# ROADPAC´14

**PROGRAM RP27**

**Terrain Cross Sections**

*User Guide*

**Release 25.2.2014**

© Pragoprojekt a.s. 1986-2014

PRAGOPROJEKT a.s., 147 54 Praha 4, K Ryšánce 16

## 1.    *Introduction*

Program "RP27- Terrain cross sections" is part of package RoadPAC. Program RP27 is one of the first programs of that package. Program can calculate terrain cross sections from field surveying data or process data scanned over DTM surface. It may be alternatively used for interpolation of terrain cross sections.

### 1.1    *Program Functions*

Program will create file of terrain cross sections (.STR) from given data of points on terrain surface.

One cross section through terrain in file STR is defined by chainage and by sequence of points on terrain surface and by topsoil layer and geological layers, if they are specified. See program RP28/29.

If cross sections are not defined in required chainage, they can be constructed from similar set of sections. Program performs shift of centreline and interpolation of given sections to a new set of sections in required chainage.

In following program RP28 the data of topsoil and geological layers will processed and appended to file .STR. Besides program RP27, cross sections scanning over DTM surface can be also used.

Terrain Cross sections, saved in file STR are later used for construction of corridor cross sections by program RP51 or for further drawing of complete longitudinal profile (RP34) and corridor cross section drawings (RP53).  For easier documentation as study level, can be used file .STR without data about topsoil stripping and geology conditions.

### 1.2    *Processed Data Files*

**Input files**

       .V27    - input data

       .SSS    - chainage (when required)

**Output files**

       .L27    - listing

       .STR    - terrain cross sections

       .SSS    - chainage (when required)

## 2.    *Input Data*

The input data are provided by filling and editing of tables or to click on controls placed on forms appearing on the computer display. Display operation is described in the user guide. See chapter "Introduction". Forms usually incorporate common control part, graphical part if it is useful and input data part. A Picture box, if is placed on form, serve to display current results.

Input data of program TERRAIN CROSS SECTIONS consists of three data blocks placed on two tabs of the form. Some blocks can be omitted depending on type of task.

## 2.1   Control Data

It appears after the selection of "INPUT DATA" in the preceding menu. On the next picture is control data part of form.



**Date**    is date of input data creation.

**Project Title and Road Title** are texts written into the header of listings and into files.

**Terrain cross sections File name.** In case that this item is not entered, program uses default active road name from main menu (only first 6 characters).

**Output printing code:   [0/1/2/3]** determines the type of data in listing and output file:

    0        without print

    1        chainage of calculated terrain cross sections only

    2        list of detailed points and elevations + 1

    3        the pseudo-graphic scheme of terrain cross sections (obsolete). + 2

**Max. Chainage Difference** is maximal chainage difference within cross sections When not given (enter zero), program will use default = 200 m.

**Max. Elevation Difference** is maximal elevation difference of adjoining detailed points at terrain cross section. Default = 20m.

**Max. Distance form Centreline** is maximal distance of detailed point from terrain cross section axis. Default = 100m.

## 2.2   Chainage Data

Can be specified on tab "Interpolation of section according entered chainage" as follows:



On the right side of tab, beside the tables, are placed radio buttons which enable to select suitable type of available chainage specification.

User can specify the list of chainage where calculation terrain cross section is requested. Chainage can be entered in two tables. First table is for sequence of chainages in a given step, the second one is for list of individual chainages.

Total number of processed terrain cross section (chainages) is max. 8000.

Description of items in the first table CHAINAGE GIVEN BY STEP:

**From (km)** is chainage of segment start in km.

**To (km)** is end of segment in km

**Step**    is step of chainage in this segment in metres

In table INDIVIDUAL CHAINAGE are individual values in km entered.

## 2.3    Terrain Data

### 2.3.1   Terrain Cross Section

In this table are entered the individual terrain cross sections. Derived from them, next cross sections can be interpolated according to specified chainage system, if it is required.



Chainage of each cross section must be entered in combo box by user. First row of output file contains information about chainage and is followed by one or more rows with detailed point in the table. Cross section must be entered in sequence according to ascending chainage.

The order of entering of detailed points in one section is free, but before saving of cross section must be detailed points sorted by <Sort the points>.  Content of table can be modified. Modification must be ended by <Save editing>.  By <Write cross section> can be a cross section inserted to input data file. When program works with cross section scanned over DTM, are the tables filed automatically. See program DTM. This is performed only in case that input data "road.V27" does not exist yet. When the file "road.V27" already exists, program automatically loads contents of this file to tables. When user want to scan a new terrain cross sections file, after potential modification of DTM, former file .V27 must be deleted then program can load modified cross sections.



Same functionality has the above displayed button placed on form. Function scan new terrain cross sections over selected DTM surface and replace former file "road.V27" by the new one.
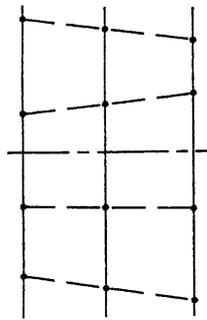
**Interpolation Types:**

For interpolation of terrain cross sections are used nearest entered cross sections. In back direction, for interpolation will be used nearest ones defined by input data. In direction forward for interpolation will be also used nearest cross section. No matter if it is new section or already interpolated section.

Depending on number of detailed points in adjacent cross sections singular or regular interpolation will be used (See next Picture.).

Singular interpolation is performed along breaklines of two adequate points of adjacent cross sections. These sections must be defined by same number of detailed points. When this condition is not kept the regular interpolation will be done. Then are points interpolated at lines parallel with centreline. In case that by regular interpolation is created more than 2000 points, points with the shortest breakline between neighbouring points will be ignored.

*Picture 1:*

a) Singular interpolation                                    b) Regular interpolation
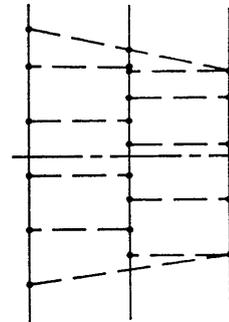


*Picture.2:    Topsoil Interpolation*
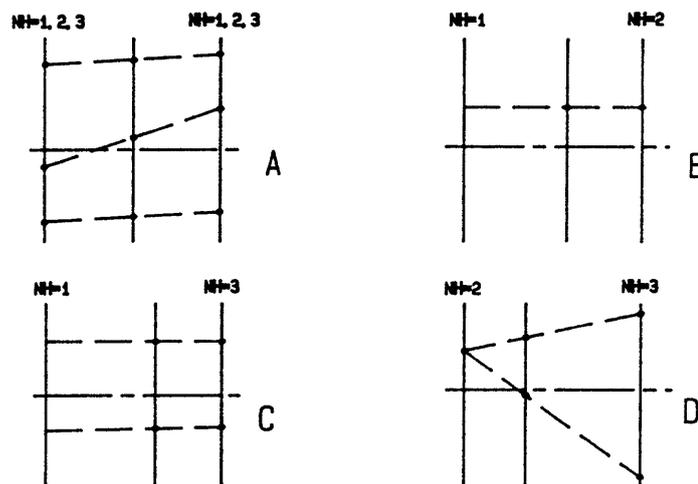


If topsoil stripping is already specified, topsoil interpolation depends on number of topsoil segments in adjacent profiles. (Picture 2) Topsoil thickness is interpolated in cases A, B, C separately in each segment. Case D depends on difference that is between two topsoil segments. In this case is supposed next third segment between them. It has zero wide and thickness is average of thickness of both neighbouring segments.

Items Description:

**Chainage**          chainage of terrain cross section
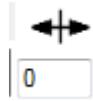


**Shift of detailed points**. Offset distance specification of terrain cross section axis to centreline of road, if it is required. Positive value (+) means shift to the right, negative value (-) to the left from road centreline.

Items of cross section change on row:

**Offset from Axis** is distance of terrain cross section detailed point from its axis. Positive value (+) means distance to the right, negative value (-)  to the left.

**Elevation**       Level of this point. (Above sea level)

Maximal number of terrain cross sections is 8000.  Maximal number of points in one terrain cross section is 2000.

### 2.3.2  Terrain Cross Section Viewer

Current content of table representing a cross section is immediately displayed on picture box placed on form.
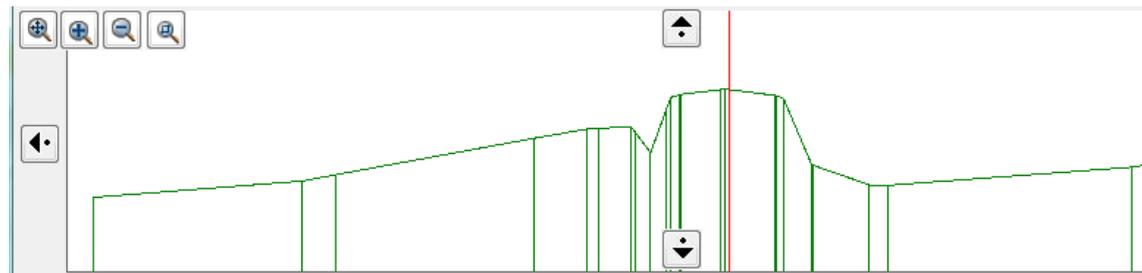


## 3.    DESCRIPTION OF OUTPUT LISTING

The output listing is generated in the course of the computation in the 'road' .L27 file. Its printing can be controlled from the main RoadPAC menu.

Beside of protocol about calculation process the output configuration contents other data according to requirements given by codes of input operation. It can be chainages where cross sections are calculated, their detailed points and topsoil layers, or pseudo-graphical scheme of cross sections (obsolete).

## 4.    Warning messages

The program differentiates between fatal errors, which usually cause program termination with unusable results and formal errors that are handled by alternate solution. Fatal errors are marked by *** in reports and formal errors are marked by **. The following table contains list of warning messages and comments to alternate solution:

| Text of Error Report | Alternative Solution |
|---|---|
| *** Leading line is missing *  27 | |
| *** Inaccessible type of leading line: nnn | |
| ** First line ignored | |
| *** Between leading data read no marked line * | |
| *** Premature data end | |
| *** Inaccessible function code number x =  nn | |
| *** Incorrect code combination for road x: nnn | |
| *** Entered same name for input and output file: aaaaaa | |
| ** line 999 is missing | |
| ** Incorrect line type nnn ignored | |
| ** More than nnn detailed points, ignored | |
| ** Formal error, line ignored: (line copy) | |
| ** More than nnn detailed points, ignor. from km  n.nnnnnn | |
| ** Total number of correction higher than nn | |
| ** Profile chainage is missing | |
| ** Inadmissible line type: (line copy) | |
| ** Incorrect profile engage km nn.nnnnnn | |
| ** Difference between chainage is greater than n.nnnn acceptable: | |
| ** Detailed points are missing - km nn.nnnnnn | |
| *** Line  271 read with error (line copy) | |
| ** Line  272 read with error (line copy) | |
| *** Line  271 is missing | |
| ** Cannot be interpolated singularly  in profile km nn.nnnnnn | |
| ** Various entry mode of geology in profile km nn.nnnnnn | |
| ** Different number of geology layers in profile  km nn.nnnnnn | |
| ** Various soil classification in profile km nn.nnnnnn | |
| Exceed max. difference of highs : (nnn.nn, nnn.nn) - (nnn.nn, nnn.nn) | |
| ** Only points Y<0 specified | |
| ** Only points Y>0 specified | |
| ** Exceed max. profile width for Y<0 | |
| ** Exceed max. profile width for Y>0 | |
| File WORK.STR has been rewritten into file aaa .STR   Error while calling function COPY of file WORK.STR | |
| ** Interpolation of existing profile – km nn.nnnnnn | |
| ** Interpolation before first measured profile nn.nnnnnn | |
| ** Interpolation or removing before file beginning | |
| ** Interpolation or removing behind file end | |

| | |
|---|---|
| *** Output file will be blank | |
| ** Line read with error (line copy) | |
| ** More than 2000 points in profile | |
| *** Error at reading from working file | |
| ** Two points (nnn.nn, nnn.nn),(nnn.nn, nnn.nn) replaced by point (nnn.nn, nnn.nn) | |
| *** Error while writing to working file | |