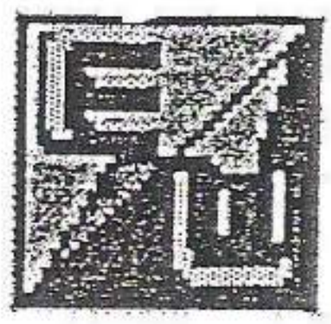

EARTHWORKS

For Windows

USER'S GUIDE

Version 2.5A

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(2)

GETTING STARTED WITH EARTHWORKS

1

What you need to start

There are few minimum requirements to be able to install and run EARTHWORKS successfully.

We assume that

- You have read the owner's manual for the computer you are using, and are familiar with your machine and with using a mouse.
- You know how to use Microsoft Windows ,and are familiar with its terms such as icon, click , double click, menu, window.
- You understand basic DOS concepts such as directory structures and file naming.
- You are a person who is related to earthworks in road construction.

EARTHWORKS and Windows

EARTHWORKS runs under Microsoft Windows, version 3.0 or higher. If you are new to Windows, we recommend that you read your

Windows manual for details and procedures for using Windows before running EARTHWORKS. Understanding how to control Windows, choose commands, and use menus and dialog boxes, will make you familiar with most of the techniques you need to use EARTHWORKS.

Software and hardware

The minimum software and hardware you need to run EARTHWORKS are:

- MS-DOS or PC-DOS, version 3.1 or higher.
- Microsoft Windows, version 3.0 or higher.
- To run in standard mode, a personal computer with the Intel 80286 processor (or higher) and 1 megabyte or more memory.

Or:

- To run in 386 enhanced mode, a personal computer with the Intel 386 processor (or higher) and 2 megabytes or more memory.
- A hard disk with 5 megabytes of free disk space, and at least one floppy-disk drive.
- An EGA, VGA, or similar high-resolution monitor that is supported by Windows.
- A printer that is supported by Windows. If you are using laser printer its minimum memory should not be less than 1 megabyte .

- A mouse that is supported by windows. Though it is not required, a mouse is highly recommended because it makes the program easier to use.

Installing the program

You must Install the program before you can use it. Installation procedure copies EARTHWORKS files to a directory called \EW on the current drive of your hard disk, or if you prefer, to a drive and directory you specify. It also creates a program group and program icon for EARTHWORKS.

To install the program:

1. Insert the EARTHWORKS disk in your computer's floppy-disk drive.

2. Start Windows, if it is not already started.

3. From the File menu select Run. The Run dialog box appears.

4. In the Command Line field, type d:\install where d is the drive having EARTHWORKS disk. Then click OK or press Enter.

5. A dialog box appears, asking where you want to install EARTHWORK. Accept the path displayed, or enter a new path to a different drive and directory on your hard disk.

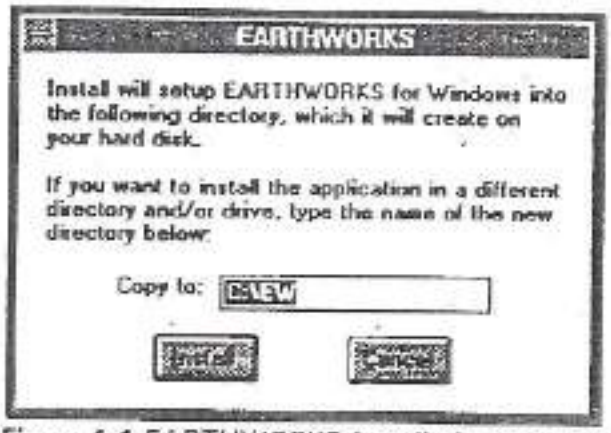

Figure 1.1 EARTHWORKS Installation dialog box

6. Choose Install to accept your entries and to start the installation. The EARTHWORKS program is copied to your hard disk into the selected directory. The EARTHWORKS icon appears in the EARTHWORKS program group .

7. When the installation is complete, put the EARTHWORKS disk in a safe place incase you need to reinstall it.

Starting the program

1. Start Windows.

2. Open EARTHWORKS group window.

3. Double-click the EARTHWORKS icon.

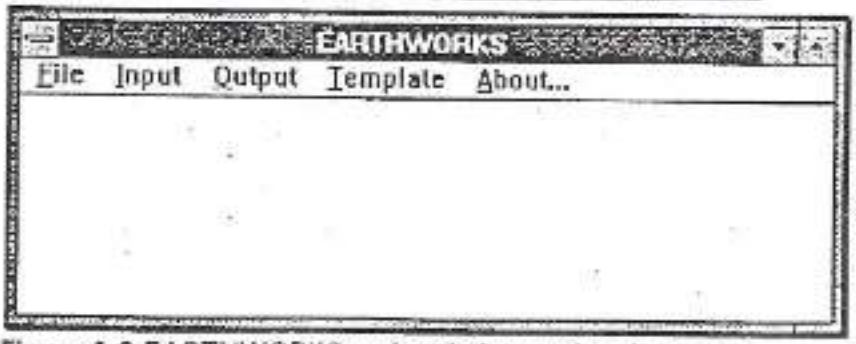

Figure 1.2 EARTHWORKS main window and main menu

7

The main program window appears, with the program main menu displayed.

Quitting the program

From the main menu select File, then select Exit. The program will close any opened child windows and data files. The program will not allow you to quit if it is performing any task like data import / export or volume calculations, or if there is a current critical error. This means that you cannot exit Windows as well. So you must complete the running task or abort it, and you must also solve the current error before quitting.

WORKING WITH PROJECTS
2

Projects and files

Each EARTHWORKS project consists of four files unique to each project, plus three files common to all projects.

Unique files

The unique files store the input data of the projects, like cross section coordinates and global variables data, project's title, description, etc....The unique files' names consist of three parts:

1	2	3
ProjectName	*DataIndicator*	*.Extension*
1-5 char	2 char	2,3 char

1. **Project Name (Code):** This part is used to distinguish between projects and is identical for all unique files of a specific project. The maximum Project's name is five characters long.

2. **Data Indicator:** This part is used to identify the data stored in each unique file. It is two characters long.

3. File Extension: This part is either DTA for cross sections and global variables data files, or EW for project's basic data and printing defaults.

Example

If the project's name is PROJ1, your four EARTHWORKS project unique files are:

PROJ1.EW: Has project's basic data and printing defaults
PROJ1_NG.DTA: Has natural ground cross section data
PROJ1_RL.DTA: Has road cross section data
PROJ1_SU.DTA: Has project's supplementary data (global variables).

Note: Your project's files can exist in any valid directory on your computer disks.

Common files

There are three common files to be used for all your EARTHWORKS projects:

1. EW.INI: Saves the latest used project's name and directory, so when you restart EARTHWORKS program this will be the default project.

2. ST.DTA: Has all your typical road cross sections data.

3. SL.DTA: Has the side slope data related to your typical cross sections.

Note: The common files must exist in Your installation EARTHWORKS (EW.EXE) directory.

Open a project

Select File from the main menu, then select Open.
The Open Project dialog box is displayed listing the existing projects (*.ew files) in the default directory with the default project highlighted.

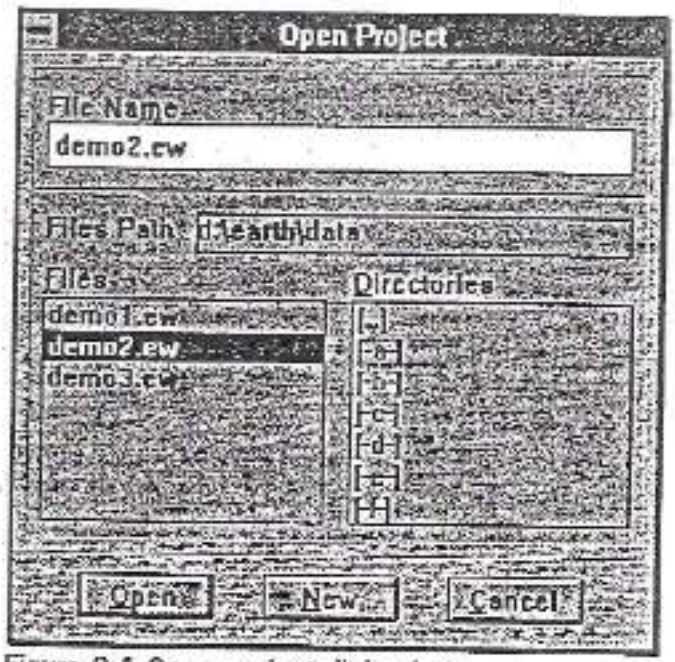

Figure 2.1 Open project dialog box

To open an existing file, select the desired project (file) and click Open button.

To create a new project, enter a new valid project name (1 - 5 characters) in File Name field with .EW extension, then click New button. The program will create empty unique data files for the new project in the current directory.

Project basic data

In both cases, opening an existing project or creating a new one, the program will display the Project's basic data input dialog box. Enter the desired project's data. Projects name and description are printed as two-line reports'

header, the contractor's and consultant's names are printed as reports footer. See Chapter 5 "Printing Results" for reports details.

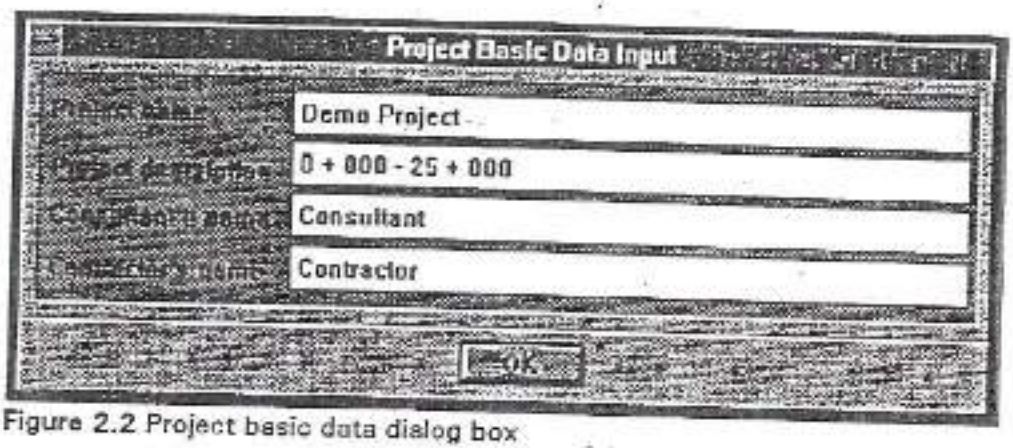

Figure 2.2 Project basic data dialog box

Close a project

To close your current project, select File from the main menu, then select Close. You must close your current project before opening another one.

Quitting EARTHWORKS will automatically close the project. If there is a running EARTHWORKS task or a critical error, you can neither close the project nor quit the program; you must abort the running task and solve the error before that.

Delete a project

You can delete the current project by deleting all its related data (unique) files from your hard disk. To do this, select File from the main menu, then select Delete. The program will warn you before you go on and gives you the chance to cancel the operation.

Data backup

You must back up your EARTHWORKS data on a regular basis. Backups ensure that you have a copy of your data in case your current data becomes damaged. You can use any backup software for this job.

What to backup

To backup a specific project you must backup its four data files, which we are defining here as unique files:

1. *ProjectName*.EW
2. *ProjectName*_NG.DTA
3. *ProjectName*_RL.DTA
4. *ProjectName*_SU.DTA

You must always have the latest modified copy of these files. Also you must backup the second set of data files, the common files, whenever you modify them:

1. TEMPLATE.DTA
2. SIDESLOP.DTA

Note: It is not necessary to backup the EW.INI file, because the program will always create a new one whenever you change your current project.

CROSS SECTION DATA INPUT

3

In this chapter we will show you how to enter ground and road cross section data. Since the procedure is the same for both sections, we will only describe ground cross section input .

Adding new stations

1. From FARTHWORKS main menu select Input.

2. From the Input drop-down menu select Ground Levels option (or Road Levels option, in case of road cross section input). The following dialog box appears.

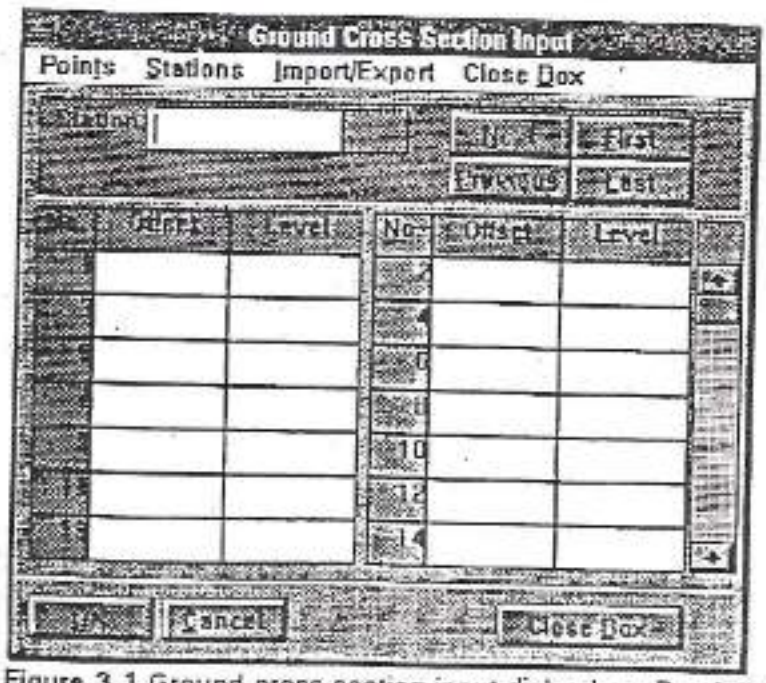

Figure 3.1 Ground cross section input dialog box, Road dialog box is similar.

3. Type the desired station in the station field then press Tab key. The program disables the station field and displays New to the right of the station field if the entered station does not exist in the data file, and it will display Old if the station already exists in the data file. The Caret moves to the offset field of the first point.

4. Enter the offset value, then press Tab key. The counter of cross section points will be incremented by 1 and the Caret will move to level field..

5. Enter the level of the point and press Tab key to move the Caret to the offset field of next point.

6. Repeat steps 4 and 5 to enter all points of the current station, then press Enter key or click OK button. The program will save the station.

7. Repeat steps 3 through 6 to add more stations.

Note: You can enter up to 225 points per section. The number of sections (stations) per file is only limited by the available disk space.

Keeping offset values

In many cases cross section points offsets are fixed for a set of adjacent stations, but levels are different. So the program provides an option to keep and re-display the offsets of the last entered station, and use them while entering the levels of a new station.

If the displayed offset is identical to the offset of the new point, then just press Tab key to skip offset entry, and move to level field to enter the point's level; if not, type the correct offset value and press Tab key.

However, this feature is optional, so you can disable it if you like. To change the option status, choose points from the menu. The last item in points menu is Keep Offset Values, the check mark (✓) next to the option indicates that this feature is enabled.

Figure 3.2 Keep offset values option.

To toggle the option's status (disable it in this case) click on the option using the mouse or use the arrow keys to highlight it then press the SPACEBAR. The check mark disappears indicating that this feature is now disabled.

Editing an existing station

Inserting and removing points

During data entry you may miss or duplicate some points. In this case you need to remove or insert these points.

- If the station you want to edit is not the current one, type the desired station in the station field then press Tab key. If the station is stored in the data file the program retrieves and displays its data.

- Position the Caret at the point which you want to remove or insert, by clicking on the offset or level field of the point or by using the Tab key

- Select Points from the menu then select the desired option (Insert or Remove).

Modifying cross section points

- If the station you want to edit is not the current one, type the desired station in the station field then press Tab key. If the station is stored in the data file the program retrieves and displays its data.

- Position the Caret at the field (offset or level) that you want to edit, by clicking on the desired offset or level field or by using the Tab key.

- Make any corrections for all points that need to be corrected, then click OK button or press Enter key to store the updated data.

Entered / Calculated road cross section points

For road cross section points, the program provides a feature that allows you to differentiate between the manually enterd or imported points and the points that were calculated using template facility (discussed in chapters 6 and 7).

The offset and level fields of a calculated road point has a white background; whereas the manually entered or imported road points fields have a dark background.

This feature makes it easy to spot any manual modifications that are made to the data of a

road cross section that was originally calculated using template facility.

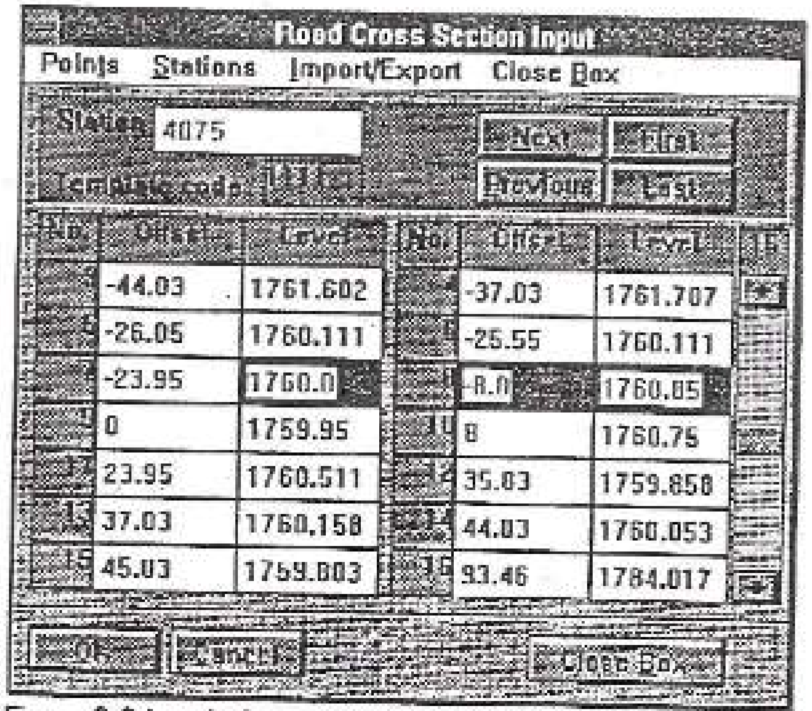

Figure 3.3 Level of point 7 and point 8 was manually modified, all other points are calculated ones.

Importing data from external file

The program allows you to import cross sections data (ground or road) from an external ASCII file into your current data file. The import file format is as follows.

```
600.000        27
   -32.000 617.526 -23.300 616.575 -26.450 616.522 -26.500 616.333
   -22.000 616.480 -17.300 616.483 -16.950 616.668 -15.150 616.664
   -15.000 616.537  -7.600 616.791   0.000 617.000   0.400 617.016
     8.750 617.165   2.500 617.190   7.650 617.855   9.700 617.209
    15.600 617.578  15.000 617.679  17.300 617.477  17.630 617.245
    21.400 617.130  27.000 616.998  27.150 617.163  30.200 617.230
    30.650 617.293  30.350 617.237 131.569 617.293
625.000        25
   -33.000 617.514 -27.700 616.751 -26.350 616.673 -26.600 616.497
   -21.900 616.520 -17.150 616.575 -17.000 616.760 -15.250 616.765
   -15 [illegible] 615  -8.000 616.826  -2.30[illegible]  -1.300 617.130
                     2.600 617.385   [illegible]          9.000 617.356
                    [illegible] 617.737                  [illegible] 617.269

           61[illegible]
      .050 616.915                            [illegible] 627.2[illegible]
    -1.300 617.206  0.[illegible]             1.700 617.813
     2.750 617.237   9.300 61[illegible]  15.650 617.850  15.90[illegible]
    17.500 617.529  17.650 617.276  22.700 617.153  27.900 617.856
    78.000 617.267  30.036 617.307  30.350 617.313
END
```


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Each station in the input file has two parts of information:

1. The header: It defines the station, and the number of its cross section points. Each station has one header line. The columns 1 to 10 have the station value, and the columns 11 to 18 have the number of points.

```
                    1
12345678901234567 8
     600.00         27
station   points number
```

2. The points: Each point is defined by its offset followed by its level, and each line in this part defines 4 cross section points, with 8 columns for each value (offset or level) starting from column 11. You can have as many lines as it needs to enter the complete cross section points.

```
1         2         3         4         5         6         7
01234567890123456789012345678901234567890123456789012345678901234.
  -32.000 617.328 -29.500 616.579 -26.650 616.523 -26.500 616.333
   offset   level  offset   level  offset   level  offset   level
```

This information, station, number of points, and points data (offset, level), is repeated for all available sections.

Note: The file must not have any blank lines.

To indicate the end of data, enter END word at the last line of the input file

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To import a file:

- Select Import/export from the menu, then select Import option. The following dialog box appears.

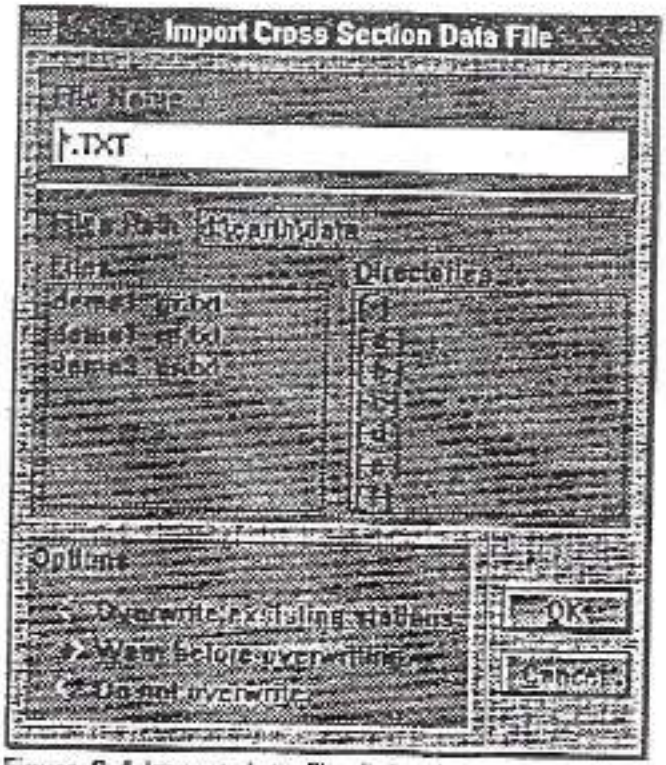

Figure 3.4 Import data file dialog box.

- Use the Directories list box to set the drive and the directory of the imported file. Use the Files list box to select the file.

- Set the desired write option in Options box, by pushing the required radio button. The program provides three different write options:

Overwrite Existing Stations: The program will automatically overwrite any existing station, without warning.

Warn Before Overwriting: The program will prompt you before overwriting any existing

station, so you have the chance skip the update of the existing cross section.

Do not Overwrite: The program will automatically skip any existing station, keeping its current cross section points.

- Press Enter or click OK button to start importing data. A dialog box appears, showing the currently processed (imported) station. You can abort the process by clicking Cancel button.

Exporting data to external file

The program allows you to export cross section data (ground or road) to an external ASCII file. The exported file format is identical to the format of the import file described above.

To export data to an external file:

- Select Import/export from the menu, then select Export option. The following dialog box appears.

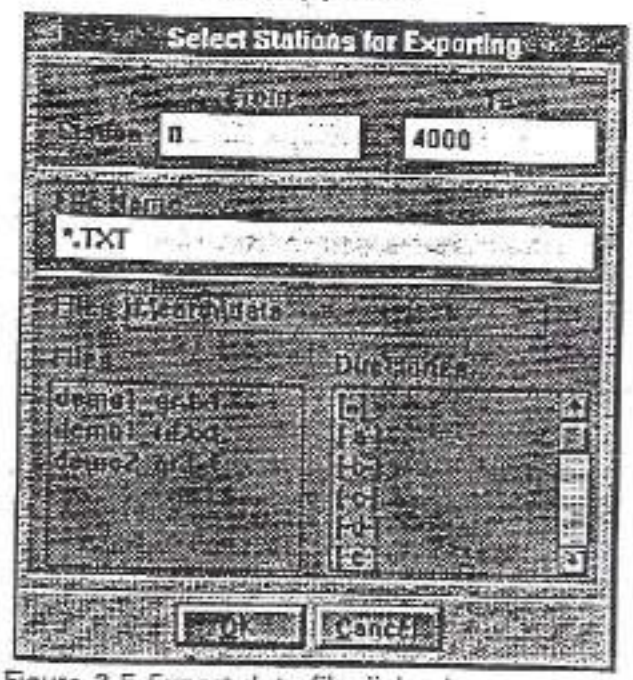

Figure 3.5 Export data file dialog box.

- Define the cross sections range that you want to export by entering the start and the end stations of the desired reach in From and To fields respectively.

- Use the Directories list box to set the drive and the directory of the exported file. Use the Files list box to select an existing file, or type a valid DOS file name in the File Name field.

- Press Enter or click OK button to start exporting data. A dialog box appears showing the currently processed (exported) station. You can abort the process by clicking Cancel button.

Browsing through data file

You can browse through data records (stations) using (Next, Previous, First, Last) buttons, or the similar options available under the menu item Stations.

Retrieves and displays the first station in the file. If the file is empty, a warning message will be displayed.

Retrieves and displays the last station in the file. If the file is empty, a warning message will be displayed.

Retrieves and displays the station that follows the current one. If you reach the end of the file, a warning message will be displayed.

Previous Retrieves and displays the station that comes before the current one. If you reach the beginning of the file, a warning message will be displayed.

Deleting stations

The program allows you to delete the currently displayed station from your data file.

- If the station you want to delete is not the current one, type the desired station in the station field then press Tab key. If the station is stored in the data file, the program retrieves and displays its data.

- Select Station form the menu, then select Delete option. Before proceeding the program asks if you are sure that you want to delete the current station and gives you the chance to abort the process by selecting No button from the warning dialog box.

Note: The Delete option is only available through Ground cross section input dialog box. You cannot delete road cross sections directly. Anyway, deleting ground station will automatically delete the road cross section and any global variables of the same station if any.

Printing stations data

The program allows you to print the points coordinates (offsets and levels) for a range of stations stored in your data files (ground or road).

To print cross section data:

- Select Station form the menu, then select Print option. The following dialog box is displayed.

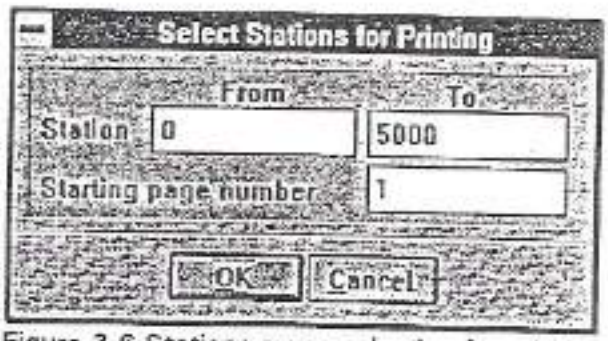

Figure 3.6 Stations range selection for printing dialog box.

- Enter the start and end stations of the desired range in From and To fields, then click OK button or press Enter key to start printing on Windows default printer.

- You can abort printing by clicking Cancel button

DISPLAYING RESULTS ON SCREEN

4

The program provides three different ways to display results on the screen:

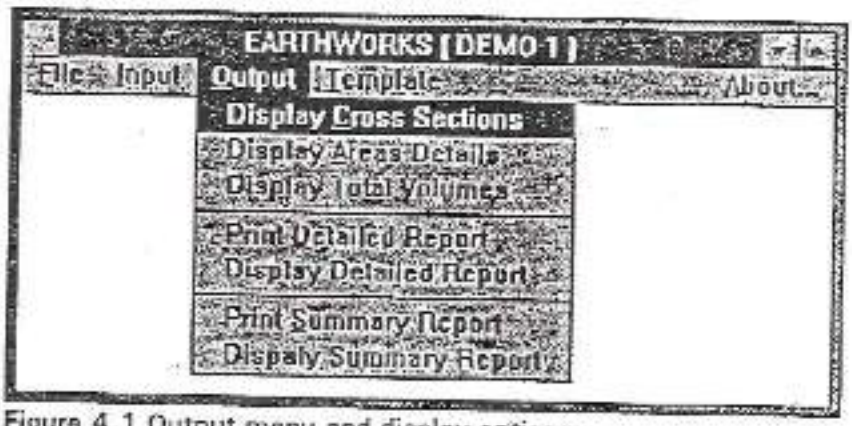

Figure 4.1 Output menu and display options

- Display Cross Sections For checking the entered cross sections data visually.
- Display Areas Details For detailed checking of partial areas, intersection and projection points
- Display Total Volumes For calculating the total cut and fill volumes for a selected reach.
- Display Detailed Report For detailed display of results, includes: road points, ground points, sub- areas and volumes,

zero points, and totals for a selected reach.

- Display Summary Report For summary display of results, includes: total areas, total volumes, and accumulative volumes for a selected reach.

Display cross section

Once you have entered the data for both cross sections Ground and Road, you will use this option to display these sections for easy and fast checking of coordinates, slopes, interface points, etc... Form main menu select Output then select Display Cross Sections.The program will open a new window and display a graph of road and ground cross section for the first station in your current project, and it will display the graph menu of options to move through stations and to customize the graph.

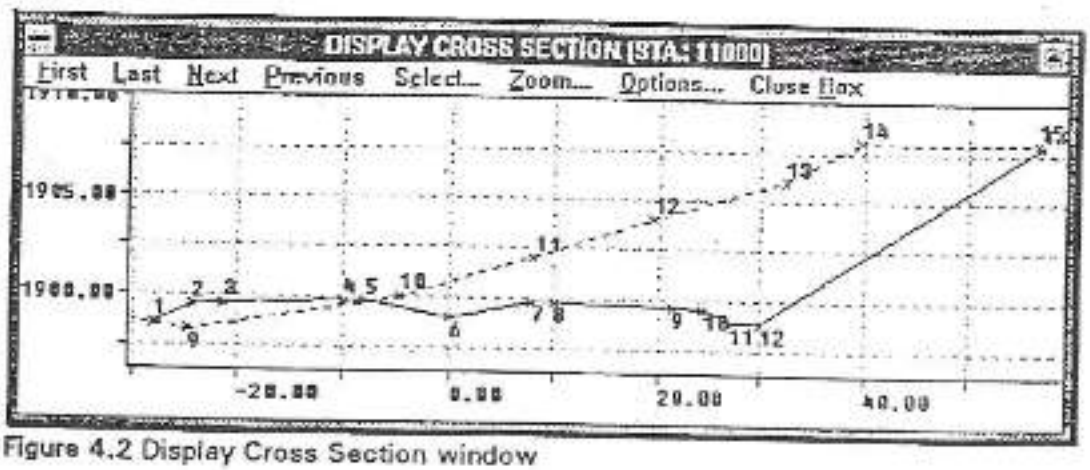

Figure 4.2 Display Cross Section window

Moving through stations

The graph menu provides options to move through stations. You can use these options by clicking the required option or by pressing Alt. key with the first character of the option name:

First Displays the first station in the file

Last Displays the last station in the file

Next Displays the station that follows the current one. If you reach the last station a warning message will be displayed

Previous Displays the station that comes before the current one. If you reach the first station a warning message will be displayed

Select You can select a station to be displayed by clicking on this option. The program will display a dialog box with one entry field. Enter the required station and click OK or hit Enter. The program will display the requested station if it exists in the file; otherwise an error message is displayed

Zooming

You can change the zoom level of the graph by selecting Zoom form the graph menu, the program will display a dialog box that has two scroll bars, horizontal and vertical they control the zoom level horizontally and vertically respectively.

To increase the horizontal zoom by one level, click the right arrow of the horizontal scroll bar; to do the same thing vertically, click the down arrow of the vertical scroll bar. To decrease the zoom by one level, click the left arrow for horizontal zoom and the up arrow for the vertical zoom.

Figure 4.3 Zooming display dialog box

There are five zoom levels (0 - 4). The default is 0 where the complete section is displayed in the window, In this case the graph window has no scroll bars. Once you increase the zoom level vertically and/or horizontally scroll bars will automatically appear, and only part of the graph is displayed. You can use these scroll bars to control which part of the graph you want to see.

Note: You can zoom in the graph by maximizing the graph window; you do this by clicking the *maximize* button of the window

Customize your graph display

You can change the display of the graph by including or excluding some of its elements, like grids or point numbers. To do this select Options form the graph menu. The program will display options dialog box. You can include any element in the graph display by checking its corresponding check box or similarly you can exclude it by unchecking the same box.

Figure 4.4 Display Options dialog box

Another display option the program gives is to specify which section (road or ground) to fit inside the display window. You do this by pushing the corresponding radio button (Road section or Ground section).The default is to fit the road cross section, in this case only part of the ground cross section will be displayed. For some cases you will need to fit the complete ground section, maybe to see if you can use different side slope value or to find out why the program has not calculated the interface point for some sections, in such cases you push Fit Ground button.

After you set the required options click on OK button so that the new options may be active.

Display areas details

Through this option the program provides a way to perform detailed checking for each partial area in two adjacent stations , where the program displays the coordinates that form

each partial area and identifies each point type The following are the available types:

G	Ground point.
R	Road point.
I	Intersection point between ground section and road section.
P	Projection point, where an intersection point of one station is projected to the other adjacent station.

The program draws vertical lines to mark the intersection points and to project these point from one station to the other.

To use this option select Output from the main menu, then select Display Areas Details. The program will open a new window and display a graph of road and ground cross section for the first station in your current project, and it will display the graph menu which is similar to the menu of Display Cross Sections, except that the options here work for two stations concurrently and there is one extra option available: Areas.

Note: When you first invoke Display Areas Details or choose Select from the graph menu to display a specific station, only one set of road and ground sections will be displayed. You can work on that one if you want, or display the second station's set of sections by using Next or Previous from the graph menu.

Here we will discuss Areas option only. For the other options please refer to Display Cross Sections above.

When you select Areas option the program will open a window to display the partial areas

details for the current stations, with two boxes for each station one shows the areas and the other shows the coordinates of the selected area. Use the mouse or Up and Down arrow keys to select a new area and the program will display its points coordinates and types .

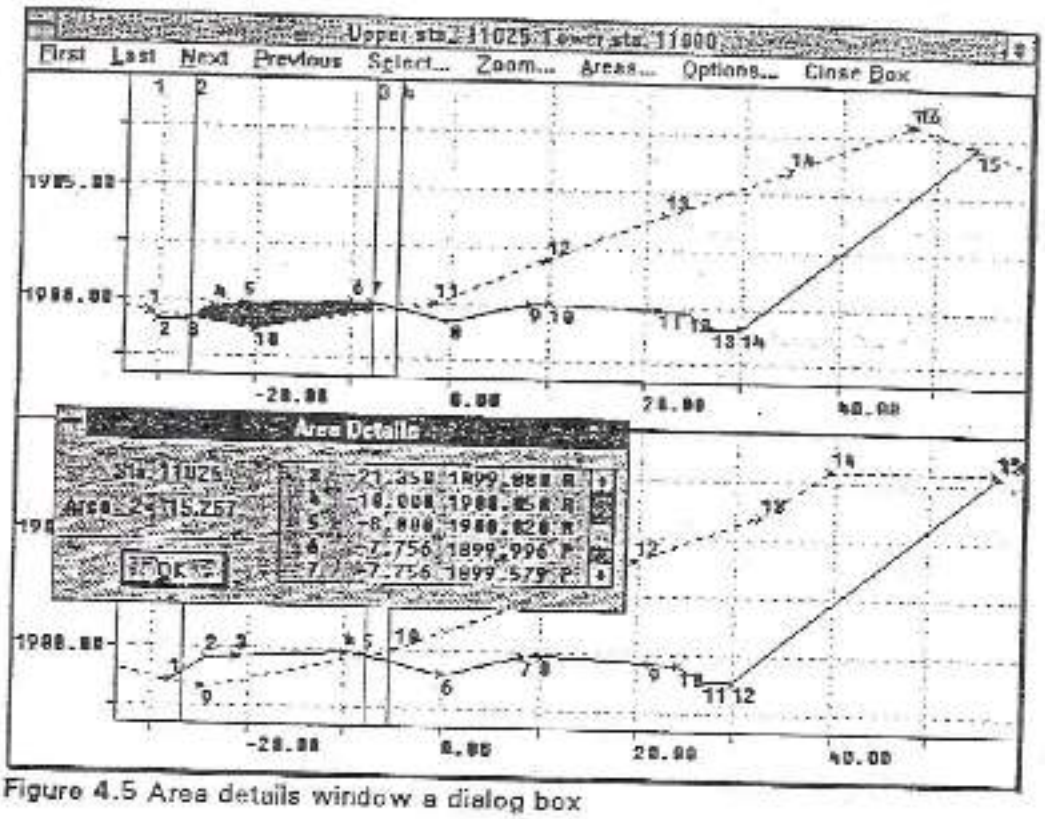

Figure 4.5 Area details window a dialog box

The boxes can display a maximum of five rows at a time. If the areas or the coordinates of any of them do not fit in the box, i.e. there are more than five partial areas in the station, or there are more than five points in the selected area, a vertical scroll bar will appear. Use this scroll bar to see the rest of the data.

You can also check any partial area and display its value with the coordinates of its points and their types by clicking the left button of the mouse between the vertical lines that limit the wanted area. In this case the program will fill the selected area and display its value with the coordinates and types of its points.

Display Total Volumes

You can display the total cut and fill volumes for a selected reach for a fast checking. From the main menu select Output, then select Display Total Volumes. The program will display a dialog box with four entry fields. Two fields are for entering the start and end stations of the selected reach, the default is the first and last stations in the file.

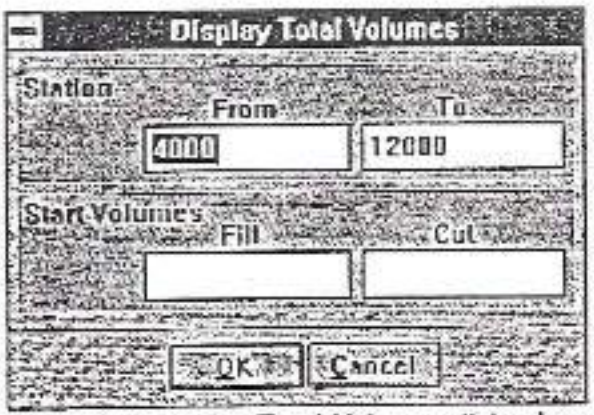

Figure 4.6 Display Total Volumes dialog box

The other two fields are for entering a starting values for cut and/or fill volumes, the program will add these values to the calculated volumes, the default value is zero. After you enter the required data click OK button or hit Enter key, the program will start processing, then it will display the results. You can check the volumes and then close the results box by clicking OK button.

Display Detailed/Summary Report

These two options Display Detailed Report and Display Summary Report displays identical reports to the similar printing options, Print Detailed Report and Print Summary Report described in chapter 5 PRINTING RESULTS. refer to that chapter for more information.

PRINTING RESULTS
5

The program provides two options (reports) to print your results on any printer supported by MS Windows 3.x.

Print Detailed Report
Print Summary Report

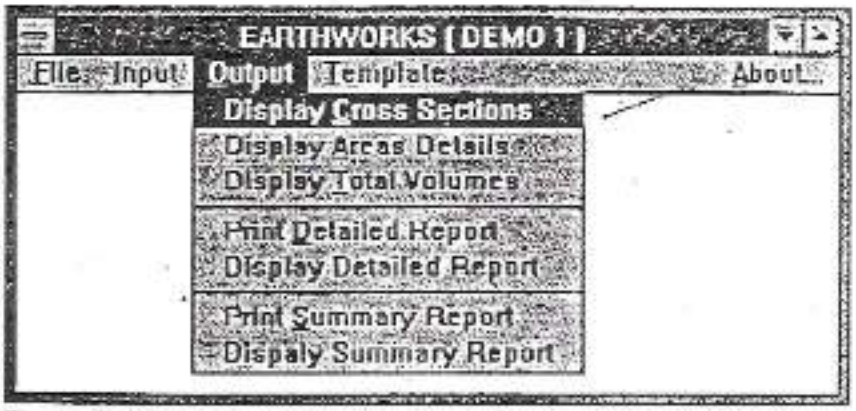

Figure 5.1 Output menu

Print Detailed Report

This report is divided into four parts

1. A graph of the road and ground cross sections.

2. The road and ground cross sections points. In case of road section the program will add to the original road section points any intersection points,

they will be identified by printing an asterisk next to the point number.

3. Sectional sub-areas and volumes. This part has the areas and volumes for both the current station (defined in the report as End) and the previous station (defined as Start). The program will also print the zero line distance -if any- measured from the previous station (Start). If there is no zero line (both sub-areas are fill or both are cut), the distance between the two stations will be printed.

4. Total areas and volumes. This part has the total fill and cut areas for both the current and previous sections with the intermediate volume between them, and the total volumes from the beginning of the selected reach till the current station.

The Report header has the date, the page number, the project name and description and the station. The report footer has the contractor's name and the consultant's name. To enter or change the header and footer data, please refer to Chapter 2 "Working with projects".

To print this report select Output from the main menu, then select Print Detailed Report. The program will display a dialog box to enter the report parameters:

Station / From-To: Enter the start and end stations of the reach you want to report. The defaults are the first station and the last station in the your current file.

Start Volumes / Cut-Fill: Enter the start fill and cut volumes if the report is a continuation of a previously printed one. These volumes will be added as constant values to the calculated volumes, the default value is zero.

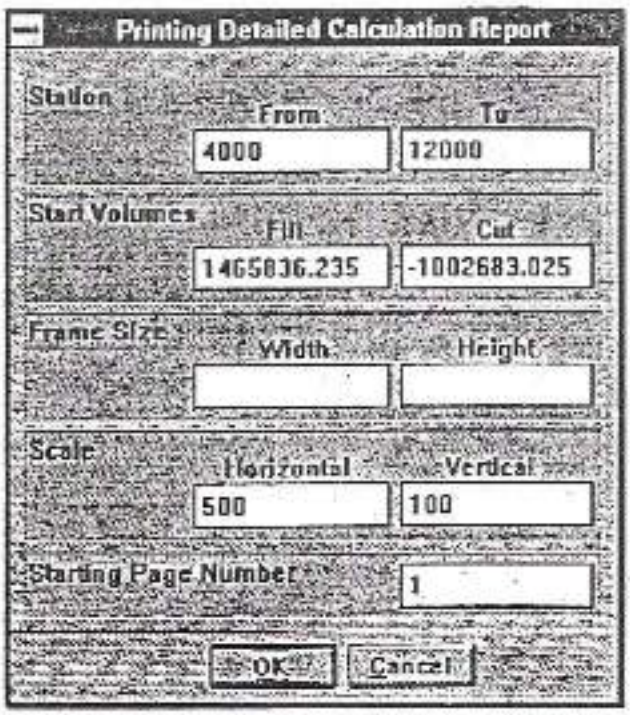

Figure 5.2 Detailed Calculation Report dialog box

Frame Size / Width-Height: Enter the graph width and height in millimeters. The default height is 70 mm., and the default width depends on the paper size, orientation and the printer type.

Scale / Horizontal-Vertical: Enter the graph scales you want to use. For example, enter 1000 if the required scale is 1/1000. The default is to calculate the scales that will fit the complete road cross section inside the graph frame. The used scale is printed on the right side under the graph border.

You can use any combination of the last four parameters: Width, Height, Horizontal and Vertical scales to customize your graph output

Starting Page Number: Enter the required page number if this report is a continuation of a previously printed one, the default value is 1.

Print Summary Report

The program will print a table with the total cut and fill areas for each station in the requested reach. The accumulative volumes up to each station is also printed in the same row. Between every two stations the intermediate volumes of these two stations are printed.

The Report header has the date, the page number, the project name and description, and the report name. The report footer has the contractor's name and the consultant's name. To enter or change the header and footer data, please refer to Chapter 2 "Working with Projects".

To print this report select Output from the main menu, then select Print Summary Report. The program will display a dialog box to enter the report parameters. The Required parameters are exactly the same as the ones discussed in the previous report, except for the frame size and scale which are not needed here.

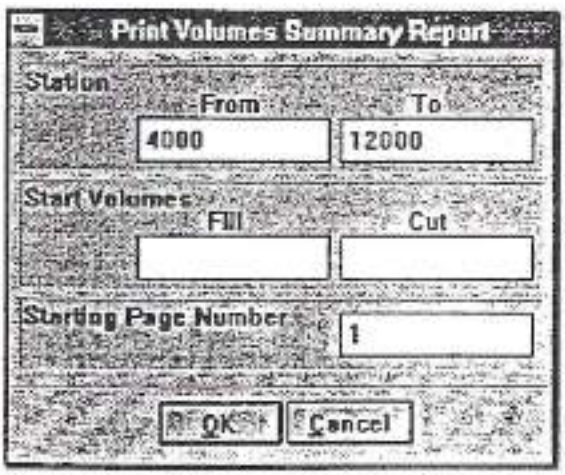

Figure 5.3 Volumes Summary Report dialog

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Selecting fonts

The program allows you to select the name and size of the font that you want to use to print your results. From the main menu select File, then select Fonts. The program will display a dialog box that lists all the available fonts in your system with the currently used font displayed at the top of the box.

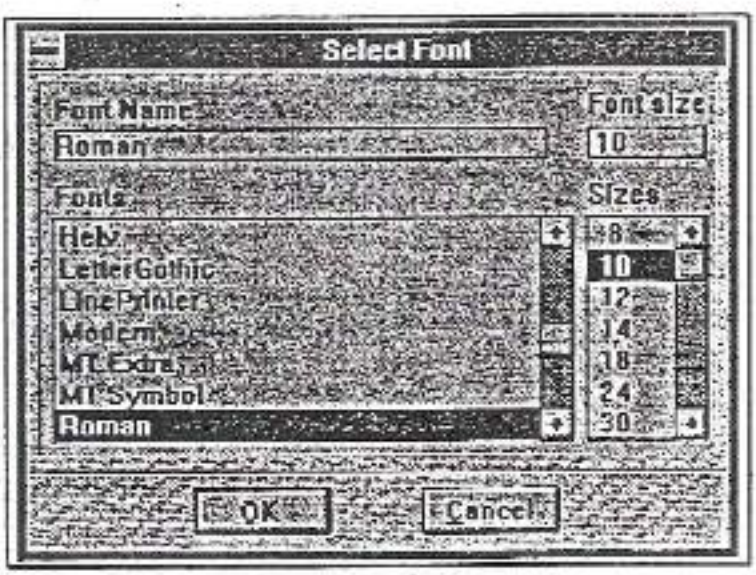


Figure 5.4 Select Font dialog box

Use the mouse or the arrow keys to change the current font and size, then click OK or hit Enter to make your selection active. The selected font will be saved with your current project and it will be the default font when reopening the same project in the future.

Setting printer

The program prints the results on the default Windows printer using the printer default setting and options. To change the printer settings select File from the main menu, then select Printer Setup. The program will display a dialog box of the default printer settings.

Change the paper size, orientation or any other setting as required, then click OK button. To change the default printer use Windows Control Panel.

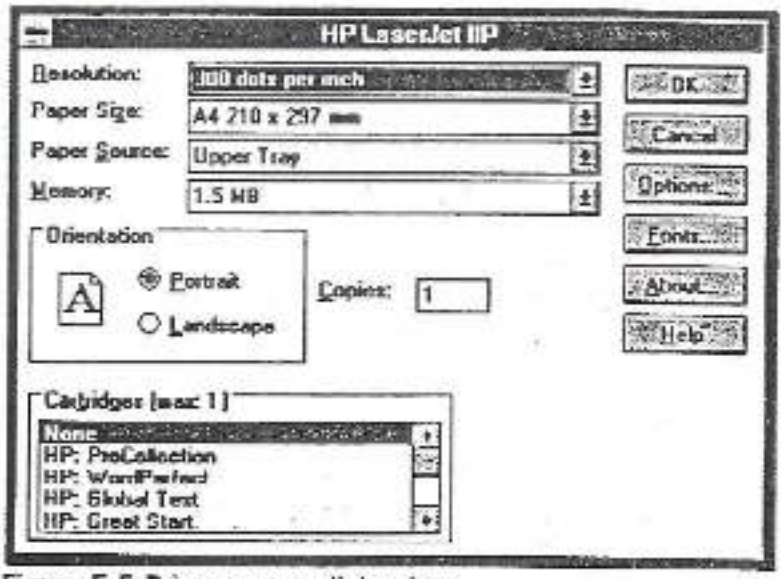


Figure 5.5 Printer setup dialog box

CREATING ROAD TEMPLATE
6

Road Template is a very powerful feature that will eliminate the need for manual data entry for road cross section points. You can define almost any road cross section, including side slopes, as a template then use it to calculate and store the complete road cross section points for every station of the road. This will not only save time but will also get rid of the data entry mistakes.

In this chapter, we'll show you how to create road templates and build your own templates library. In the following chapter we will show you how to use the template data to calculate road cross section points and side slopes interface points with natural ground.

To enter new template you must complete the following four major steps:

- Enter template code and title. You must specify a unique four-character code for every template. If your cross section has service roads then you must use the same main road code for the service road templates.

- Enter template points definition. You need to do this for the main road as

well as for the left side and/or the right side service roads separately if any.

- Select the connection method between the main road and the service roads. There is no need for this step if your cross section doesn't have service roads.

- Enter side slope points definition, for both sides left and right and for fill and cut cases.

Note: You don't need to have an open project file while creating or editing road templates.

Preparing the input data for road cross section

Before you start entering the template you must prepare the input data using typical cross section drawings of your project.

Divide the cross section into three parts:

1. Template points:
   - Main.
   - Service left.
   - Service right.
2. Connection:
   - Left.
   - Right.
3. Side slopes:
   - Left.
   - Right.

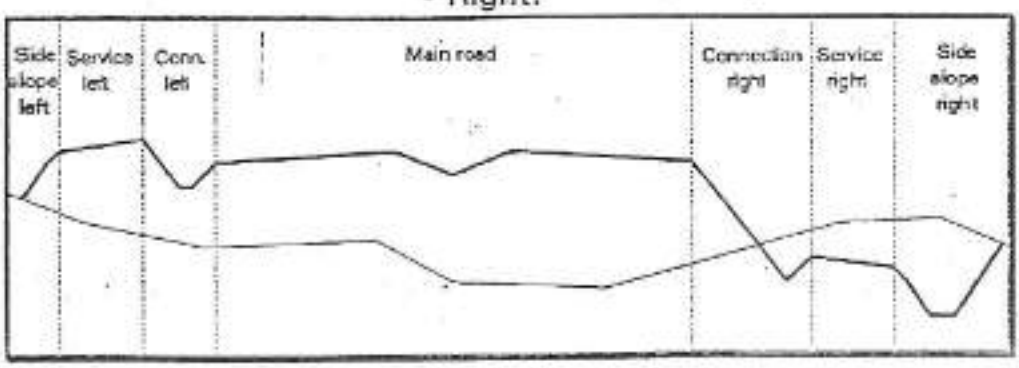


Figure 7.1 Parts of cross section with service roads

If the section has no service roads, you will only have two párts, Road points *(Main)* and Side slopes *(Left, Right)*. Here we will discuss road points. Connections and side slopes will be discussed later in this chapter.

Preparing template points data

Usually the road points limits are the outer edges of the outer shoulders. This applies to the main road as well as to service roads.

Point numbering

Use your typical road cross section drawings and mark the points needed to define the road section. Also mark the two control points and any required help points.

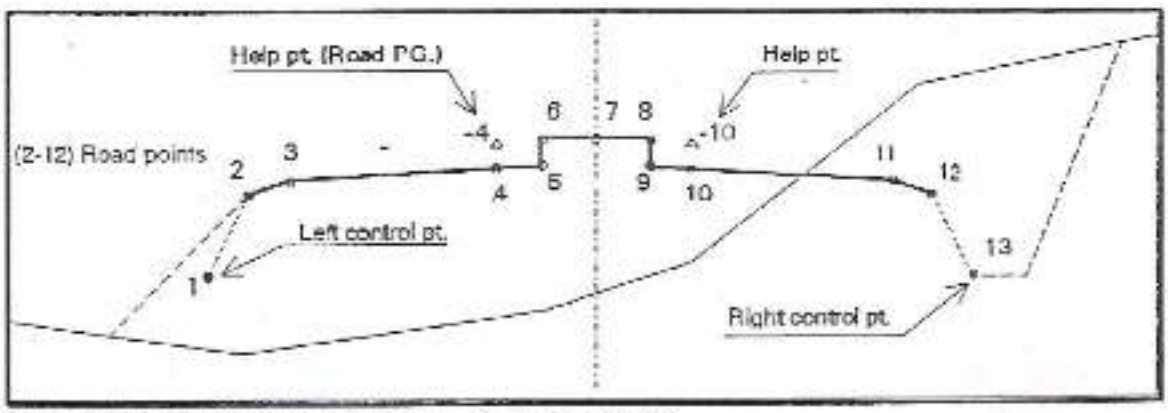


Figure 7.2 Points numbering, road, control and help.

Road points

Starting from left give sequence numbers to road points starting with number 2, *(first and last points are reserved for control points)*. Don't level any gaps so that the last point number should be equal to road points number + 1.

(41)

Control points

The program uses the control points to determine the case *(cut or fill)* for each side of the road section. These points will not be stored as part of the cross section.

Note : If you want to store the control points in road cross section, then add two points to the template and define points no. 1 and 2 using the same coordinates *(offset and level)*, and do the same for the points n-1 and n, where n is the number of template points.

There are only two control points, one on each side of the main road. For sections with service roads, each control point belongs to the service road of the same side.

The number of the left control point is 1, and the number of the right control point is equal to **road points number + 2**.

Usually the inner point of the bottom of the side ditch is considered as the control point.

Help points

Use negative numbers to identify help points, and they need not be sequential.

You can use help points when you want to create a new point and use it as reference without storing it as cross section point.

Defining template Points

Real and calculated points

Every new template point *(road, help and control)* is defined (calculated) relative to a

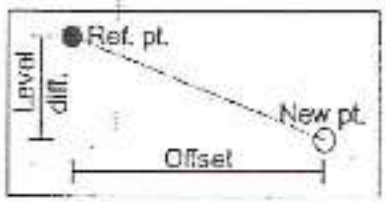
known reference point, and thus becomes known and can be used as reference point for other new points afterwards.

Anyway, you can define new points without reference point *(actually you enter 0 as reference point no.)*. These points are called **real points** because they are defined directlyby their coordinates .

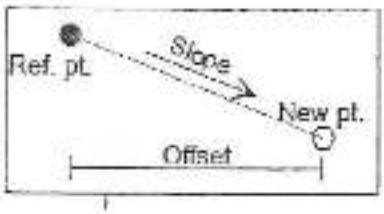
How to define new points

1. By true point's coordinates (offset, level). Reference point number should be 0.

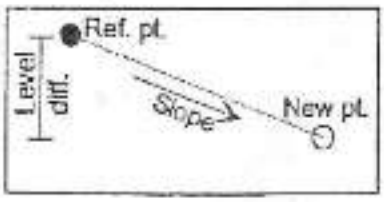
2. Calculate new point's coordinates using known values of **offset and level** difference relative to a reference point.



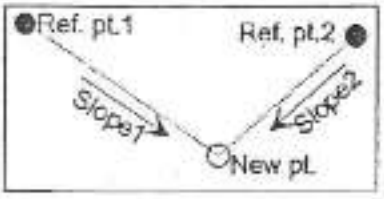
3. Calculate new point's coordinates using known values of **offset and slope** relative to a reference point.



4. Calculate new point's coordinates using known values of **level difference and slope** relative to a reference point.



5. Calculate new point's coordinates using **two known slopes** and two reference points.



Example 7.1

To demonstrate how to define road points based on the previous discussion, we'll create the input data needed to define the cross section shown in figure 7.3.

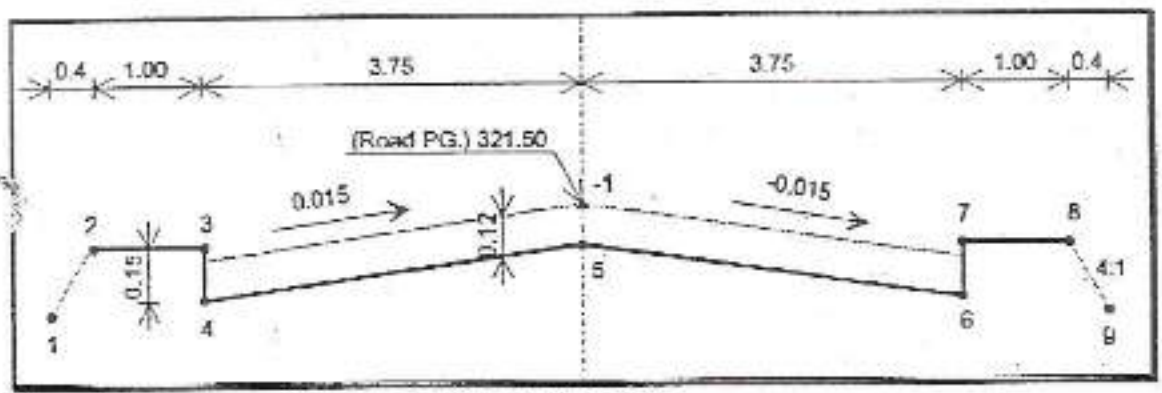


Figure 7.3 Cross section drawing for example 7.1.

The section has 7 road points (2 to 8), 1 help point (-1) and of course 2 control points (1 and 9).

- We will start by defining a real point, which is the road P.G. Since this point does not belong to the considered cross section, it is a help point, and its coordinates are 0.0, 321.50.
- Next we'll define point no. 5, using point -1 as reference with offset = 0.0 and level difference = -0.12.
- We'll continue and define point no. 4, relative to point no. 5, with offset = -3.75 and slope = 0.015.
- Point no. 3 relative to point no. 4, with offset = 0.0 and level difference = 0.15.
- Point no. 2 relative to point no. 3, with offset = -1.0 and level difference = 0.0.
- Point no. 1 relative to point no. 2, with offset = -0.4 and slope = 0.25.
- Point no. 6 relative to point no. 5, with offset = 3.75 and slope = -0.015.

- Point no. 7 relative to point no. 6, with offset = 0.0 and level difference = 0.15.
- Point no. 8 relative to point no. 7, with offset = 1.0 and level difference = 0.0.
- Finally point no. 9 relative to point no. 8, with offset = 0.4 and slope = -0.25.

Notice that offset is negative whenever the new point is to the left of the reference point, and level difference is negative whenever the new point is lower than the reference point. For the slope its algebraic value is used, and the location of the new point relative to the reference point has no importance in this case.

Global variables

All values *(offset, level, level difference and slopes)* used to define/calculate a new point, can be constant or variable and change their value from one station to another.

For example, when you define a new point with true coordinates to represent the P.G. point, then the level value will change from one station to another, whereas the offset could be constant for all stations. The same is true if you want to define a new point for a variable width carriageway, then you will use variable offset and constant slope (which may represent the superelevation value, so it could be variable as well).

The program provides 10 global variables; their names are "Var_1", "Var_2", ..., "Var_0"), plus 6 dedicated variables for main road superelevation, named as follows:

- "Se_M_lt" for Left side main road.
- "Se_M_rt" for right side main road.
- "Se_in_lt" for left inner shoulder.
- "Se_out_lt" for left outer shoulder.

- "Se_in_rt" for right inner shoulder.
- "Se_out_rt" for right outer shoulder.

Example 7.2

The above example is not a true one, because the way we have defined point no -1 means that all road stations will have the same levels. To solve this problem we'll use global variables concept and redefine point no. -1 as real point with offset = 0.0 and level = "Var_1". When running template calculation the program will replace "var_1" with its true value for each station. The definition of the other points will not change.

If the section has a variable superelevation, then we must redefine point no. 4 by using "Se_M_lt" instead of 0.015. Similarly we must redefine point no. 6 and use "Se_M_rt". Again when running template calculation the program will assign the true value of both variables to each station.

Note : Here we will discuss how to use global variables in template data. Defining and entering global variables will be discussed in the next chapter.

Entering template code, title and road type

- By selecting Template from the main menu you get the drop down menu of template option.

Figure 7.4 Main menu with Template option sub-menu.

- From the drop down menu select Road points... An empty dialog box (*for entering template code, title, road type and road points*) will appear.

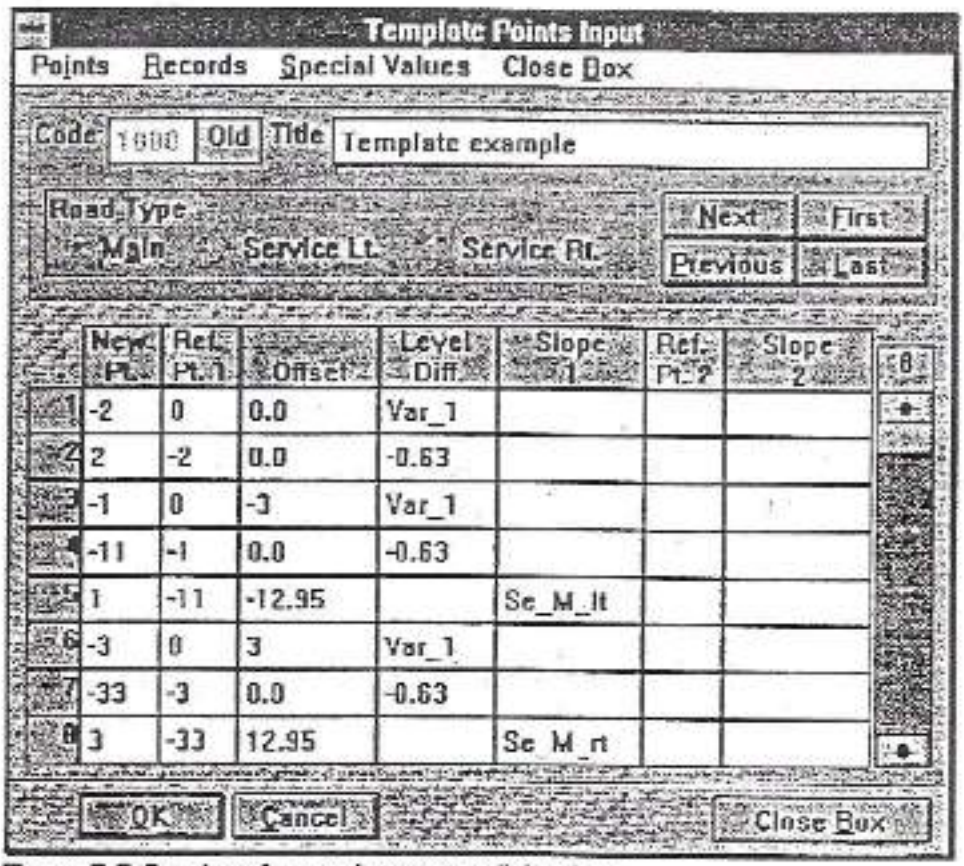


Figure 7.5 Road surface points entry dialog box.

- In Code filed enter a four-character code and hit Tab key. The caret will move to Title field. If the code exists in the template file then its data will be retrieved and displayed and the status field will change to Old. If not, then the status field will be New.

- In Title field enter the title for a new code or edit it for the old code. Hit Tab or use mouse to move to Road Type selection box.

- Use left and right arrow keys or mouse to select road type, Main, Service Lt. or Service Rt.

Note: You cannot enter data of service roads before entering main road.

- Hit Tab key or use mouse to move to road surface points entry table.

Entering template points

You will enter road surface points using the cross section sketches and the data you prepared as discussed previously in Preparing the input data.

General notes

- Each row of the table in the dialog box defines one point.
- Always start with a true point.
- Use Tab key or mouse to move from one cell to another or to a new row.
- Don't use a point as reference before it is defined.
- Don't define any point more than once.
- To accept the point it must have a valid definition format.
- Once the point is accepted and you move to another row, the point number field over the scroll bar will be incremented.
- When you reach to the bottom of the displayed table the rows will automatically scroll up to allow new point entry.
- To save the template, click on OK button or hit Tab key when the caret is at the beginning of an empty new row.
- To ignore any changes you made to any template definition, click Cancel button.

Valid points definition format

As we explained previously in how to define new points, you can define a new point using any of the 5 formats listed in the following table.

Row No.	New Pt.1	Ref. Pt. 1	Offset	Level Diff.	Slope 1	Ref. Pt. 2	Slope 2
1	n	0	x	x			
2	n	n	x	x			
3	n	n	x		s		
4	n	n		x	s		
5	n	n			s	n	s

0: No reference point, the new point is real.
n: Integer number.
x: Real number or global variable.
s: Real number or special value *(superelevation, slopes, global variables).*

Anyway, you will not be able to leave a row with invalid point definition format.

Note: OK button status will indicate the validity of the points entry. So when it grays the entry either becomes invalid or incomplete; it will be black only in case of valid entry.

Using special values

By selecting menu option Special Values, you can use variable main road superelevation, special slopes *(Vertical, Horizontal)* and global variables, in your template points definition. For example, to enter the level for point no. -1 in example 7.2 as "Var_1", move to Level Diff field in the first row then select Special Values, form the drop down menu select global variables, and finally select Var_1.

Example 7.3

The following table shows the input data for the cross section that was defined in example 7.2.

Row No.	New Pt.1	Ref. Pt. 1	Offset	Level Diff.	Slope 1	Ref. Pt. 2	Slope 2
1	-1	0	0.0	Var 1			
2	5	-1	0.0	-0.12			
3	4	5	-3.75		Se M lt		
4	3	4	0.0	0.15			
5	2	3	-1.0	0.0			
6	1	2	-0.4		0.25		
7	6	5	3.75		Se M rt		
8	7	6	0.0	0.15			
9	8	7	1.0	0.0			
10	9	8	0.4		-0.25		

We can define point no. 3 and no. 2 using special value slopes as follows:

Row No.	New Pt.1	Ref. Pt. 1	Offset	Level Diff.	Slope 1	Ref. Pt. 2	Slope 2
4	3	4		0.15	S VERT		
5	2	3	-1.0		S HORZ		

Inserting and removing points

To insert a new point, move the caret to the row where you want the point, select Points from the menu then select Insert. A new empty row will be inserted pushing the current point down. Enter a valid point data and leave the row to accept the point.

To delete an existing point, move the caret to the row that has the point, select Points from the menu then select Remove. The current row will be deleted pulling up the following point. Be

sure not to remove a point used as a reference for other points. Anyway the program will give an error message in such case when you try to save the template

Main/Service roads connection

If there is a service road on any side or on both sides of the main road. After entering the points for them separately using the same main road template code but different road types *(Service Lt. and/or Service Rt.)*, then you have to define the connection criteria with the main road. The program provides three connection methods. To use one, follow the following steps:

- Select Connection Method... from Template option sub-menu. The Main / Service Connection Details dialog box will be displayed,

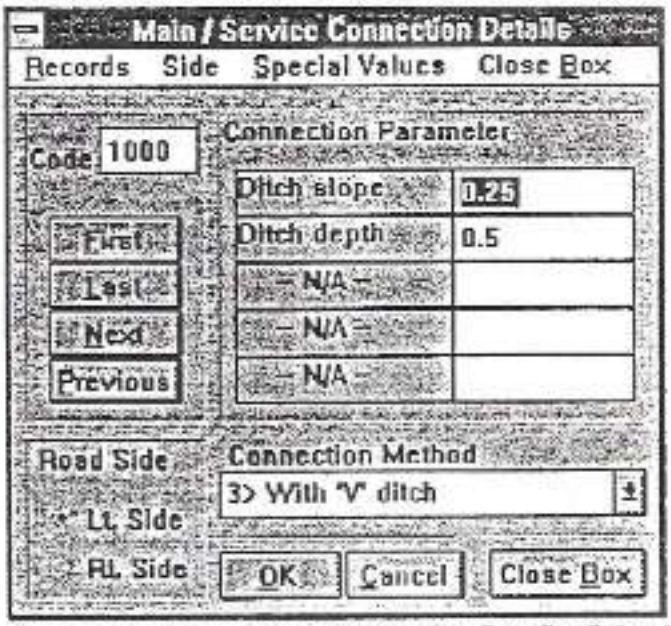


Figure 7.6 Main/service Connection Details dialog box.

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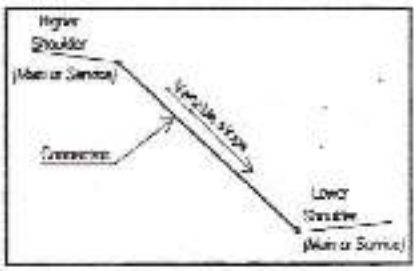
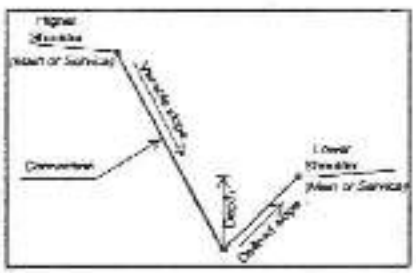
- Enter the template code,
- Select the road side,
- Click the down arrow to list the available methods then select the desired method, the required parameters will change accordingly
- Enter parameters
- Click OK button to save the data

Connection method parameters

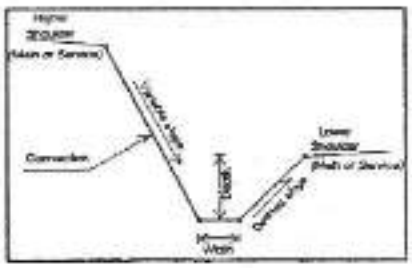
The required parameters vary according to the selected connection method. To complete your definition, they should be entered :



Direct: This is the simplest method and no parameters are required. The program will connect the shoulders of the main and service road directly with straight line.



With "V" ditch: The program will connect the main and service roads using "V" type ditch. In this case, you have to enter two parameters, first the ditch slope, which defines the fixed slope between the lower shoulder *(of main or service)* and the bottom of the ditch; the other ditch slope will be variable and calculated by the program according to the level difference between the two shoulders. Second parameter is the ditch depth, which defines the vertical distance between the lower shoulder and the bottom of the ditch.



With "U" ditch The program will connect the main and service roads using "U" type ditch. In this case you have to enter three parameters, the first and the second are similar to "V" ditch, the third is the ditch width, which defines the bottom of the ditch width.

Using special values

You can use the same ten global variables *(var _1..var_0)* described in page 166 to define any parameter value, plus one special slope *(Vertical)* to define special ditch slope.

To use a special value, click inside parameter field where you want to use the value, select Special Values from the menu, then select Slopes *(vertical)* or Global variables *("Var_1" to "Var_0")*.

Defining side slopes

The last part of the template we are going to define is the side slopes. The program allows the definition of variable and complex slopes.

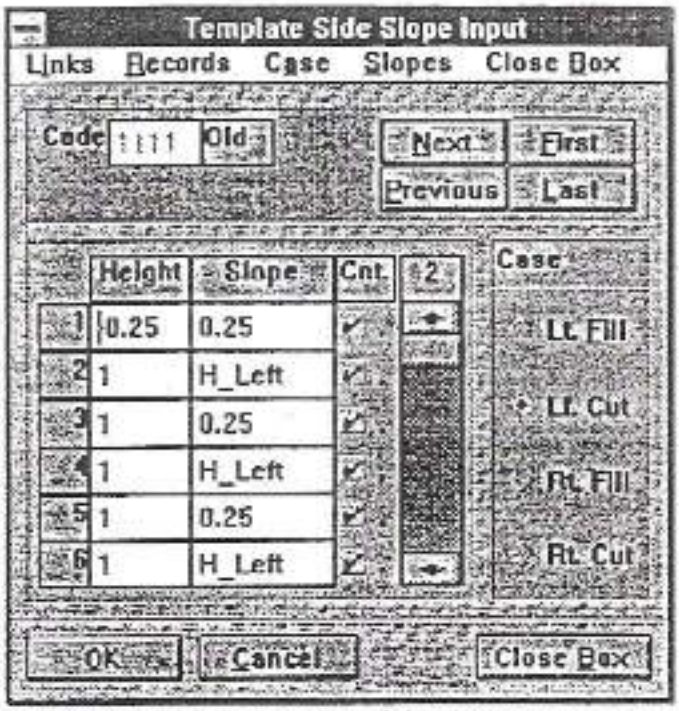


Figure 7.7 Side slope entry dialog box.

To define the side slopes we must enter the slope and its corresponding height limit, or -as a special case - when the defined slope is horizontal, we will enter a horizontal distance instead of vertical one (see example 7.7).

To enter side slope data follow these steps:

- From Case box choose side *(left or right)* and case *(fill or cut)* by clicking the appropriate radio button.
- Enter an existing template code, *(i.e. template points should be entered for main road)*.
- Click on the first row of the Height/Slope table and start entering the data *(see the following examples for details)*.

Variable side slopes

Side slopes on both sides of the road usually vary according to the height of cut or fill. The program assumes the height corresponding to

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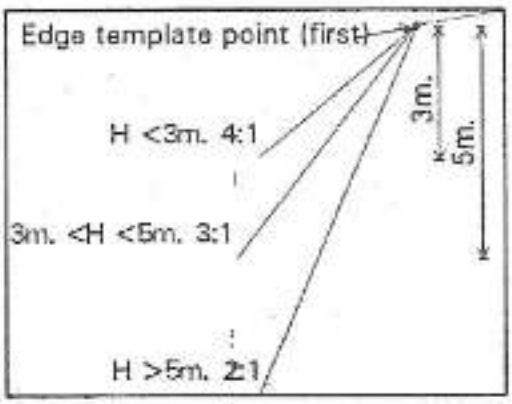
a certain side slope as the vertical distance from the edge template points (first or last) to the last point of that side slope.

Example 7.4

Row no.	Height	Slope	Cnt.
1	-3.0	0.25	
2	-5.0	0.333	
3	-100.0	0.5	



Notice that:

- Every row defines one slope end point.
- Height is negative because its direction is downward.
- Slope has an absolute value.
- Cnt. field is empty.
- Last height value is big enough to cover the case > 5.0 m.

Note: The example defines fill slopes that work for both sides. To define cut case with the same heights and slopes all you have to do is to change the height sign.

Simple and complex side slopes

The previous example shows how to define a simple side slope where there is one slope link *(point)* corresponding to each height limit. Complex slopes on the other hand have multiple links for one height limit.

We define every link by its height *(not height limit)* and slope. The Cnt. check box should be checked indicating that the current slope has continuation on the following row, the last link

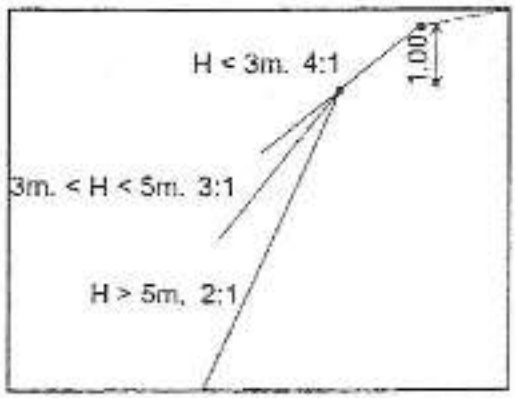
is defined by the height limit and the corresponding slope, of course the Cnt. check box for the last link should be unchecked.

Example 7.5

In this example we are defining three side slopes using five rows, one simple slope with 3 m. height limit and two complex slopes each with two links and height limit of 5 and 100.

The field above the scroll bar shows the number of the defined side slopes (3) in this example. If you unchecked any of Cnt. boxes in row 2 or 4 the number will be increased to (4). On the contrary, if you check Cnt. box on the first row, the number of defined side slopes will be decreased to (2).

Row no.	Height	Slope	Cnt.
1	-3.0	0.25	
2	-1.0	0.25	X
3	-5.0	0.3333	
4	-1.0	0.25	X
5	-100.0	0.5	

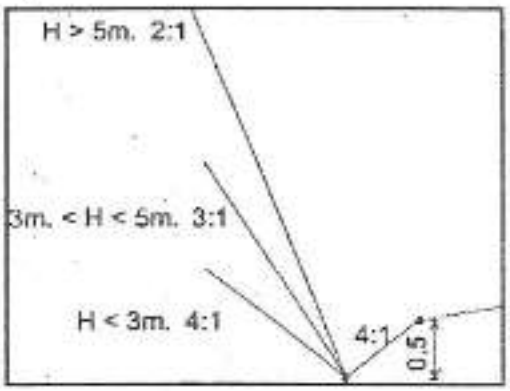


Example 7.7

The most common case where you will use complex slopes is to define cut side slopes with ditches.

Here we are defining three complex cut side slopes with (V) type ditch; the first link is identical for all three, the second link varies according to the height.

Row no.	Height	Slope	Cnt.
1	-0.5	0.25	X
2	3.0	0.25	
3	-0.5	0.25	X
4	5	0.3333	
5	-0.5	0.25	X
6	100.0	0.5	



Using special slopes

The program provides three special slopes, vertical, horizontal left and horizontal right.

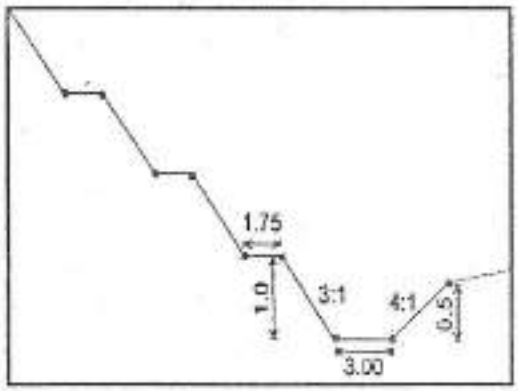
To use a special value, click inside slope field where you want to use the value. Select Slopes from the menu, then select *(Vertical, Horizontal right or left)*. The sign of Height value, plus or minus specifies the vertical direction upward or downward respectively.

Example 7.7

In this example we are defining a complex cut side slope with 15 links, 2 to define the (U) ditch and 13 to define the steps.

Notice that, in row no. 2, since the slope is horizontal we are defining the ditch width as 3 m. *(not the height)*. similarly in row no. 4 1.75 is the step width. Also because we are defining one complex side slope, check box (Cnt. column) is checked for all rows except for the last one, and the field above the scroll bar should display the number of slopes as 1.

Row no.	Height	Slope	Cnt.
1	-0.5	0.25	X
2	3.0	H Left	X
3	1.0	0.3333	X
4	1.75	H Left	X
5	1.0	0.3333	X
6	1.75	H Left	X
.....	.....	.....	X
15	100.0	0.5	



Inserting and removing links

To insert a new link, move the caret to the row where you want the link. Select Links from the menu then select Insert. A new empty row will be inserted pushing the current links down. Enter a valid link data and leave the row to accept the link.

To delete an existing link, move the caret to the row that has the link, select Links from the menu, then select Remove. The current row will be deleted pulling up the following links.

Browsing through data files

You can browse through data records for Template points, connection method and side slope using (Next, Previous, First, Last) buttons. Also you can use similar options available under the menu item Records.

First — Retrieves the first template record in the file (that has the lowest code value) and displays its data. If the file is empty a warning message will be displayed.

Last — Retrieves the last template record in the file (that has the highest code value) and displays its data. If the file is empty a warning message will be displayed.

Next — Retrieves the record that follows the current one. Depending on the current position, next record can be for a different template code, or for the same current template code with a different side (left, right) or case (cut, fill). If you reach the end of file a warning message will be displayed.

Previous — Retrieves the record that comes before the current one. Previous record can be for a different code or for the same current code depending on the current position. If you reach the beginning of the file a warning message will be displayed.

Printing templates data

You can print the input data for Template points and Side slopes for the currently displayed record (code), by selecting Records then Print under Template Points option or Side Slope option respectively

Deleting templates

You can delete templates by selecting Records then Delete from Template Points menu. Delete option will delete all the related data for the current code; that is, it will delete service roads, side slopes and connections data if the current record is for main road, and it will delete the same side (left or right) connection data if the current record is for service road.

You cannot delete side slope and connection entries from data files directly.

TEMPLATE CALCULATION
7

In this chapter we will show you how to use the template data to calculate road cross section points and side slopes interface points with natural ground.

Global variables

The program provides sixteen global variables, which you can use to define road cross section values that change from station to station, like road PG. or superelevation, These values are used when calculating road section points for a specific template.

Pre-named variables

Out of sixteen global variables there are six with pre-defined names:

Main Left.
Main Right.
Outer Left Shoulder.
Outer Right Shoulder.
Inner Left Shoulder.
Inner Right Shoulder.

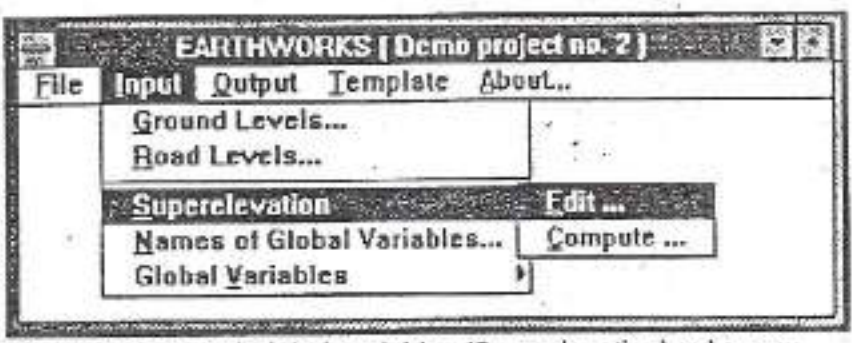


Figure 7.1 Named global variables (Superelevation) sub-menu

As their names shows, these six variables are defining main road superelevation. You can enter the data by selecting Superelevation form Input Sub-menu, then you can choose one of two entry methods, direct value entry Edit, or linear interpolation Compute. These two methods plus two more, Vertical Curve, and data file Import, are discussed later under Entering global variables data.

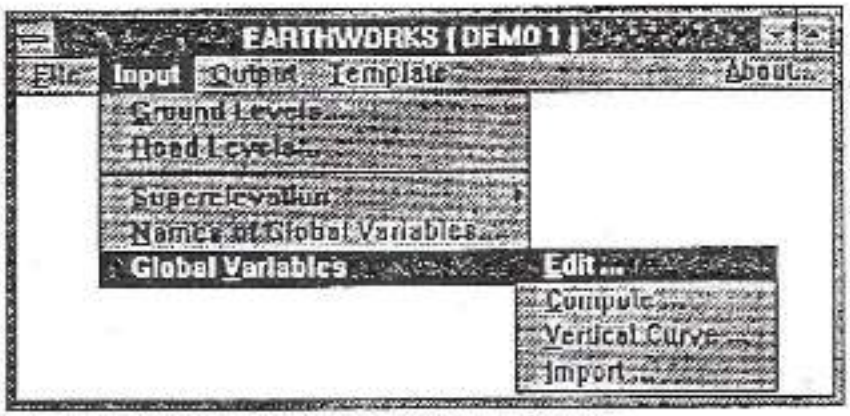


Figure 7.2 Unnamed global variables sub-menu

Naming global variables

The other ten global variables are unnamed, and before using these variables it is highly recommended to name them, even it is optional, because this will help when you start entering variables data.

To name a variable, select Input form the main menu, then select Naming of global variables, a dialog box with ten radio buttons and one text

field appears. Select the required variable by pushing the associated radio button and then enter the text that describes the purpose of the selected variable.

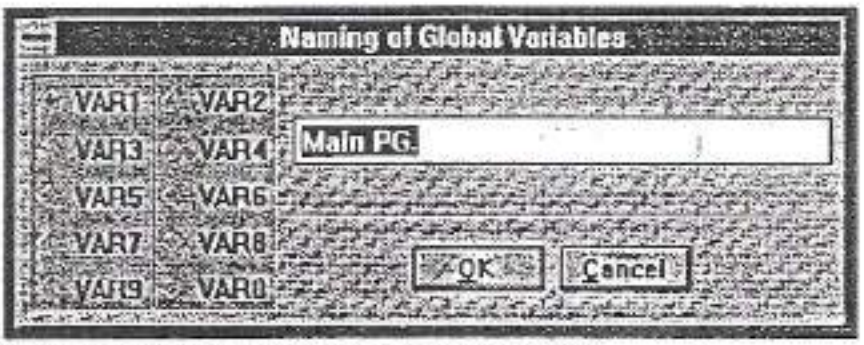


Figure 7.3 Naming global variables dialog box

You can name more than one variable. When you finish click OK button. Clicking Cancel will abort the procedure and ignore any updates.

Entering global variables data

The program provides three methods to enter global variables data. It is up to you to decide which one to use based on the available data format.

Direct value entry: Using this method you can enter a global variable value for each station individually.

- From the main menu Input option select Global Variables or Superelevation, then select Edit.
- Use the input dialog box to select the desired global variable by pushing the proper radio button. The program will display its name in Global variable name field (see Naming global variables above). This step is only applicable to unnamed global variables; for named global variables

(i.e. main road superelevation) there are a separate field for each variable.

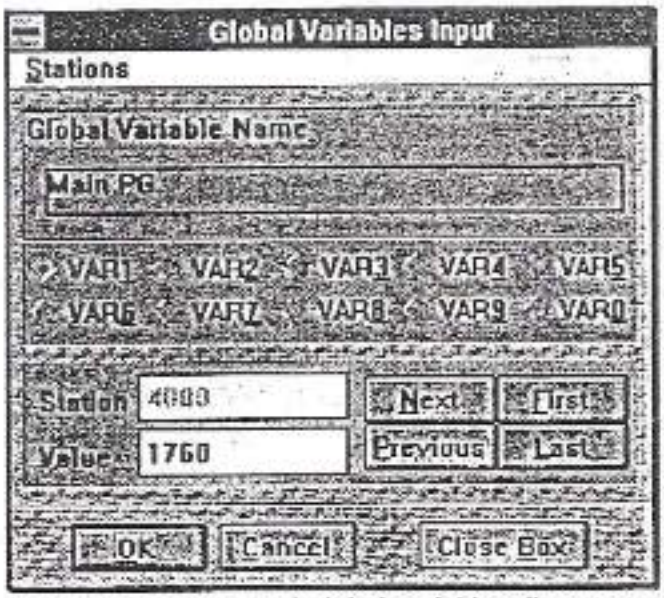


Figure 7.4.a Unnamed global variables direct entry dialog box

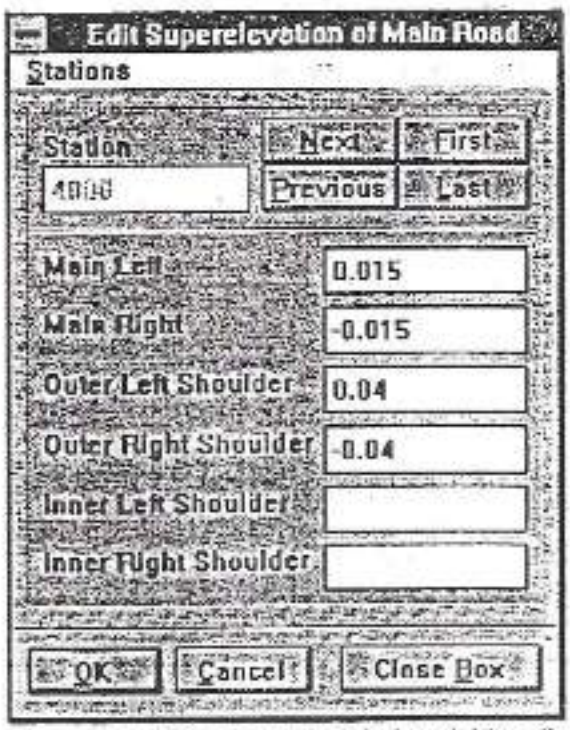


Figure 7.4.b Pre-named global variables direct entry dialog box

- Enter each ground station and its corresponding global variable value, then click OK button or press Enter. This method is mostly used to correct or change data

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previously entered by one of the other two methods.

Note: You can move through data while using this method, by using the First, Last, Next and Previous buttons, or Stations options.

Linear interpolation: Using this method you can enter a global variable values for a range of ground stations.

- From the main menu Input option select Global Variables or Superelevation, then select Compute.

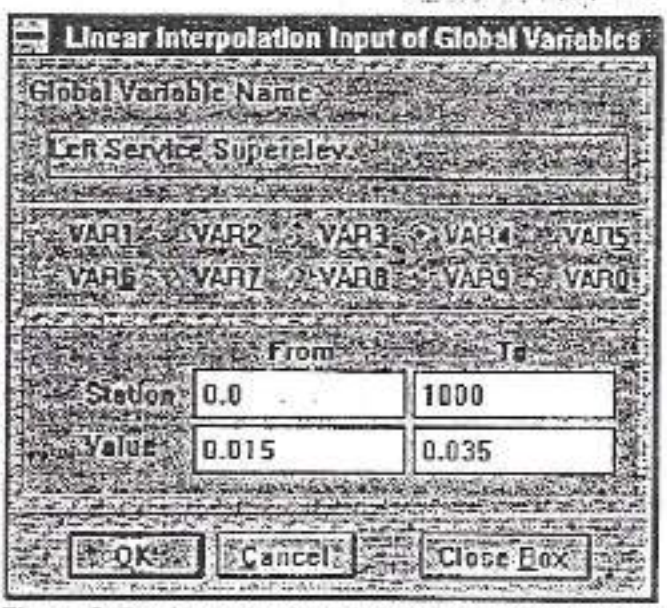

Figure 7.5.a Unnamed global variables linear interpolation input dialog box

- Use the input dialog box to select the desired global variable by pushing the proper radio button. The program will display its name in Global variable name field (see Naming global variables above). This step is only applicable to unnamed global variables. For pre-named global variables (i.e. main road superelevation), there are a separate field for each variable.

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- Enter the desired start and end stations and the corresponding start and end global variable values, then click OK button or press Enter. The program will calculate and store the in-between values by linear interpolation. Clicking Cancel will abort the calculation process. All the calculated stations prior to cancel command are saved in the file

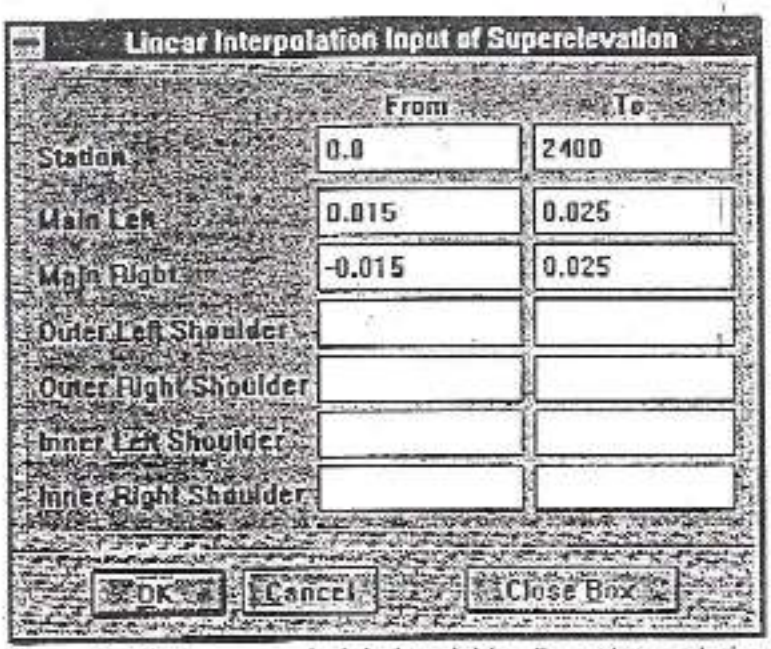

Figure 7.5.b Pre-named global variables linear interpolation input dialog box

Note: You can use this method along with the following one (Vertical curve calculation) to enter the road profile grade values for unnamed global variables. See the example under Vertical curve calculation.

Vertical curve calculation: Using this method you can enter the road profile grade for areas where a vertical curve exist by amending unnamed global variable values already entered using the previous method (Linear interpolation).

Note: This method is only available for unnamed global variables.

- From the main menu Input option select Global Variables, then select Vertical Curve.

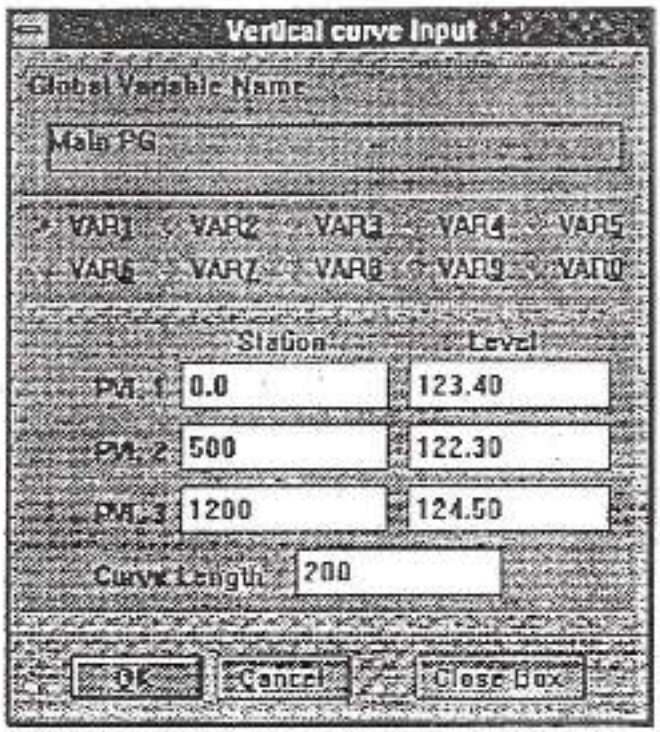

Figure 7:6 Unnamed global variables Vertical curve input dialog box

- Use the input dialog box to select the desired global variable by pushing the proper radio button. The program will display its name in Global variable name field (see Naming global variables above).

- Enter the required vertical curve data, then click OK button or press Enter. The program will calculate and will overwrite the values between the two tangent points of the vertical curve. See figure 7.7

Example:

To calculate and store the profile grade for the following vertical alignment data:

Station	Level	Curve Length
0.0	214.0	
250.0	217.5	250.0
400.0	212.0	50.0
475.0	213.0	

You have to perform two steps:

1. Enter station and level for each PVI along the specified road reach using Linear Interpolation Input of Global Variables dialog box.

	From	To
Station	0.0	250.0
Value	214.0	217.0

	From	To
Station	250.0	400.0
Value	217.0	212.0

	From	To
Station	400.0	475.0
Value	212.0	213.0

2. Re-enter station, level, plus vertical curve length for each PVI along the specified road reach using Vertical Curve Input dialog box.

	Station	Level
PVI. 1	0.0	214.0
PVI. 2	250.0	217.5
PVI. 3	400.0	212.0

Curve Length	250.0

	Station	Level
PVI. 1	250.0	217.5
PVI. 2	400.0	212.0
PVI. 3	475.0	213.0
Curve Length	50.0	

Note: You must not use Linear interpolation input method after using Vertical curve calculation input method for the same reach, unless you want to overwrite the calculated vertical curve values, hence you must complete step 1. for the entire desired reach before starting step 2.

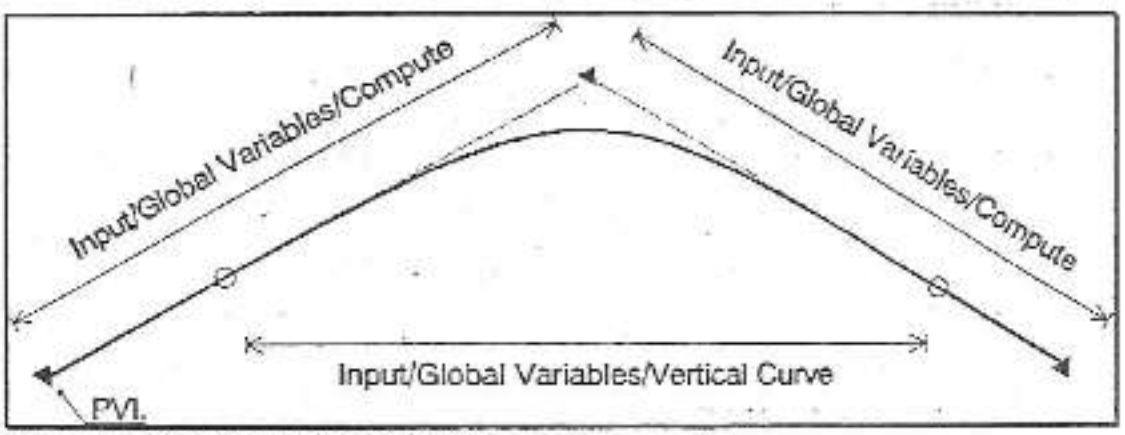

Figure 7.7 Vertical curve calculation.

Importing data file: Using this method you can enter global variable values for a range of ground stations by reading the data from an external ASCII file.

Each data file line defines one global variable value for a certain ground station as follows:

column	data
1-12	ground station
13-24	global variable value

Example:

24000.000	312.345
24025.000	312.854
24050.000	313.036
.....	.....
30000.000	320.723

You can use any word processor or spreadsheet program that gives ASCII files to create your data files. Do not leave any blank lines in the file, and it is not necessary to write the stations in sequence.

Note: This method is only available for unnamed global variables.

- From the main menu Input option select Global Variables, then select Import

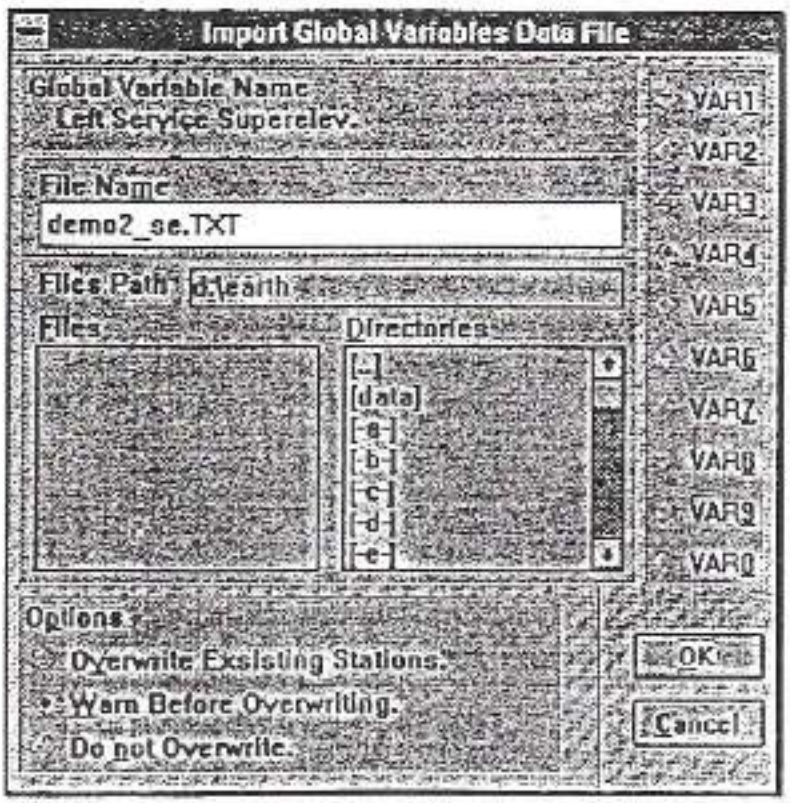

Figure 7.8 Unnamed global variables import dialog box

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- Use the input dialog box to select the desired global variable by pushing the proper radio button. The program will display its name in Global variable name field (see Naming global variables above).

- Enter the data file name or select it from the Files box, and change the current directory if necessary from Directories box.

- Set write option in Options box, by pushing the required radio button. The program provides three different write options:

Overwrite Existing Stations: The program will automatically overwrite the global variable value for any existing station, without warning.

Warn Before Overwriting: The program will prompt you before overwriting any existing station, so you have the chance skip the update of the existing global variable value.

Do not Overwrite: The program will automatically skip any existing station, keeping its current global variable value.

Printing global variables

The program allows you to print any global variable data for a range of stations.

To print a global variable data:

- From Input main menu option select Superelevation option for pre-named global variables, or Global Variables for unnamed global variables, then select Edit.

- Select the desired variable, by clicking in the appropriate field for pre-named variables, or by pushing the appropriate radio button for unnamed variables.

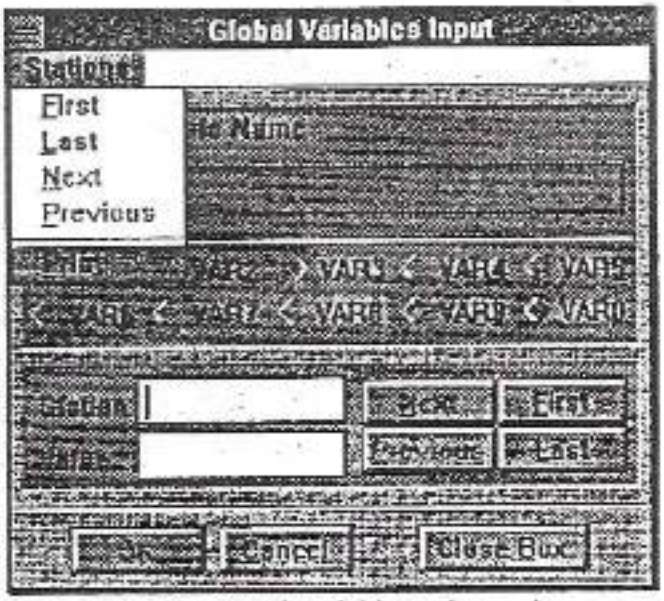

Figure 7.9a Unnamed variables print option

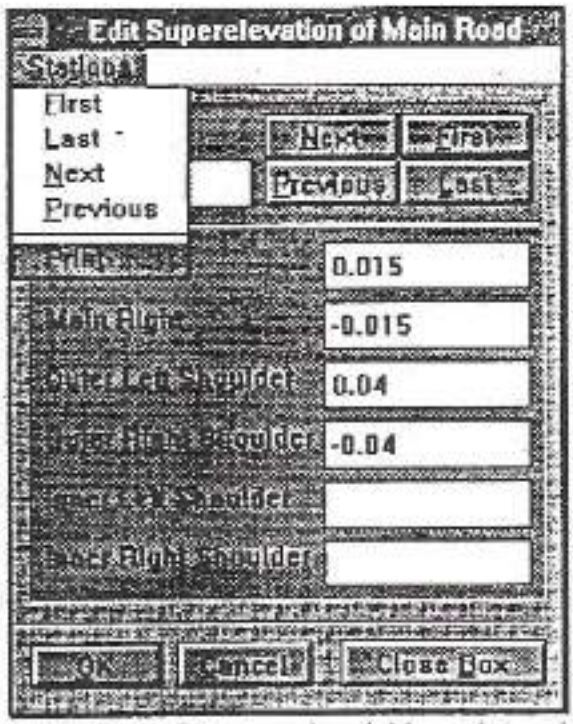

Figure 7. 9b Pre-named variables print option

- From edit dialog box menu select Stations, then select Print.

Figure 7.10 Stations range selection for printing dialog box.

- Enter the start and end stations of the desired range in From and To fields, then click OK button or press Enter key to start printing on Windows default printer.
- You can abort the printing by clicking Cancel button

Assigning template code

You must assign a template code for every ground station that you need to calculate road cross section for. The program allows you to specify the template you want to use for a selected range of ground stations, so you can use different templates in the same file.

To assign a template code to a selected range of already entered ground stations:

- From the main menu select Template, then select Template Selection. The (Template Selection for Ground Stations) dialog box is displayed,

- Enter the From and To stations, then enter the template code that you want to use for this range.

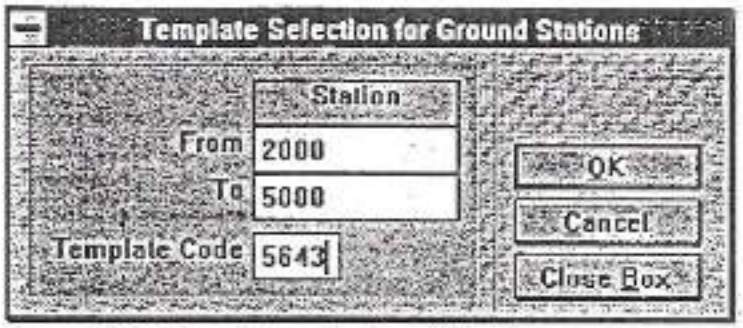

Figure 7.11 Template selection dialog box

- Click OK button or press Enter. The program will start processing and it will store the selected template code with each station of the selected range. The program will close the entry dialog box and open another dialog box that allows you to monitor the calculation process. You can abort the process by Clicking the Cancel Button.

Running template calculation

The template calculation involves two separate steps:

1. Calculating road points
2. Calculating interface with ground

The program allows you to process both steps together or any one separately.

To run template calculation:

- From main menu select Template, then select Template Calculation. The (Template Calculation) dialog box is displayed.

- Enter the From and To stations to define the calculation range. The defaults are the first and the last ground stations of the current project.

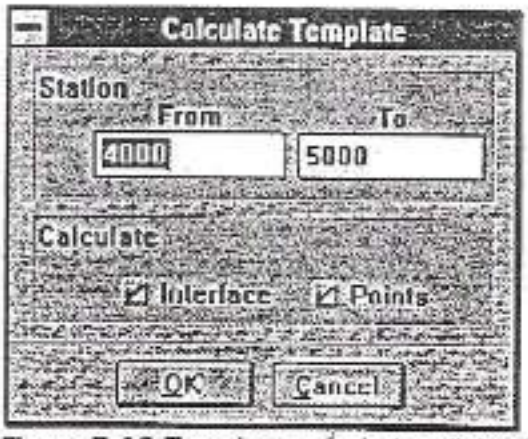

Figure 7.12 Template calculation dialog box

- Define the required calculation steps by setting the calculation option. You do this by checking or unchecking the check box that corresponds to the required calculation step. The default is to run both steps.

- Click OK button or press Enter to start the calculations.

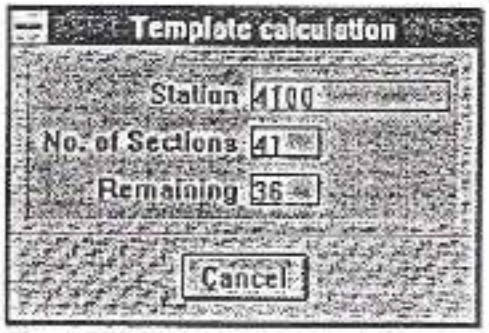

Figure 7.13 Template calculation monitor dialog box

The program will close the entry dialog box and display another

dialog box that allows you to monitor the calculation process. You can abort the process by clicking the Cancel Button. If the program encounters any problem while running the calculations, it will stop and display a warning message and ask you whether to continue the calculation or to abort it.

Calculation steps

As a program default and for most of your projects you will run template calculations for both steps, road points and interface. Nevertheless for some cases you may need to run either step separately.

Calculating road points This is the less possible case to happen, where the program will calculate the road points using the stored template data and skip the side slope calculations.

You may need this option to check the road surface position relative to the existing ground section without bothering about the side slope, especially if calculating the side slope gives more warnings because of not being able to find the interface point for either side.

Calculating interface with ground This is the more possible case to happen, where the program will skip the road points calculations and only calculate the side slope interface with the natural ground using the stored side slope data and previously entered and sorted road sections data.

You will use this option when it is practically impossible to build a template for your road cross sections, because there is no typical cross section applied, and the road section definition changes unconditionally form station to station.

In this case, you must add the two control points to the entered road points. Most of the time you will duplicate the first point and the last point of each section. Refer to Preparing template points data, in Chapter 6, for more information about control points.

Interface / side slope determination

For a given station there could be more than one solution for the interface points. The program will accept the first solution it finds and stop the calculation process.

For example, if we have the following side slope data for the fill case of the left side for the illustrated section part in figure 7.14.

Height	Slope	Cnt.
-3.0	0.25	
-5.0	0.333	

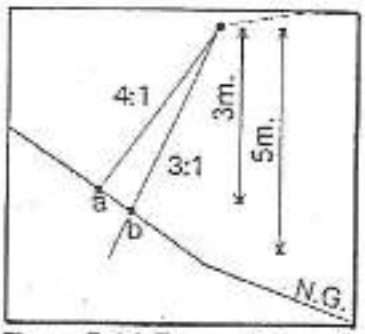

Figure 7.14 Two valid interface points

The program will always start with the higher (4:1, 0.25) side slope value to look for the

interface point, and if it finds a solution it ignores the other slope even though it gives a valid solution. So in this case the program will store point (a) as the left side interface point.

If you want to force the program to start looking for the interface point using the smaller slope value you will have to switch the slopes rows.

Height	Slope	Cnt.
-5.0	0.333	
-3.0	0.25	

In this case the program will store point (b) as the left side interface point.