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Title: CADD FILE FORMAT AND TRANSFER REQUIREMENTS			
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ADMINISTRATIVE INFORMATION

This Engineering Instruction (EI) does not supersede any other official issuance. This EI will be incorporated into the CADD Manual at the next opportunity.

PURPOSE

This EI issues the attached document entitled "CADD File Format and Transfer Requirements".

EFFECTIVE DATE

The attached document should be used during the progression of projects initiated after September 1, 2000. Regions may implement the attached document at an earlier date as project conditions warrant.

CONTACT

Address questions regarding this EI to Susan Andrews of the Design Services Bureau at 518-457-6685.

CADD File Format and Transfer Requirements

This document defines requirements for the preparation and transfer of electronic information during the design process. In addition, an outline of what information is to be transferred, the specific format of the information, who is expected to provide the information (the supplier), and who will receive the information (the customer) is defined. Department suppliers refers to persons directly employed by NYSDOT. Consultant suppliers refers to consultant firms hired to provide an engineering services for NYSDOT.

Following are several examples of data flow:

1. A Regional Survey Group or consulting firm (the supplier) provides base mapping to the Regional Design Group or consulting firm (the customer) for use in progressing the design of a project.
2. A Regional Design Group or consulting firm (the supplier) provides engineering services for the entire design of a project and then provides that information to the Regional Construction Group (the customer) for use during construction of a project.
3. A Regional Design Group or consulting firm (the supplier) provides engineering services for Phases I through IV of a project and then provides that information to the Regional Design Group or consulting firm (the customer) for use during Phases V and VI of a project.
4. A Regional Design Group or consulting firm (the supplier) provides engineering services for the design of a project and provides information to a Main Office Program Area (the customer) to provide engineering services on a section of the project.

While this is not an all encompassing list, it does cover the majority of electronic data transfers through the design process.

I. SUBMISSIONS OF ELECTRONIC INFORMATION

- A. The supplier shall provide to the customer the following information in electronic format as described below in items 1 through 7. **The supplier shall use MicroStation® for all graphical CADD work being submitted.** Consultant suppliers are not required to use NYSDOT standard CADD software other than MicroStation®, such as InRoads®, as long as the final submitted format is as shown below. If files (other than graphical files) are translated from software other than NYSDOT standard CADD software, the supplier shall ensure **100%** transfer of data, and all files must meet the requirements specified elsewhere in this document.
1. The supplier shall submit graphics files in MicroStation® (.DGN) format. All CADD Graphics files shall be created using MicroStation®. Files which are .DXF, .DWG, .IGES, etc. are not acceptable formats.
 2. The supplier shall submit surface files in InRoads® Digital Terrain Model (.DTM) format.
 3. The supplier shall submit alignment and cogo point data for all existing features in an InRoads® alignment file (.ALG) format.
 4. If the supplier is required to submit a record plan alignment for a project, the alignment shall be submitted in an InRoads® alignment file (.ALG) format.
 5. If the supplier is required to submit Right-of-way, property, highway boundary lines, or horizontal control, they shall be submitted in an InRoads® alignment file (.ALG) format.
 6. If the supplier is required to submit an ASCII file(s) listing all survey data collected for the project. The format shall be ASCII.
 7. There are additional requirements for electronic information submitted to the Structures Division. These requirements are outlined in the Bridge Data Sheets and listed in the Bridge Manual Appendices 3A & 3B.

B. Consultant suppliers shall submit files provided on one of the following media:

1. 3½" high density floppy disks
2. Compact Disks, CD-R only

The format shall be such that the files can be used on a Windows NT operating system, or current Department standard specified in the Consultant Agreement. If submitting compressed files, files shall be in a format which is self extracting. Files must be placed in their entirety on single disk or CD. Files which have been divided are not acceptable.

C. Department suppliers may submit files to Department customers through the Department's network.

D. All files shall be checked for computer viruses before submission. The supplier shall include a dated log file and a written verification of this virus check which includes the name of the virus check software and version number used and the date the virus check was done. Files which contain viruses are not acceptable.

E. For every project a transmittal letter to the customer shall be prepared which includes a listing of what is on the media being submitted to the customer. The listing shall include file names, the Project Identification Number (PIN), official job title, State Highway Number(s), and reference marker numbers for the beginning and ending locations contained within the files on the media submitted. The listing shall also include a reference between file name (see Section I. H.) and plan drawing number if applicable. The submission shall also be numbered and dated, e.g., Submission #1, 2/12/2000. Each of the individual media shall also be labeled with the PIN, and be numbered and dated. Revisions shall be submitted under the original submission number and include a revision number and revision date.

F. All submissions shall be compatible with the current versions of CADD software in use by NYSDOT as designated in a separate Engineering Bulletin to be issued annually.

G. Department suppliers shall use approved versions of CADD software.

H. Consultant suppliers may submit electronic files in other than the stated versions of NYSDOT CADD software standards, as long as the files are compatible with NYSDOT CADD software standards. A written request shall be sent to NYSDOT stating the version of the NYSDOT CADD software standard the consultant supplier wants to use for the submission. This request shall be directed to the Project Manager/ Job Manager/ Consultant Manager as applicable.

- I. The supplier shall ensure that the contents of all electronic files are the same as any hard copy information submitted (e.g. survey notes, or paper plots).
- J. The supplier shall name the files as outlined by the CADD Manual in the Chapter titled "CADD File Naming Convention".
- K. If the project contains multiple sites, such as several culvert replacements or slope failures, each file relating to a site must also be identified by the corresponding number or letter for each site. The media for each individual site shall include Project Identification Number (PIN), official job title, State Highway Number(s), and reference marker numbers for the beginning and ending locations contained within the files on the media submitted.

II. INFORMATION AVAILABLE FROM NYSDOT

- A. NYSDOT does not guarantee the accuracy or performance resulting from the use of shared computer programs or files including direct, indirect, special or consequential damages. No technical support shall be provided. No warranties are extended or granted, either expressed or implied, with respect to the accuracy and/or performance of any materials provided.
- B. Support files referenced throughout the CADD Manual are available. These files are located on the Department's Public Web site. Consultant suppliers may request this information through the Consultant Management Bureau at (518) 485-8635, or by contacting the Design Services Bureau at (518) 457-6685. Consultant suppliers should provide an active PIN (Project Identification Number) with their request. Department suppliers can obtain support files referenced throughout the CADD Manual through NYSDOT's network. Department suppliers working in off-network locations may obtain these files by contacting the Design Services Bureau at (518) 457-6685. These files include but are not limited to:
 - 1. MicroStation seed files
 - 2. Color table
 - 3. Font resource file
 - 4. NYSDOT custom line style resource files
 - 5. NYSDOT standard cell libraries
 - 6. Named levels files
 - 7. NYSDOT custom toolboxes for level designation assignments
 - 8. InRoads preference files
 - 9. IPlot settings files

- C. The files listed in II. B. are a resource for the supplier and NYSDOT does not require consultant suppliers to use the files listed above. Consultant suppliers may develop their own versions of any and all of the information listed above, as long as they continue to meet all requirements listed in this document and throughout the CADD Manual. Consultant suppliers should include with their submission any support files used to create their submission, if they are other than those listed above.
- D. Department suppliers shall use NYSDOT support files as outlined throughout the CADD Manual.

III. GRAPHICS FILES REQUIREMENTS

A. Requirements for all graphical CADD files

1. All graphics files submitted shall be in a MicroStation® (.DGN) format. **The supplier shall use MicroStation® for all graphical CADD work being submitted.** All graphics files shall conform to applicable Chapters in the CADD Manual. Any questions regarding items not included in the CADD Manual, or interpretations of the CADD Manual should be addressed to the CADD Innovation Section of the Design Services Bureau. Consultant suppliers should direct questions regarding interpretations of the CADD Manual to the CADD Innovation Section through the Project Manager/ Job Manager/ Consultant Manager as applicable.
2. All text shall conform to the requirements outlined in the Chapter titled "CADD Metric Drafting Standards" of the CADD Manual.
3. All text shall be placed view dependent.
4. Named levels shall be identical to those contained in NYSDOT named level files. These files are available, see Section II. B..
5. Text shall be readable from left to right or bottom to top of the final drawing.
6. The supplier shall not submit any files with B-Spline curves.

B. Requirements for Existing Information

1. All topography or base mapping files shall consist of graphic elements representing the existing topography as obtained for the purpose of the survey.
2. Graphics files shall be true three dimensional (3-D) files.
3. All features represented by linear or curvilinear elements shall be drawn using **3-D Linestrings** or **3-D Curvestrings**.
4. All topographic symbols shall be placed using cells contained in the nysurvey.cel cell library. Cells shall be placed at an active scale of 1 for a 1:100 scale D size plot. Scale factor adjustments shall be made for files mapped at scales other than a 1:100 scale e.g., an active scale of 2.5 for files mapped at a scale of 1:250 for a D size plot.
5. Any baseline alignments, centerline alignments, traverse lines, highway boundary lines, property lines, profiles, and cross sections shall be placed at elevation zero. The distance between station marks for alignments shall be accurate to three decimal places.
6. The supplier shall submit a separate graphics file(s) which contains only the text descriptions and related information for all of the elements in the above described topography file. This file shall be attached as a reference file to the topography file. This file shall contain only text and descriptive information and the following shall serve as the guidelines for the development of this file:
 - a. All text is to be placed on the same level as the feature which it is describing.
 - b. All text shall be placed at either elevation zero or at an elevation equal to that of the feature it is describing.
 - c. The color of all text strings shall be the same as that of the feature it is describing.
 - d. Text strings shall not overlap each other so that they become unreadable on a plot with all of the levels displayed. Point numbers for surveyed points may overlap.

- e. A line string in the topography file shall never be broken to make a text string easier to read. If necessary place the text string off to the side and use a leader line to point to the location of the feature.
 - f. The legend sheet should be identical to the one shown in Chapter 21 of the Highway Design Manual or the latest revision available in the sheets.cel cell library. If the supplier needs to add additional features which have not yet been designated on the legend sheet, they must submit a modified legend sheet outlining these features to the Project Manager/ Job Manager/ Consultant Manager as applicable. Features designated on the legend sheet should not be altered. The legend sheet is available, see Section II. B..
7. The graphics file which contains the text shall also contain all the information relating to signs with the exception of the sign location. Either sign faces or a description of the sign shall be placed in this file.
- a. If the supplier chooses to show sign faces they should be displayed using the nysign.cel cell library. The nysign.cel cell library is available see Section II. B..
 - b. Standard Manual of Uniform Traffic Control Devices signs shall show the sign face.
 - c. Non-standard signs and guide signs, such as business signs, shall have measurements indicating the sign size. The actual face may be drawn or a description of the wording on the sign is acceptable.
8. The supplier shall submit a separate graphics file(s) that contains the point numbers and feature coding for all surveyed points. This file shall be in the form of a reference file attached to the topography file.

C. Graphics File Requirements for Proposed Information

- 1. All proposed mapping files shall consist of graphic elements representing the proposed topography as designed.
- 2. Included in the submission shall be a proposed break line file accurately representing the proposed condition of the project after construction. It shall be created in such a way that an accurate Digital Terrain Model could be created from graphical elements alone. This file shall include an exterior boundary of the proposed work.

3. Centerline alignments, property lines, right-of-way lines, profiles, and cross sections shall be placed at elevation zero.
- D. Graphic Files Requirements for Detail Drawings and Tables
1. All details shall be drawn to true scale unless noted that they are "Not To Scale".
 2. All tables shall be generated using a mono spaced font so that revisions will allow the column integrity to be maintained.

IV. SURFACE FILE REQUIREMENTS

A. Surface File Requirements for Existing Features

1. The supplier shall submit a surface file which is an InRoads® Digital Terrain Model in the **Digital Terrain Model (.DTM)** format. This file shall be representative of the existing ground at the time of the survey and shall have been field edited. This file may be used to develop cross sections, profiles and quantities for the project.
2. If a project contains a bridge(s), then supplemental Digital Terrain Models (DTM's) shall be required for each bridge deck surface.
3. If the surveyed area includes an undercut area or overhang area supplemental DTM's shall be created to accurately portray the field conditions.

B. Surface File Requirements for Proposed Features

1. Department suppliers shall submit a surface file which is in InRoads® **Digital Terrain Model (.DTM)** format meeting all of the requirements listed in Section IV. B. 3.
2. Consultant suppliers shall submit one of the following files listed in Section IV. B. 2. a. and b. to represent the proposed surface as designed.
 - a. A surface file which is in InRoads® **Digital Terrain Model (.DTM)** format meeting all of the requirements listed in Section IV. B. 3.

- b. An ASCII file listing the proposed surface information in STATION, OFFSET, ELEVATION format, from which an InRoads® Digital Terrain Model (.DTM) meeting all of the requirements listed in Section IV. B. 3 can be derived.
3. This file shall be representative of the proposed ground as designed. This file may be used to develop cross sections, profiles and quantities during the construction of the project. All Digital Terrain Models (DTM's) shall be developed using the following guidelines:
 - a. The maximum length between transverse features shall be set to no more than 10 m to allow for a sufficiently dense proposed surface. The maximum length between transverse features on bridge decks or culvert walls should be less than 10 m. Areas with several features, such as curbed areas, intersections, and areas of tight vertical curvature may require more dense transverse features to accurately represent the proposed surface.
 - b. A Maximum Triangle Length shall be set so that triangles do not make erroneous connections.
 - c. Surfaces shall include a perimeter. Inaccurate or extraneous triangles around the perimeter of the proposed ground shall be deleted. Inaccurate triangles include any surface information which does not reflect the actual intended proposed work.
 - d. Problems encountered when building the surface file shall be corrected by fixing the graphic elements or redeveloping the proposed surface involved, rather than by modifying or deleting a point used to create a triangle vertex. The surface file shall be representative of the graphics file containing proposed information that is submitted.

V. ADDITIONAL FILE REQUIREMENTS

- A. The supplier shall provide alignments and cogo points of existing survey.
 1. If the supplier is required to provide record plan alignments for the project, alignments shall be entered using cogo points or computed values rather than picking points from the graphics file. These cogo points or computed values shall be input to four (4) decimal places.

2. Each point defined as a part of an alignment shall have a description. The description shall be preceded by a delimiter such as an asterisk.
 3. Where alignments intersect, event points shall be attached to the horizontal alignment in the *.ALG file, at the point of intersection.
- B. The supplier shall submit an ASCII file which contains a list of all of the surveyed points. This file shall meet the following requirements:
1. It shall be in a linear format with no more than one point on each line of the file.
 2. Each line shall contain the point number, an X, Y, & Z coordinate and a short description of the surveyed point.
 3. Each description shall be readily identifiable using the Code Names as designated in the CADD Manual in the Chapter titled "CADD Level Designations".
- C. The supplier shall submit an ASCII file which contains a list of all final Right-of-way and property line points.

VI. ACCEPTANCE OF SUBMISSIONS OF ELECTRONIC INFORMATION

- A. Acceptance of Submissions for All Files
1. The customer may review and comment on the information submitted by the supplier to ensure conformance with NYSDOT guidelines.
 2. The customer may run a virus check on every submission before doing any other review. If a virus is encountered, said submission will be returned immediately and the supplier will be notified what virus was found and what software package was used to discover the virus.
- B. Acceptance of Submissions for Graphics Files - The supplier is responsible for conformance with this document and may use the same guidelines as the customer to evaluate conformance. Guidelines which shall be used by NYSDOT in its evaluation of the graphics files are listed in items 1 through 5.

1. Graphics files may be reviewed on a level by level basis to ensure adherence to CADD Level Designations or Element Properties as described in the CADD Manual.
2. Graphics files may be viewed from several view rotations (including isometric, front and side views) to examine for elements at incorrect elevations. Elements at incorrect elevations are not acceptable.
3. Graphic elements may be analyzed using the information command within MicroStation® for conformance with the prescribed sizes and other designated attributes.
4. Edit Graphics Software (EdG) may be used to review the graphics files for colors outside the prescribed range or text in fonts other than specified in the current CADD Manual, and any additional items outlined in this document.
5. The customer may not review each and every tie point or sign face in a graphics file to ensure accuracy, but instead may spot check submitted files for inconsistencies.

C. Acceptance of Submissions for Surface Files - NYSDOT shall use the following guidelines in its evaluation of Digital Terrain Models (DTM's):

1. The customer may generate contours and look for inconsistencies, such as a large group of close contours, or pavement areas that do not form "V"'s with the contours. Where these types of problems are encountered the customer will investigate further before requesting clarification.
2. The customer may generate profiles along the approximate centerline of all major roads and streams. The customer will review the profiles for unusual slopes or breaks.
3. The customer may generate cross sections from the approximate centerline of all major roads and streams. Cross sections will be done at 3 m intervals in most areas, and 1 m intervals in the areas of bridges or culverts. The limit of each section will be the approximate limit of survey. These sections will be reviewed for unusual slopes or breaks.
4. The customer may display the triangles in a file to ensure that erroneous triangles have been removed.

- D. Acceptance of Submissions for Alignment Files - NYSDOT will use the following guidelines in its evaluation of the Alignment files (.ALG):
1. The customer may display the alignments and cogo points in a design file to see if they appear in the correct location in relation to the topography.
 2. The customer may generate InRoads® report files based on the alignments and cogo points and compare it against the survey notes submitted by the supplier for accuracy.
- E. Acceptance of Submissions for ASCII files - NYSDOT will use the following guidelines in its evaluation of ASCII files:
1. The customer may review ASCII files to ensure they are in a format consistent to the file content.
- F. Rejection of Submissions for All Electronic Information- If any files submitted do not meet the requirements outlined in this document, files shall be returned to the supplier for correction and re-submission. Upon return of any files, the customer will provide a written explanation of any areas that do not conform to this document. The supplier shall be responsible for finding the source of any error.
- G. Any contacts between a consultant supplier and NYSDOT will be done through the Project Manager/ Job Manager/ Consultant Manager as applicable.