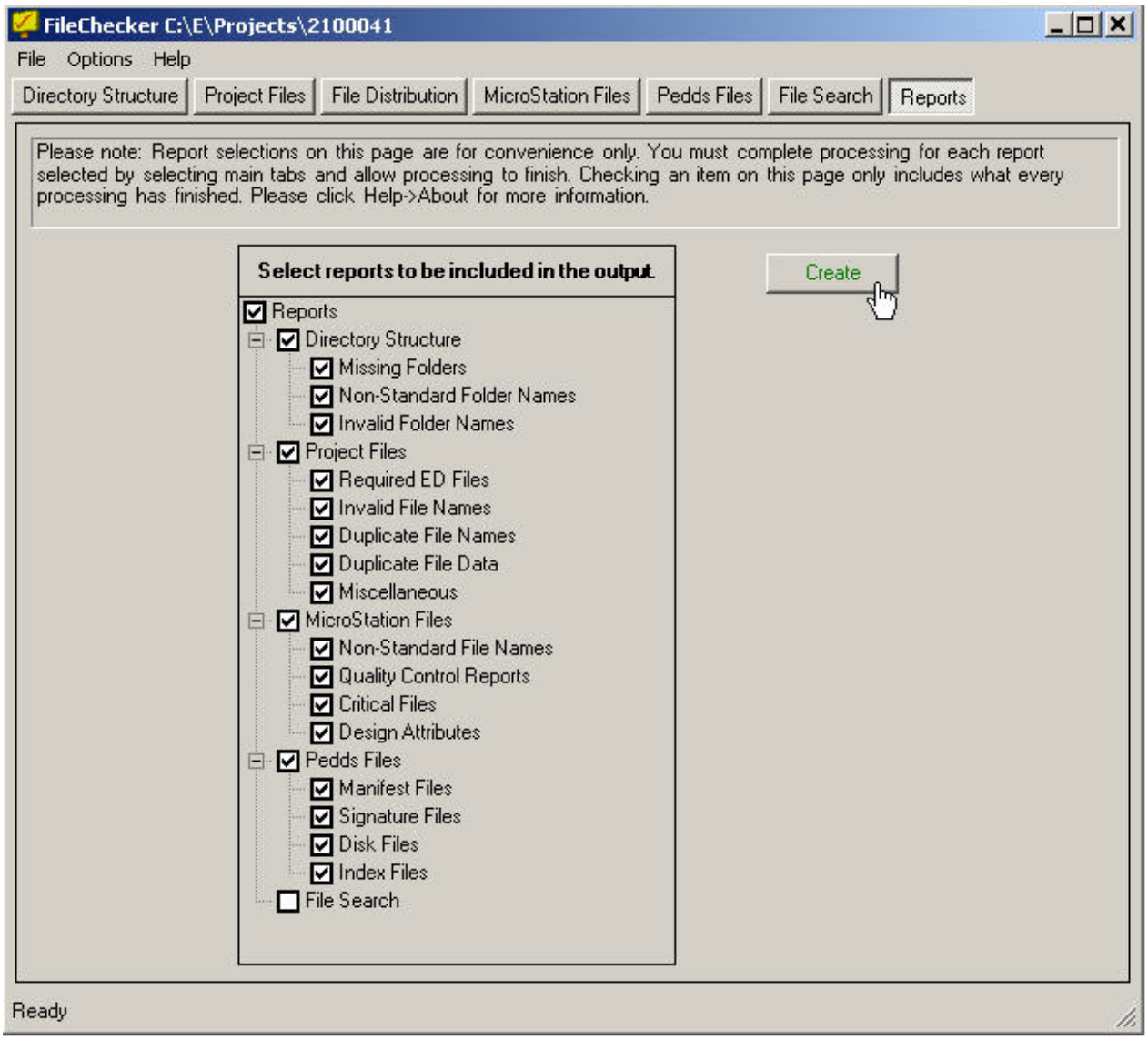
FileChecker's Interface



FileChecker Reports

FileChecker has a series of task buttons running across the top of the interface as seen in the image above. These represent the major reporting tasks performed by FileChecker. Beneath each major task, tabbed windows appear that generally offer a view of the data being reported. Each Task button and Tabbed report should be opened and examined for all project. FileChecker also has a powerful search tool that can search for text strings, including multiple occurrences, within files.

Once all of the screens have been opened and viewed, a report may be saved to disk (in HTML format) for later access from the following screen:



Note: The report screens have additional controls to sort data in columns (by clicking in the column header) and some have pull-down lists to access additional data.

Note: Different components of the screens viewed may be omitted from reporting.

Note: Any report produced by FileChecker contains the following text in the header:

This report flags suspected inconsistencies in an Electronic Delivery project, but does not replace a thorough technical review by a qualified professional or eliminate the responsibility of the user. A report with few or no status errors is a good sign, but does not guarantee an error free project. Likewise a report with many status warning or errors cannot be assumed to indicate an invalid project. The user or reviewer of this report must carefully consider the standards applicable to the project at the time of development.

7.5.2 Quality Control (QC) Software

The QC Software currently requires MicroStation to run and includes several components which support automated and manual checking of design files for compliancy to the FDOT level-symbology standards. The QC Processes records this compliance information within the MicroStation design file and uses it for reporting compliancy in the FDOT Electronic Delivery process. The compliance of the design file is recorded with respect to the FDOT level-symbology standards, as specified in the corresponding "Rule" files established for each of the FDOT Standard Filename. Each QC Component application is described more completely in the sections to follow.

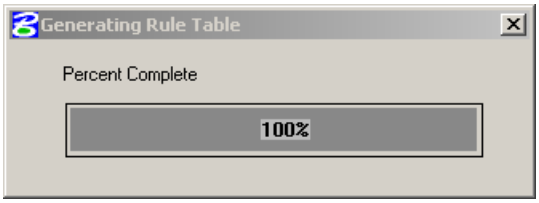
Note: For detailed listing of the current FDOT Standard Files and corresponding FDOT Standard Rule File information, see Chapter 3.10 of this document.

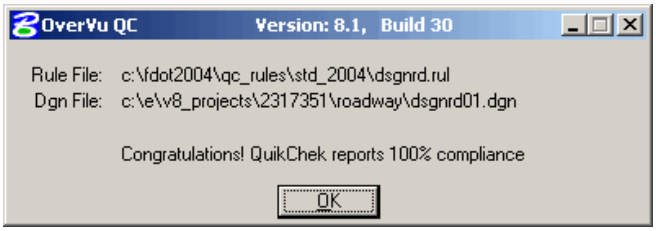
Note: For a more in-depth instructional document on the FDOT QC Software, go to the ECSO Website:

http://www.dot.state.fl.us/ecso/main/fdotcaddtraining.shtm

7.5.2.1 OverVuQC

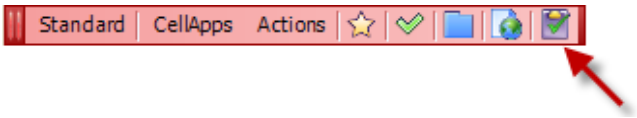
OverVuQC is an automated tool developed to monitor and report adherence of a design file to the FDOT level-symbology standards and keep the compliance information up to date within the design file for later QC reporting purposes required by the Electronic Delivery process. It has no user interface, but is automatically run upon the closing of a design file within the FDOT workspace of a MicroStation session, providing a compliancy check of the active model, writing of compliance information into the design file and then displaying the Standards Compliance Percentage for the user.





7.5.2.2 QCCompliance

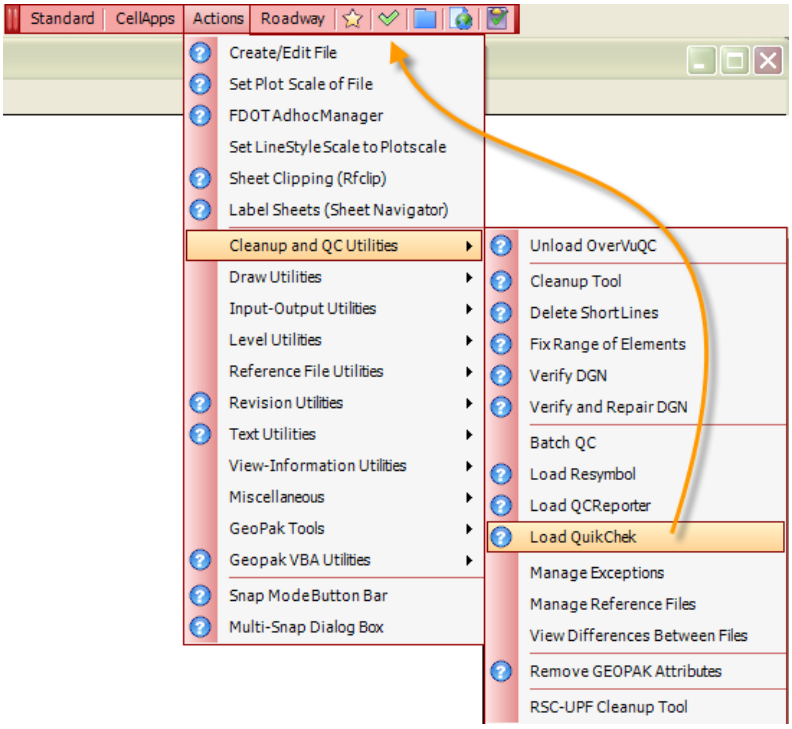
QCCompliance is a tool used to monitor and report adherence of a design file to the FDOT level-symbology standards by checking the compliance of a design file at any time during a MicroStation session and then displaying the Standards Compliance Percentage in the same dialog box manner as OverVuQC. It can be initiated at any time by the user through the FDOT Menu icon within the FDOT workspace of a MicroStation session:

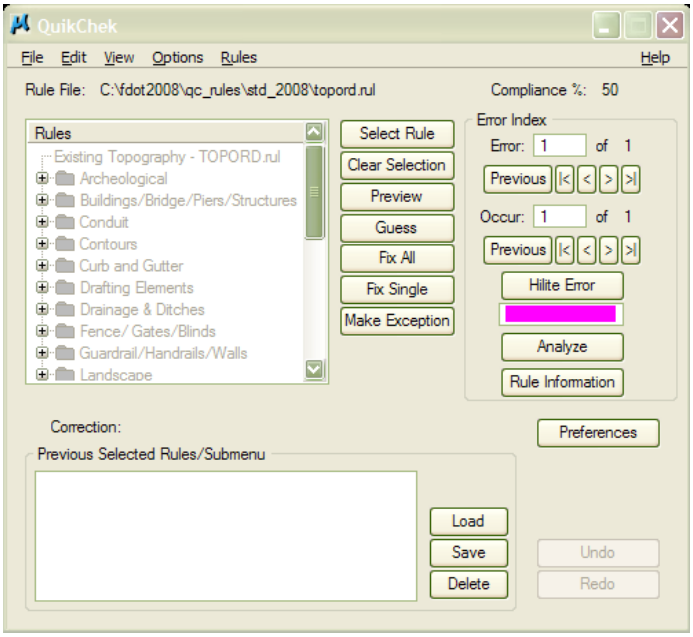


7.5.2.3 QuikChek

QuikChek is a checking and correction tool used to maintain adherence of active models of design files to the FDOT level-symbology standards by identifying non-standard elements, allowing for corrections and exceptions, writing the compliance information to the design file for QC reporting purposes and then displaying the Standards Compliance Percentage for the user in the same dialog box manner as OverVuQC. It can be initiated at any time by the user through the FDOT Menu within the FDOT workspace of a MicroStation session:

(Drop-down: ***Actions / Cleanup and Utilities / Load Quikchek*** or icon)



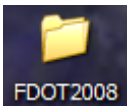


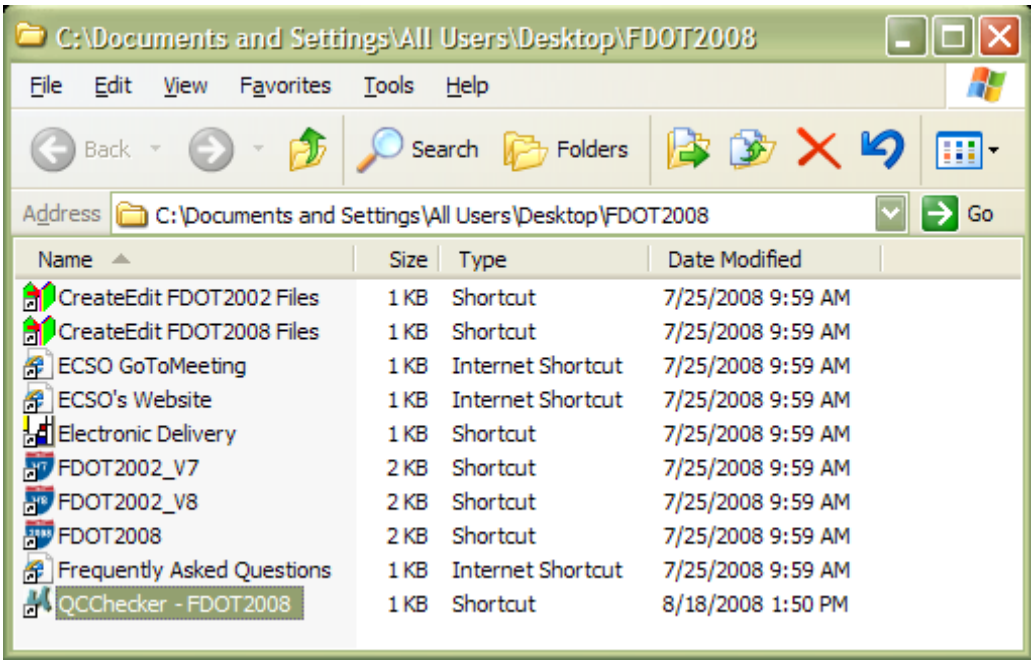
7.5.2.4 QCChecker

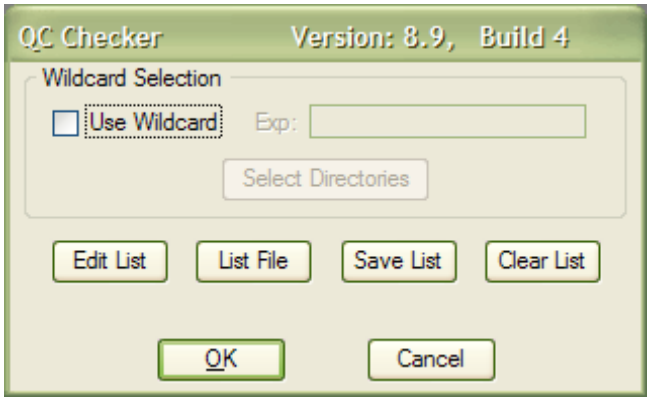
QCChecker is a batch tool used to monitor and report adherence of design files to the FDOT level-symbology standards and create a QC Report of a selected group of design files in one or multiple directories. It is designed to work outside of MicroStation, executing the QuikChek application to perform a compliancy check for each design file of the selection group, then executing the QCReporter to create, save and display a QC Report required by the FDOT Electronic Delivery process.

NOTE: FDOT provides an alternative batch option (compliance check only) through the FDOT Menu option within the FDOT workspace of a MicroStation session. See Section 7.5.3 Batch QC of this document.

QCChecker can be initiated by the use through the FDOT2008 desktop folder icon:

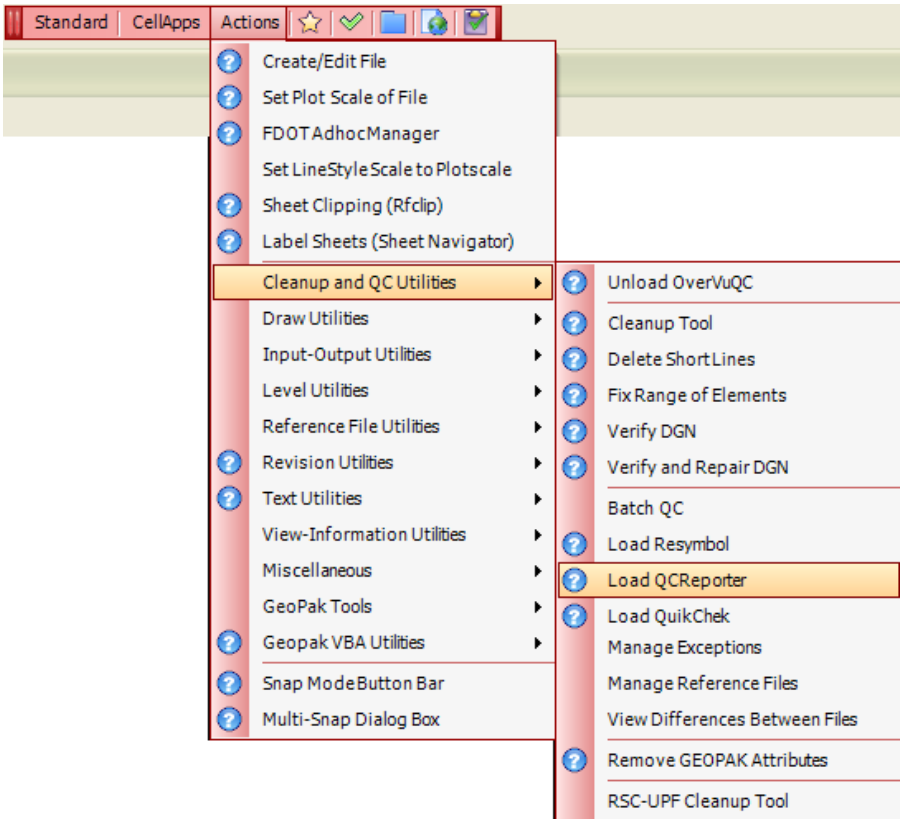


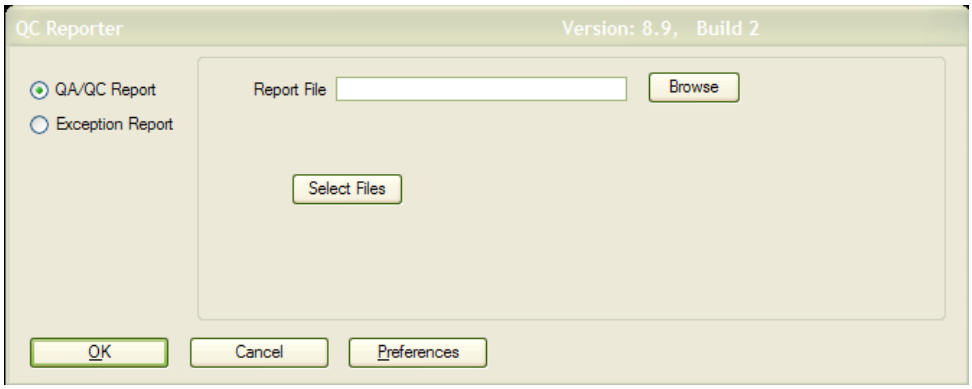




7.5.2.5 QCReporter

QCReporter is a reporting tool used to create, save and display a QC Report of the compliance information stored within design files by the QC processes Quikchek, OverVuQC, QCCompliance and QCChecker. It can be initiated at any time by the user through the FDOT Menu within the FDOT workspace of a MicroStation session:
(drop down: ***Actions / Cleanup and QC Utilities / Load QCReporter***):





The QC Report is a required submittal component of the FDOT Electronic Delivery process, read specifically by the FDOT Filechecker application. It is created in the form of an ASCII text (.txt) file located in the *\<Project\>\<discipline\>\eng_data* directory and performed on a user selected group of design files in various directories. The QC Report is a critical indicator of the quality of the level-symbology found in design files.

Note: This report is not a definitive means to judge the compliancy of the design file, but a tool to gauge whether or not proper procedures and standards have been met. Final compliancy approval lies with the appropriate authorities of each project.

Note: The **QCReporter** does NOT perform a QC compliancy check on the selected design files, but ONLY reports the compliance information recorded within the design file by the various QC processes previously run. This makes reporting fast and efficient and steps can be taken to ensure that the information is current.

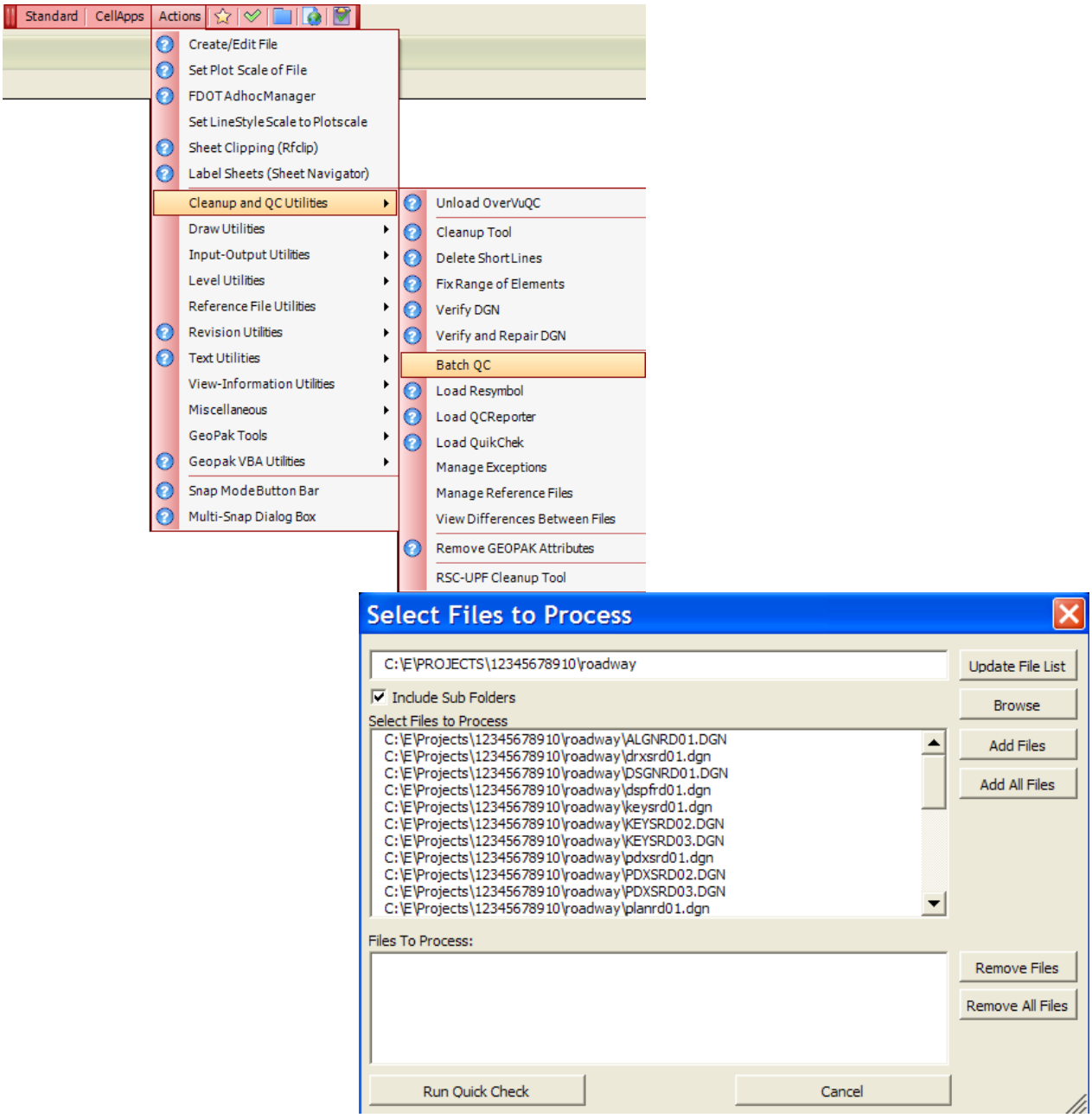
The QC Report includes: ***Design File Name*** – includes location path and Model name; ***Process*** – QC Processes performed on Model; ***Date*** – Date QC Process was last performed; ***Compliance*** – Percentage to which the design file adheres to FDOT level-symbology standard at the time of the last QC Process; ***Added Since*** – Percentage of change since the last QC Process was performed; ***Rule File*** – FDOT level-symbology standard associated with a specific FDOT standard filename; ***User*** – User ID of the last user to perform the QC Process; ***Global Origin***; and ***Working Units.*** It also reports design files that have not been processed, have no graphical elements or has exceptions created as the example displays below:

qcreportrdwy.txt - Notepad

File Edit Format View Help

```
GDM Software QC Summary Status Report    Date: 2007:12:20:19:49

Design file name
c:\e\projects\12345678901\roadway\algnrd01.dgn, Default
     Process      Date            Compliance  Checks  Added since  Rule file      User
     QuikChek     2007:12:20:18:04  100.00%     N/A        0.00%  algnrd.rul   xyzabcde
     Global Origin:     x:7045.55     y:7045.55     z:7045.55      OK
   Working Units: Survey Feet/"      Resolution:  304800     Status: OK
     2D/3D:         OK

c:\e\projects\12345678901\roadway\bdxsrd01.dgn, Pattrd
     QuikChek     2007:12:20:18:04  100.00%     N/A        0.00%  rdxsrd.rul   xyzabcde
***** No Graphical Elements Found
     Global Origin:     x:7045.55     y:7045.55     z:7045.55      OK
   Working Units: Survey Feet/"      Resolution:  304800     Status: OK
     2D/3D:         OK

c:\e\projects\12345678901\signals\dsgnsg01.dgn, Default
     This file has not been processed.

c:\e\projects\12345678901\signing\pdplrd01.dgn, Default
     Process      Date            Compliance  Checks  Added since  Rule file      User
     QuikChek     2009:02:09:11:41   13.00%     N/A        0.00%  drprrd.rul   knasdsm
***** Exceptions
        ExceptionForTesting1            Occurences:2
                ExceptionForTesting1 - description for testing 1
        ExceptionForTesting2            Occurences:3
                ExceptionForTesting2 - description for testing 2
        ExceptionForTesting3            Occurences:3
                ExceptionForTesting1 - description for testing 3
     Global Origin:     x:7045.55     y:7045.55     z:7045.55      OK
     Working Units:      Master:12(')      Sub:25400(")      OK
     2D/3D:         OK
```

7.5.3 Batch QC

The Batch QC is a batch tool used to monitor adherence of design files to the FDOT level-symbology standards by running a compliancy check (only) on a selected group of design files in various directories. It is designed to run within the FDOT workspace in a MicroStation session, executing the QuikChek application on each selected design file, including all models within each design file. This application can be initiated at any time by the user through the FDOT Menu within the FDOT workspace of a MicroStation session:
(Drop-down: ***Actions / Cleanup and Utilities / Load Batch QC***)

NOTE: This is an alternative batch option (compliance check only) to the QCChecker application. See Section 7.5.2.4 QCChecker of this document.