

CHAPTER 1

INTRODUCTION

The Interactive Roadway Design System, IGrds, is a comprehensive set of computer processes for roadway design. The capabilities provided by these processes help the designer:

- Define, compute, and store complete dimensional aspects of the roadway
 - Base line surveys
 - Plan view geometrics
 - Horizontal alignments
 - Terrain representations
 - Vertical alignments
 - Profiles
 - Design cross sections
 - Right-of-way geometrics
- Compute and report
 - Quantities
 - Construction data
 - Bridge geometrics
- Develop graphic presentations
 - IGrds generated graphics
 - Drafting system graphics
 - Plotter output
 - Plan sheet preparation

IGrds capabilities are extremely flexible, and may be selected and used by designers in various combinations and sequences. A possible project sequence is shown below:

1. Enter survey data and make any geometry computations needed for developing alignments.
2. Develop preliminary project alignments using results of step 1.

3. Enter photogrammetric background mapping and cross sections into project files. (Cross sections may also be entered from field survey or generated from terrain models, DTM.)
4. Develop and display design alignments and project geometric layout features using results of previous steps. These steps may be iterated throughout the project design phase.
5. Display terrain profiles from cross section data or DTM and develop vertical alignments.
6. Enter the design data which is necessary to complete the three dimensional definition for any roadway.
7. Compute design sections and earthwork quantities. Display cross sections and haul diagrams.
8. Compute and display right-of-way geometrics and parcels based on alignments and construction limits.
9. Generate pay item quantities, summarize and pass to engineering estimate system.
10. Generate displays of contours and perspective views based on the combination of terrain and design cross sections.
11. Compute elevations and layout geometrics for construction.
12. Compute and display the three dimensional aspects of bridge slabs and frames.
13. Produce various layouts and construction plan sheets.

This rather comprehensive example sequence gives an overall view of IGrds capabilities. The sequence can be varied as needed. The steps can be combined, omitted, or reiterated. The designer starts building files for a project with the first step and keeps adding/modifying as the design phases continue. Textual and graphic results can be reviewed at any point in the design process.

More example scenarios are given in Chapter 9.

The ultimate product of such a sequence would be plan sheets, quantities, and construction layout data.

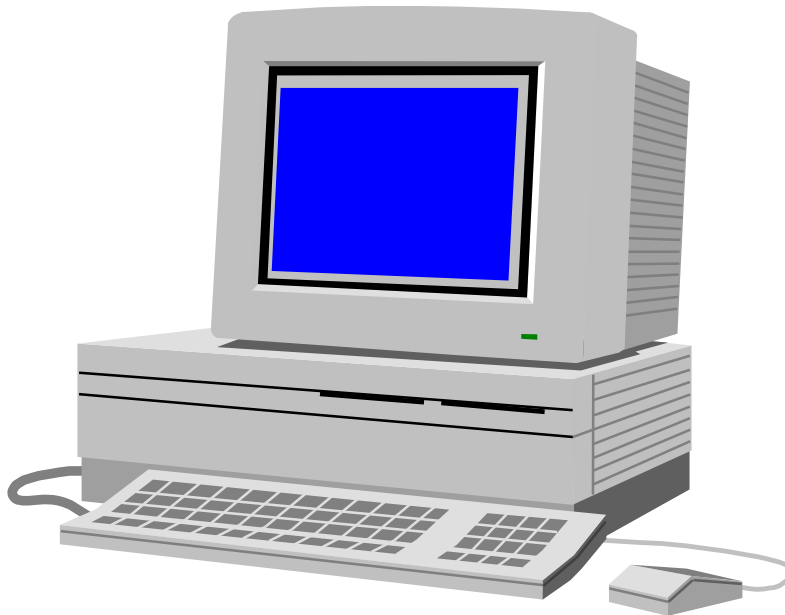
IGrds INPUT OPTIONS

IGrds is available in two options:

- IGrds/IG provides a complete set of automated commands to assist in highway design and plan preparation. The IGrds/IG Option is also integrated with Bentley's MicroStation, a proprietary CADD system. IGrds/IG can be executed in the MicroStation SE, J, and V8 environments. This powerful combination lets the designer select and interact IGrds/IG or MicroStation commands in any order. Computations and graphics can be viewed and modified as they are being created. Results can be produced in printed or hard copy plot form. The integrated automated plan preparation system provides for using IGrds results to produce complete plan sheets.
- IGrds/AN provides most of the functions of the IGrds/IG Option and can produce similar results in a batch mode. Input for a series of commands can be prepared and executed in a batch IGrds/AN run. Output is in the form of printed reports and hard copy plots. Modifications can be made in a subsequent run. Currently, the primary purpose of the AN Option is to bring older batch data sets forward into the current IGrds/IG environment.

INPUT

The IGrds/IG Option provides interactive input using an advanced Graphical User Interface (GUI) operating on a personal computer, as shown here:



The IGrds/IG Option depends on a convenient Graphic User Interface (GUI) for input. The GUI provides menu paths to every IGrds file operation, general setting, command or process. The

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Design Data Manager and Shape Builder functions provide for interactive review and management of design data. Shape data and design sections can be viewed interactively, and shape data can be imported from libraries. Dialog boxes guide user input and make extensive use of default values and predefined parameters.

The IGrds/AN Option uses structured input data records. The designer prepares the desired input and makes a batch run. One of the structured data records is called the Command Structured Language format. It can be used for a wide variety of functions, depending on the data entered.

OUTPUT

Both the IGrds/AN and IGrds/IG Options produce reports which can be printed or viewed on the screen. A variety of line plots can be requested from the IGrds/AN Option. Some of these are also available from the IGrds/IG Option. The IGrds/IG Option produces interactive results on the screen, and also produces graphic output which is stored in a graphic file for display on a graphic workstation screen. The graphic workstation provides for versatile display and plotting of any data stored in the graphics file.

MANUALS

This manual describes general concepts that apply to both the AN and IG Options of IGrds. Its intent is to help the designer understand how IGrds works - to explain in detail the background, methodology, and basic concepts used in either or both Options. It may be used as a reference to supplement the following manuals that describe how to use IGrds:

- Functional Description - A synopsis of the specific capabilities of the system
- User Manual, IGrds/IG Option - A detailed description of each IGrds/IG command
- User Manual, IGrds/AN Option - A detailed description of each IGrds/AN system input record
- System Manual – A detailed description of the operational characteristics of the system.

ORGANIZATION OF THIS MANUAL

IGrds concepts are discussed under the following topics:

- Chapter 2 - General IGrds Concepts
- Chapter 3 - Geometry Processes
- Chapter 4 - Terrain Data
- Chapter 5 - Roadway Design Data
- Chapter 6 - Creation of Design Cross Sections
- Chapter 7 - Earthwork Computations
- Chapter 8 - Graphic Output
- Chapter 9 - Design Scenarios

Additional data concepts are given in Appendices A - P:

- Appendix A - Stationing and Equations
- Appendix B - Horizontal Alignment
- Appendix C - Three Dimensional Geometry
- Appendix D - Vertical Alignment
- Appendix E - Template Processes
- Appendix F - Superelevation
- Appendix G - Widening
- Appendix H - Median Processes
- Appendix I - Sideslope Processes
- Appendix J - Special Ditches
- Appendix K - ROW Maximum Slope Intercept
- Appendix L – Metric/Imperial Conversion Utility

- Appendix M - Ramp Design and Roadway Design Tools
- Appendix N - Template Subcut and Surface Material Removal
- Appendix O - Digital Terrain Model
- Appendix P - Pavement Structure Quantities