

CHAPTER 8

GRAPHIC OUTPUT

IGrds places great emphasis on graphic presentation of computed results for design review, incorporation in construction plans, public hearings, etc. This emphasis also helps designers visualize project requirements to produce the best possible design. IGrds/IG Option graphics is the product of a powerful synergy between IGrds/IG and MicroStation commands.

Key graphic presentation features include:

- The IGrds/IG Option captures and displays graphics immediately as the design progresses in either a 2D or 3D graphics environment. Revisions and corrections can be made as the designer proceeds.
- MicroStation is an integral part of the IGrds/IG Option. IGrds/IG generated graphics can be combined with MicroStation graphics. This greatly facilitates plan preparation using the automated plan preparation system and other presentations.

IGrds graphics can be directed to a number of pen, laser, or electrostatic plotting devices. The following sections discuss IGrds graphic capabilities.

The designer communicates through the Graphic User Interface (GUI) commands, most of which produce graphics for immediate review. Response to command prompts may include:

- Selection and acceptance of graphic elements from the screen
- Mouse button options
- Typed responses

Commands not only produce immediate graphics on screen and in the graphic files of MicroStation, but they also produce IGrds working files which are used by other IGrds processes.

The MicroStation CADD system accepts IGrds graphics along with its other graphic functions. IGrds commands and CADD system commands can be intermixed as the designer chooses. IGrds can take full advantage of the CADD system's multiple graphic planes (levels), line symbologies, colors, cell libraries, etc. The CADD system can be used to manipulate, combine, and augment IGrds graphics along with other graphics and to produce plotted output. As mentioned, IGrds supports both 2D and 3D graphic files.

SYNCHRONIZED VIEW

The Synchronized View (Synch View) capability allows the user to zoom into an area of an horizontal alignment, and, at the same time, see the corresponding area on the vertical reference line (and vice versa). The plan and profile views appear in user selected MicroStation view windows (these view windows must be top view oriented). The general methodology of the Synch View capability is as follows:

- First, the desired MicroStation views for IGrds plan and profile display are selected. These remain the same for each use of the capability until changed.
- The user selects a data point on the plan view. Station and offset coordinates for the active roadway are computed, and the view is centered and zoomed about this point. The zoom factor is user changeable.
- Given the computed station and the maximum/minimum reference line elevations stored for the active roadway, profile view window coordinates are computed. The profile view window is fitted to these coordinates, which corresponds to the plan view range.
- The boundaries and the centers of the views are then synchronized and shown using temporary graphics.
- An option button allows selection of Plan Only, Profile Only, and Plan and Profile.
- The Synchronized Plan and Profile View capability can be invoked from DSD. When the Synch View capability is invoked in this manner, the design roadway station is used to set the plan and profile view orientation.
- When used in conjunction with the Design Section Display, a vertical scan line shows the current location in the reference line for the baseline being used and a 3D line shows the current location in the normal MicroStation views.
- There is an optional dynamic capability to Synch View when used with DSD. The dynamic capability keeps the synchronized plan and profile views centered (or visible) as the user increments the baseline station in DSD. With the option off, as the baseline station is incremented, the user must manually adjust the plan view to keep the current location visible.
- There is also an optional animation capability which allows for the automatic generation of design section display views at specified time intervals.

CROSS SECTION DISPLAYS

Original, final, and design cross sections may also be displayed in the IGrds/IG Option using the cross section modification process, XSM. Although these processes are primarily used for modification, they can also be used for review and plotting. If multiple subsurfaces are present, they are displayed, if desired. Likewise, both finished grade and subgrade surfaces, along with surface material removal and template subcut surfaces, may be displayed, if desired. Any linear 3D geometry element, including its 3D shape, can be projected into cross section views if the element exists at the particular station. In 3D graphics files, XSM displays are shown in the top view. The animation capability described in the previous section is also available for XSM.

CROSS SECTION PLOTS

The IGrds/IG Graphic User Interface provides a dialog box for requesting cross section plots. The techniques for developing and presenting plots are similar to those used in the IGrds/AN Option. The result is different, however. The plots are created in the graphic files rather than as plotter output. They can be viewed and manipulated using the graphic system tools. Hardcopy plots can also be produced using graphic system tools.

Any surface that exists at any baseline station may be plotted, including the following:

- Original terrain
- Subsurfaces
- Finished grade
- Subgrade
- Surface material removal
- Template subcut
- Final cross sections

The IGrds/IG cross section plotting process provides the following features:

- Plot parameter files can be selected from a file dialog at any time.
- Current plot settings in the cross section plot dialogs can be saved to a plot parameter file by the user for future use. All cross section plot dialog settings are included in the plot parameter file and can be saved by the user.
- Within IGrds/IG, all graphic line work for plots use MicroStation standard colors (current color table), weights, line styles, and levels.
- User defined sheet border cells can be used.
- True sized plots (i.e., not scaled) can be created with an optional sheet border attached as a reference file.

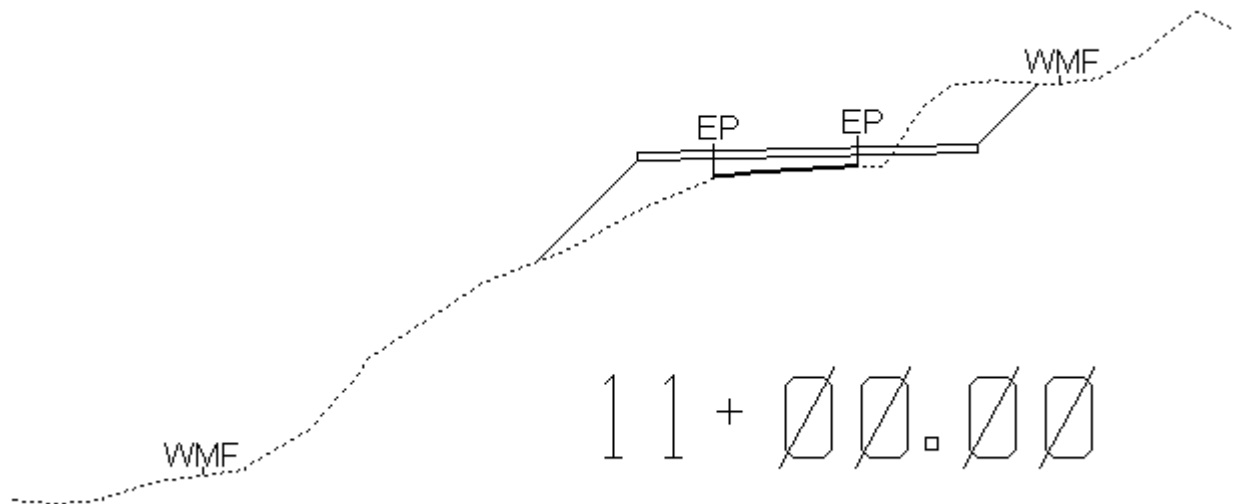
- Line color, style, level, and weight can be controlled separately by surface type and roadway.
- Plot graphics files can be named as desired by the user.
- Plot seed files can be selected from the GUI by the user.

CROSS SECTION FEATURE CODE DISPLAY

The cross section feature code display capability allows IGrds to display breakline and triangle feature code information on original ground cross sections in DXM, O/FXM, Cross Section Plot and Design Section Display. Feature codes information is extracted from DTM surfaces displayed in 3D design files when they exist and stored with the cross sections.

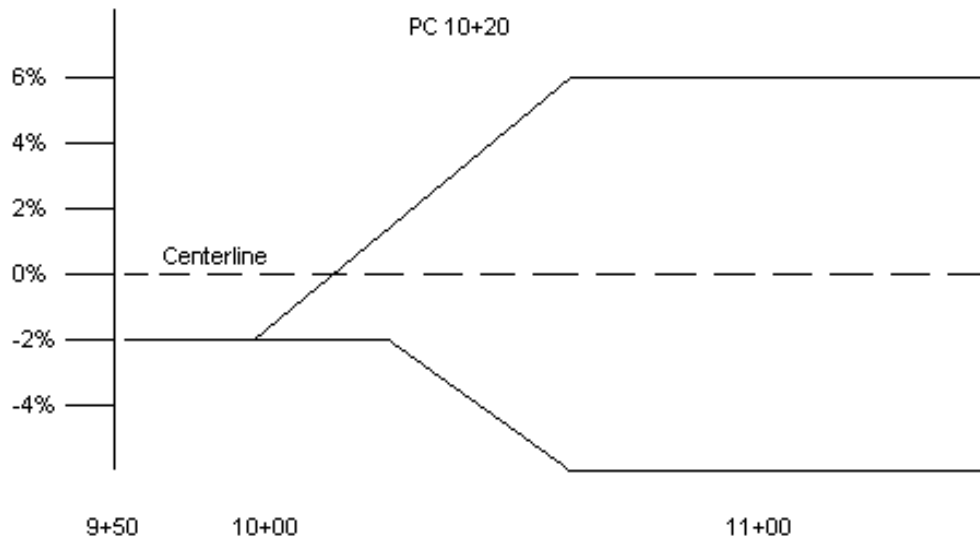
Breakline feature codes are labeled on the cross section, as shown in the figure below. Annotation text (i.e., color, level, weight style, rotation angle, location and leader lines) are all user controlled via external parameters.

Triangle feature codes are viewed in the cross section by a change in the line symbology used to draw the cross section where feature coded triangles exist. This can be seen in the figure below between the two EP breakline feature codes. As with breakline feature codes, the triangle feature codes are all user controlled.



SUPERELEVATION DIAGRAM

In a number of design situations, including ramp merge areas, it can be difficult to match and evaluate cross slopes. Recent improvements in template definition and control along with 3D geometry improvements have made the task of defining ramp areas much easier with string modeling methodologies. But, this flexibility makes the task of reviewing the superelevation much more complicated, since it may be defined by many different methods. While the grade and superelevation report lists the necessary data, often a sketch simplifies the review process: thus the need for a superelevation diagram. A superelevation diagram is a plot of the cross slopes over a range of stations. A portion of a diagram is shown in the figure below:



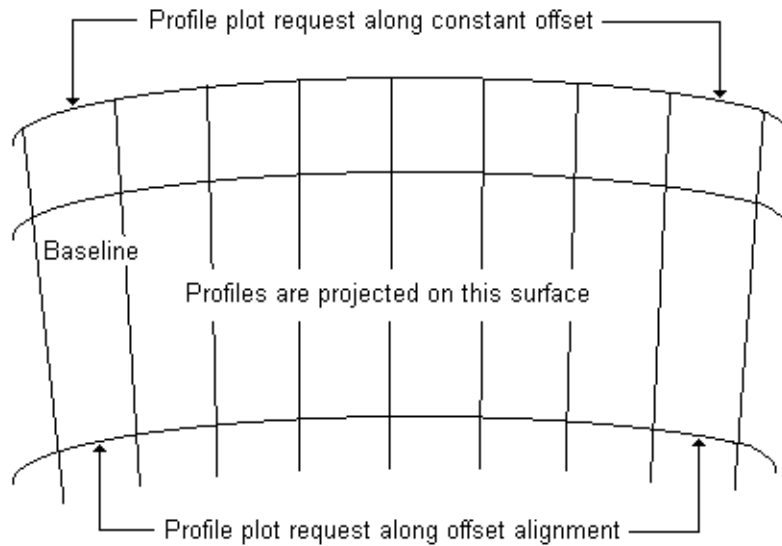
Superelevation Diagram

PROFILE PLOTS

The IGrds project model can be accessed to produce plots of profiles in the following variations:

- Original ground profiles from cross section and/or DTM
- Design profiles
- Combinations of original and design profiles
- Ditch and toe of slope profiles

Profile plots (original, design, ditch, or any combination) may be requested between the same baseline station limits. There is a limit of five profile plots in the IGrds/AN Option, but there is no limit in the IGrds/IG Option. Any profile plot must be located in a vertical surface which is referenced to one of the possible roadways. Profiles which do not lie in that surface must be projected to the surface as shown here. As with cross section displays, within a 3D graphics file, IG Option profile displays are shown in the top view.



Any 3D geometry element can be projected into an IGrds/IG profile view. Linear 3D geometry elements with attached 3D shapes are projected in true perspective.

THREE DIMENSIONAL SURFACES FROM IGrds ROAD DESIGNS

Three dimensional, renderable surfaces consisting of multiple polygonal facets can be generated from IGrds designs. These facets are generated in color based on user definable feature codes. The feature codes are related to the shapes via the design code feature table, which associates IGrds design codes to feature codes. The resulting surfaces can be rendered using the proprietary drafting system.

DRIVE THROUGH METHODOLOGY FOR IGrds DESIGN PROJECTS

Included on the release disk is a document with example projects explaining how to develop “drive through” scenarios for IGrds design projects using standard IGrds and MicroStation tools. The document contains instructions for developing rendered surfaces, drive through paths, etc., using standard IGrds commands. The document also contains instructions for using the MicroStation “Fly Through Producer”, rendering and lighting tools as well as assigning materials to background files that allow for transparency. Several example projects are also provided that show results of the described methodology.

IGrds/AN OPTION PLOTS

The IGrds/AN Option produces a variety of plots which may be directed to various hard copy plotters. IGrds/AN commands provide for user input of plot requests and specifications. The IGrds project model is accessed to produce plots of features such as:

- Horizontal alignments*
- General geometry*
- Alignment related geometry*
- Roadway surface contours*
- General annotation
- Contour line interpolations
- Crown, catch, ditch lines*
- Bridge geometry*
- Grid ticks

* Also available in IGrds/IG Option.

Cross section, profile and haul plots may also be produced in IGrds/AN runs using the similar processes to those used in the IGrds/IG Option.

Note: Ridgeline display and/or plot for the roadway template are only available in the IGrds/IG Option.

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