CHAPTER 4

TERRAIN DATA

IGrds combines terrain (original ground) subsurface and design cross sections to form a three dimensional project model, as discussed in Chapter 2 of this manual. Earthwork quantities and other construction data are computed from the terrain and design cross sections. Similar quantities may be computed from the combination of terrain and final cross sections. These three types of cross sections are discussed in more detail in the following sections.

IGrds makes use of terrain cross sections for three major purposes:

° Determining the dimensions of roadway design cross sections

° Computing earthwork quantities and construction staking data

° Displaying terrain profiles

Terrain cross sections define the terrain surface in a plane perpendicular to a base line alignment at a given station. They may also define the tops of subsurface materials as illustrated on Figure 4-1.

TERRAIN CROSS SECTION DATA

The data for a terrain cross section consists of its baseline, its station, the offset elevation, and the optional feature description for each point in the section. (Any IGrds horizontal alignment can be designated as a baseline.) The possible sources of this data are:

° Digital Terrain Models (DTM)
° Photogrammetry
° Ground surveys

Cross section and profile data from DTM surfaces and subsurfaces can be extracted and entered directly by an interactive IGrds/IG process. Data from photogrammetry or ground surveys must be entered as fixed record input files.

MULTIPLE BASELINES

Cross section data must be referenced to a stationed horizontal alignment; any horizontal alignment can be designated a baseline and an IGrds project can include multiple baselines. Stationing for cross sections must be referenced to a particular baseline. When equations exist in the baseline, they must be properly referenced in cross section data. Cross sections lie in vertical planes which are perpendicular to the baseline at the reference station.
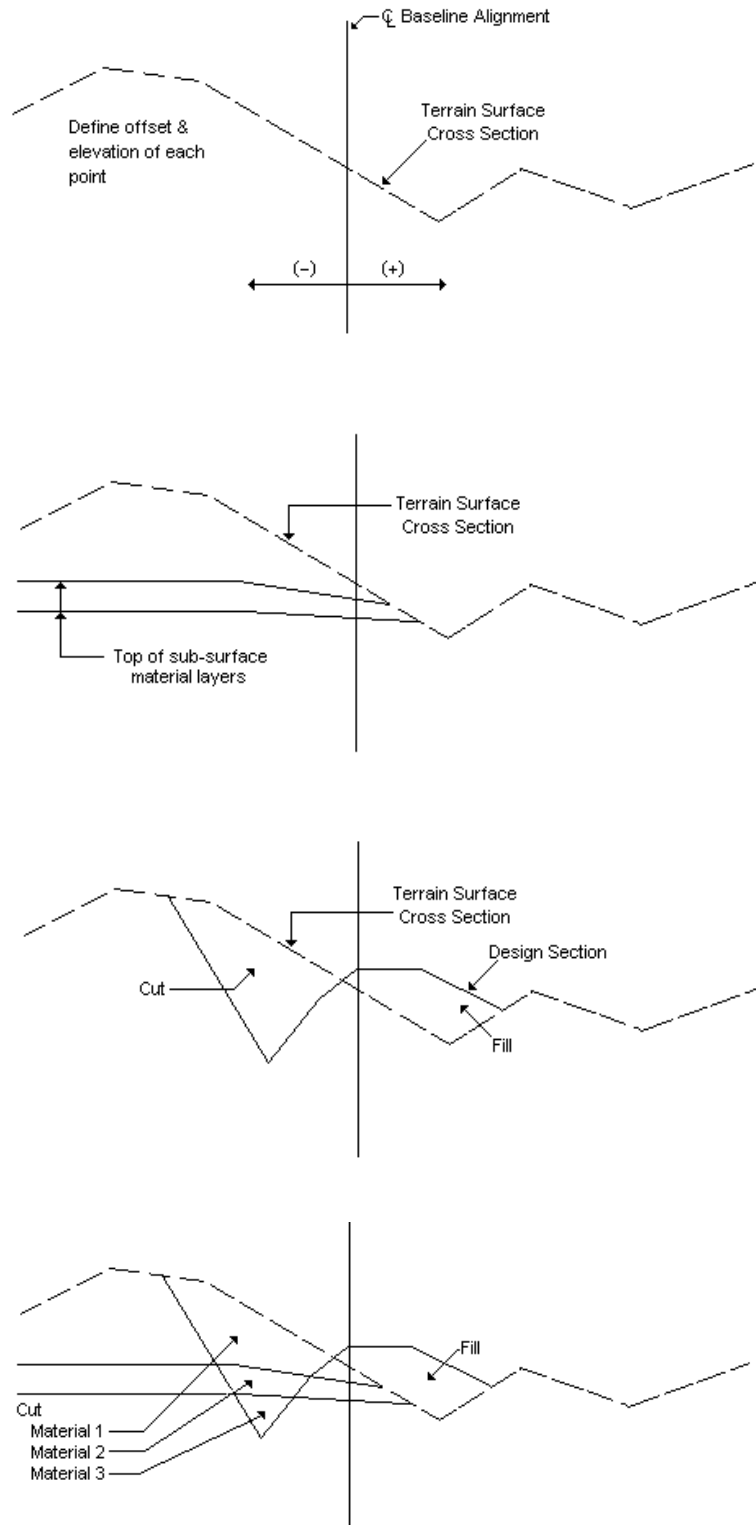
Figure 4-1 - Terrain Data

DTM CROSS SECTIONS AND PROFILES

A Digital Terrain Model (DTM) is a digital representation of a surface. The IGrds DTM processing capability only requires that a 3D design file with the DTM triangles be displayed. This allows any DTM vendor that can display the DTM triangles in 3D design file to be compatible with IGrds. IGrds/IG provides interactive processes for:

° Extracting and storing cross sections from 3D design file surfaces along any alignment (baseline)

° Extracting and displaying profiles from 3D design file surfaces along or at an offset to any alignment or geometry element

° Preparing data in both CAiCE and InRoad format for merging design surfaces using the DTM providers capabilities.

The IGrds/IG User Manual discusses each of these processes. See expanded details for the DTM processing capability in Appendix O.

CROSS SECTION INPUT PROCESS

Cross section data input files may also be entered through the IGrds/IG terrain input process, as described in the IGrds/IG User Manual, or through the IGrds/AN Option as a part of its input data stream. In either case, several standard formats of data records are recognized, and provision is available for user defined records formats. Data from the following field survey methods may be reduced:

° Differential leveling
° Direct rod reading
° Theodolite
° Rhodes arc
° Abney level
° Transit

The process also allows data for the following functions:

° Entering terrain parameters (the type of data input, editing, and report generation)

° Modifying original and final cross sections

- Original or final baseline shift
- Original or final elevation adjustment
- Original or final station adjustment
- Original and design composite sections
- Original and final composite sections
- Modifying original or final cross section left and right limits

°   Entering baseline equations (where needed)

°   Performing partial cross section adjustments to original and final cross sections

°   Entering construction hub data

°   Deleting stored station file data

°   Interpolating or extrapolating original cross sections

°   Indicating types of data to be printed

Instructions for preparing terrain input process input files are given in the IGrds/AN User Manual, Chapter 6.

DESIGN CROSS SECTIONS

The design process calculates design cross sections for a particular baseline and stores them on the appropriate original cross section records. Several other processes use the baseline cross section file records for various operations. These processes include the following:

°   Horizontal Position Process
°   ROW/Maximum Slope Intercept Process
°   Design Section Display Process
°   Volume and Haul Calculation Process
°   Construction Staking Process
°   Auxiliary Listings:
            Staking Details
            Toe of Slope Printer Plot
            Design Cross Section List
            Design Point Codes List
°   Cross Section and Profile Plot Processes

Design cross sections can be converted to original terrain sections or merged with a DTM for use in staged design or construction. Currently, design surfaces can be generated in either the CAiCE or InRoads DTM input format.

FINAL CROSS SECTIONS

Final Cross Sections can be extracted from a 3D design file, or entered by the traditional cross section method.

DTM Method

If Final Cross Sections are stored as a surface within the DTM, then finals can be extracted from the DTM by setting the active DTM surface to the final surface and cutting final cross sections along the appropriate baseline.

3D Design File Method

If Final Cross Sections are stored as a level within a 3D design file, then finals can be extracted by setting the appropriate level on and cutting final cross sections along the appropriate baseline.

Cross Section Method

Within IGrds, final cross section data can also be submitted in the same way as original cross section data, with one exception. If the designer wants to intersect original ground at any point, a negative zero rod reading is entered along with the desired distance, and the final cross section will follow the original cross section until another negative zero is entered. If the distance is outside the original section, the elevation of the last original cross section point will be used. If a negative zero is indicated on a final cross section, but there is no original at that station, then the final section will be skipped.

CROSS SECTION MODIFICATION

Cross section modification in the IGrds/IG Option may be used to modify and/or add points on an original and/or final cross section. This process can also be used to graphically preview cross sections.

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