MISSOURI DEPARTMENT OF TRANSPORTATION (MoDOT)

Specifications of Computer Deliverable Contract Plans

Revised June 1, 2009

General Requirements:

The Missouri Department of Transportation uses MicroStation for highway and bridge design and drafting. Highway design surveys and road design computation are achieved by using the GEOPAK software. All department drawings are available to the consultant in a MicroStation DGN format only. GEOPAK deliverable requirements pertain to road design, preliminary design, and survey projects only. Bridge design projects do not require GEOPAK deliverables.

1. The consultant shall furnish to the department all of the contract plan drawings, for an entire project as MicroStation drawings (DGN). The departments preferred format is that of MicroStation 2004 files. All associated files that are attached to the drawing such as cell libraries, line definitions, and reference files must be included. The use of Microsoft Excel spreadsheet program can be used to create summary sheets, however, any type of linking between the files to the contract plans is not permitted.

2. All design elements of the project shall be provided to the department in GEOPAK files completed with the GEOPAK 2004 version.

3. Each drawing file that is part of the final contract set shall be a full size plan sheet of 22 x 34 inches (560 x 865 mm) nominal size. All images shall be within a border of 20.375 x 31.25 inches (520 x 800 mm). The border shall be centered on the plotted page to ensure no part of the drawing is cut off during reproduction. Other than cross section sheets, there shall be one MicroStation drawing file that corresponds to each sheet of the plan set as submitted. The consultant may provide all cross section sheets in a single MicroStation file but must reference MoDOT's border to each individual sheet.

4. The plan drawings shall be to a represented scale. The geometry shall be within a 2D file and consist of vector lines, which can be selected and manipulated. Drawings shall be created in real world modified state plane coordinates at a 1 to 1 scale where applicable and plotted to the represented scale.

5. All drawings shall be self contained or furnished with the supporting library of symbols and details to make the drawings complete in the format provided. MoDOT plots all drawings in a WYSIWYG (What You See Is What You Get) format based upon a MoDOT specific border file attached as a reference file. The department will furnish the appropriate color table through its internet site at **http://www.modot.mo.gov/business/standards_and_specs/geopakstandards.htm.** All line style, cells, and symbology are applied to the MicroStation drawing and not modified at plot time. Drawings that require specific commercial plotting software to

create plots that match delivered contract documents will not be accepted. All drawings must be fully reproducible in black and white. Screening, shading, and use of grayscale on plans will not be accepted for final plans delivery.

6. The department will verify the computer drawings using MicroStation 2004 and GEOPAK 2004. The computer graphic image will be checked against a plotted copy of the drawing furnished by the consultant. All information relating to plotting parameters shall be included in the drawing file. (i.e. weights placed on lines, symbols shown as they should plot.)

7. Drawings shall have a color table meeting department's standards to simplify the transfer process. The department will furnish the appropriate color table through its internet site at **http://www.modot.mo.gov/business/standards_and_specs/geopakstandards.htm.**

8. All drawings shall conform to department drawing standards as shown in the MoDOT Engineering Policy Guide (EPG), and the referenced MicroStation CADD Standards manual. The MicroStation CADD Standards Manual is available from the department's internet site at **http://www.modot.mo.gov/business/standards_and_specs/geopakstandards.htm.** All drawings shall follow the department's standards for names, numbers of levels, colors, and line weights as defined in the appropriate manual. For ease in implementation of these standards, all standard items shown in the above document are selectable from department created MicroStation Settings managers and/or GEOPAK Design and Computation Manager database file (.ddb) that are also available on the department's internet site.

9. Drawings shall be filed in drawing groups or directories with the project number as the name of the parent folder and with file names describing the types of sheet they contain. The MoDOT file naming convention is detailed in the Engineering Policy Guide article **237.13: File Naming Convention.**

10. The consultant shall furnish the computer drawings on CD ROM format. All submittals shall consist of two CD ROMs, one shall be labeled "working set" and one set labeled "archive set". In addition the CD ROMs shall contain a text file describing the contents including project name, drawing names, consultant's name and the date of submittal. This file shall be named CONTENTS.TXT and be located in the root directory of the disk.

11. Drawing files shall be submitted at the point in which all work covered by the contract is complete. Road project files shall be delivered to the Project Manager in the District, or his/her assigned, responsible person in the district where the project is located. Bridge project files shall be delivered to the Structural Liaison Engineer responsible for the project.

12. Copies of the department's format drawings, a copy of the department's standard library of details, and the Missouri Standard Plans for Highway Construction are available on the

department's internet site. Copies of these files will be supplied in MicroStation DGN format.

13. Payment to the consultant for the computer deliverable will not be made until all of the drawings for the project have met the satisfaction of the department.

Specific GEOPAK Delivery Requirements

14. All elements representing existing topography features shall be plotted according to the current MoDOT Survey Manager Database (.smd). The department will furnish the appropriate Survey Manager Database through it's internet web site at **http://www.modot.mo.gov/business/standards_and_specs/geopakstandards.htm.**

15. All survey or photogrammetry information supplied by the consultant and included in the project's development shall be plotted in a MicroStation drawing file (.dgn). The consultant shall also supply the GEOPAK coordinate geometry database file (.gpk) containing the survey and photogrammetry information. A text file index listing the import data set names, their associated point ranges, and description of the data shall also be supplied for each gpk file. The feature codes used in the survey and photogrammetry information shall conform to the MoDOT standard feature codes as specified in the current MoDOT Survey Manager Database (.smd) file.

16. The consultant shall provide a GEOPAK digital terrain model (.tin) representing the existing ground, and any surface from which original ground sections are derived. A text file index describing the tin model, the name of the file, and the derivation shall be included in the final submittal. (For example, but not limited to staged construction surfaces, existing subsurface material)

17. The consultant shall provide the GEOPAK Design and Computation Manager attributes from the standard MoDOT Design and Computation Manager database (.ddb) at the time of letting.

18. The consultant shall provide a GEOPAK coordinate geometry database file (.gpk) containing all chains, profile, and other elements needed to construct the final plans including but not limited to special ditch profiles, sidewalk profiles, wall profiles, etc. The chains and profiles shall have names pertaining to the items they represent. Documentation of all chains and profiles are to be supplied in an ASCII text file.

19. The consultant shall provide MicroStation drawing file(s) (.dgn) containing the pattern lines representing the locations of all cross sections. The pattern lines for each alignment along which original ground cross sections are derived, shall be distinguished either by the pattern line color, or by being drawn in a separate MicroStation drawing file. The pattern lines representing the cross sections used for earthwork shall be distinguished from the pattern lines representing cross sections used for other purposes (for example, but not limited to culvert sections, entrance sections, superelevation transition points) either by the pattern line color, or by being drawn in a separate MicroStation drawing

file. The pattern line file shall also show and label any match lines used in the development of the cross sections.

20. The consultant shall provide MicroStation drawing file(s) (.dgn) containing superelevation shapes used in deriving the proposed cross sections. Shapes shall be constructed for driving lanes only. The shoulders are not to be shaped. Dependent and independent shapes shall be plotted in different colors. Superelevation shapes used for the construction of each cross section file with a different cross section alignment shall be distinguished either by the shape colors, or by being drawn in a separate MicroStation drawing file.

21. The consultant shall provide all input files used to construct the automated superelevation shapes.

22. The consultant shall provide MicroStation drawing file(s) with all cross sections for the project. There shall be a separate cross section file for each cross section baseline along which earthwork is computed. The cross sections in the cross section file shall exactly match the cross sections shown in the submitted cross section sheets file(s), and the cross sections shown on the submitted contract plans. A GEOPAK cross section cell shall be present at the proper location for each cross section in the cross section file.

23. Cross sections shall be submitted for but not limited to earthwork sections, entrance sections, and superelevation transition sections. Cross sections used to compute earthwork shall be shown in a separate file or distinguished by a separate pattern line color from all sections not used for earthwork. The superelevation transition sections included shall be at the following locations as described in the standard plans 203.20#, and 203.21#, where # is the current standard revision: Section A-A (normal crown), Section B-B (0% superelevation), Section C-C (reverse crown), and Section D-D (full superelevation).

24. Earthwork sections and superelevation transition sections shall be perpendicular to the alignment they represent. In areas where alignments meet, and a cross section crosses more than one alignment, the station value shall be plotted at the location the pattern line intersects the secondary alignment(s).

25. The consultant shall provide cross section sheets file(s) containing the cross section information. The cross sections represented in the cross sections sheets files shall exactly match the cross sections drawn in the submitted cross section file(s), and the cross sections shown on the submitted section sheets of the contract plans. A maximum of 255 sheets shall be included in the cross section sheets file. Each sheet shall be within a MoDOT standard border.

26. Any non-MoDOT GEOPAK criteria files used in the project shall be submitted. All non-MoDOT GEOPAK criteria files submitted shall be documented as to their purpose in an ASCII text file that is to be submitted with the criteria files.

27. All GEOPAK Project Manager files and input files used in the development of the plans shall be submitted. The Project Manager files shall be located in the \projdbs directory within the project directory.

Specific Electronic Plans and Design Data Submittal Requirements

28. All contract plans and engineering design data of MoDOT projects shall be submitted in electronic form according to the Engineering Policy Guide articles **237.9: Submission of Plans and Supporting Documents**, and **237.14: Electronic Design Data Delivery.**

29. Electronic plans refer to actual contract plans signed and sealed by the engineer.

30. Electronic design data refers to the electronic design files used in preparation of the contract plans specific to cross sections and terrain modeling for Global Positioning System (GPS) machine grading.