PRAGOPROJEKT

ROADPAC´14

PROGRAM RP16

Relation of two roads

User guide

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1.   INTRODUCTION

The program RP16 - RELATION OF TWO ROADS forms part of the RoadPAC program system. It enables the investigation of geometry between two roads defined by type .SHB files. The chainage i.e. the points in which the geometry is investigated, is defined either by the chainage specified in proper table or by the type .SSS file. The road on which the chainage system has been defined, is called the master road the other road is called the slave road.

1.1   Program Functions

The program constructs generally the offset cross sections, the intersection points of which are situated on a line, called the dividing line. The offset cross sections consist of two cross sections each of which is constructed with reference to its centerline. An offset cross section may comprise one cross section only. The construction of an offset cross section proceeds as follows: In the points of the master road a cross section is constructed. Its intersection point with the dividing line is found, from which a perpendicular is dropped towards the slave road centerline. The points on the master road are defined by its chainage.
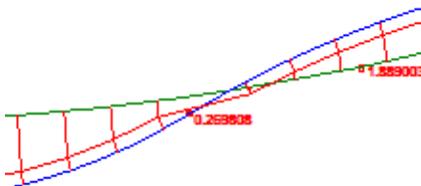
In accordance with the definition of the dividing line the program may perform four basic tasks. When defining the task the rules 1-4 are applied.
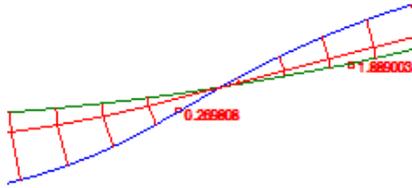
Figure No.1

     1. The dividing line coincides with the slave road. (See Fig.1) This task is defined according to Rule No. 1(See tab Task1 - perpendicular)
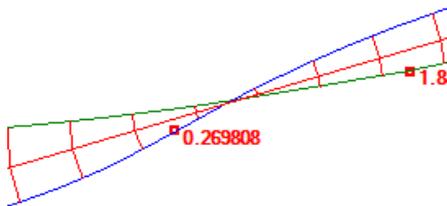
Figure No. 2

2. The dividing line is an equidistant of the slave road (see Fig.2) Task is defined according to Rule No. 2 (See tab Task 2 – equidistant)

Figure No.3

3.   The dividing line is a distant defined by a constant offset distance ratio O1: O2 of both centerlines (See Fig.3). This task is defined according to rule No. 3

(See tab Task 2 –distant)

Figure No.4

4. The dividing line is a defined by polyline segments (see Fig.4). This task is defined according to Rule No. 3 (See tab Task 3 – polyline (line)).

5.   The results can be stored in the SIDE LIMITS file with SOM extension.

6.   The CHAINAGE system may be defined simultaneously for both roads. In such a case the task is solved twice in succession for both master and slave roads. In the final report the results of both tasks are merged and consolidated in accordance with the chainage of Road 1.

1.2   Processed files

Input files:
      .V16 - Input data
      .SSS - Chainage file (for 1. or 2. roads)
      .SHB - Main points of road horizontal alignment (always for both roads)

.SOM - Side limits file (for 1. or 2. roads)

Output files:

.L16 - Listing

.SSS – Chainage file   (for 1. or 2. roads).

.SOM - Side limits file (for 1. or 2. roads).

2.   Input data

The input data are provided by filling and editing of tables or to click on tool buttons placed on forms appearing on the computer display. Display operation is described in the manual. 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 immediate results.

The input data of the program RELATION OF TWO ROADS are prepared by means of a 6 tabs placed on form, which appears successively on the display. According to job type some blocks or tables may be omitted.

2.1   Control Data Block

It appears after the selection of <INPUT DATA> in the preceding menu. On the next picture is control data displayed.

Warning, for program RP16 an exclusive rule is valid. Name of input data is in whole system usually equal to name of „**Active road**". For user is for program RP16 recommended to specify different name of input file .V16 in proper combo box **<Input data>** placed on form. Name of master road is set by program. It is the name of active road. Name of slave road is optional.

Date is the date of input data definition.

Project title and Road title are arbitrary texts printed in the headings of output listing and files.

Input file of Road 1   (Master road is always active road)

Is already specified   the main points of master road will be read (from type SHB file).   Such file must be available.

Input file of Road 2   (Choose or specify from list available in combobox)

Name is not specified nothing will be read as the slave road, i.e. than the slave road will not be processed. (Fatal error)

Name is specified the slave main points of Road 2 will be read (from type .SHB file). Such file must be available.

Work with the SIDE LIMITS file: (0/1/2/)

0   Means no work with the SIDE LIMITS file.

1   Means the generation of the SIDE LIMITS file.

2   Means the supplementing of the SIDE LIMITS file.

2.1.1 Side limits

Note: The SIDE LIMITS file may contain either one or several continuous side limit segments on the left-hand or right-hand sides of the road centreline. These segments may link-up with one another, but must not overlap on the same side of the road. One run of the RP16 program can generate only one side limit segment and record it in one or both side limits files as specified.

In the next run of the RP16 program the side limits file can be supplemented with further segments, or the formerly recorded segments can be corrected by new computation. The correction is made automatically, when the newly computed and recorded segment overlaps at least partly the segment on the same side has been already recorded. In such a case the whole existing segment is invalidate and replaced with the new segment. If the newly computed segment does not overlap any previously computed and recorded segment, the SIDE LIMITS file is supplemented with this new segment. The program defines the boundaries of the segment by the first and the last cross section generated by the RP16 program in the framework of the correct job definition.

Code of angle unit in outputs: (0/1/2)

0   the angles in output listings will be given in grades

1   ditto, but in degrees (three figures, meaning degrees, minutes, seconds)

2   ditto, but in decimal degrees (one figure only)

2.2   Definition of Sections of Dividing Lines

This data block enables the definition of road sections in which the relation of two centerlines is investigated in accordance with the Rules Nos. 1 - 4 (see chapter 1.1 of this guide). The block consists of four tabs which presents the tables for the definition of sections according to Rule 1 through Rule 4.

General Rules of Task Definition

One task must include the definition of at least one segment and at most 5 segments with different rules for the construction of the dividing line. The segment is defined by the chainage of the beginning and the chainage of the end of the segment on the master road and the corresponding segment on the slave road with adequate excess. The corresponding segment on the slave road is defined also by the chainage of the beginning and of the end the segment. In case of several segments the chainage on the master road should follow one another without gaps. On the slave road the scope is

defined with some excess on either ends. The definition of chainage by a table filling for the master road forms is part of block 2.3 CHAINAGE of this manual.

2.2.1. Rule 1) Relation using Perpendiculars

Meaning of individual items:

<u>Road 1 start </u>is the chainage of the beginning of the segment in km on road 1.

<u>Road 1 end </u>is the <u>chainage</u> of the end of the segment in km on road 1.

<u>Road 2 start </u>is the chainage of the beginning of the segment in km on road 2.

<u>Road 2 end </u>is the <u>chainage</u> of the end of the segment in km on road 2.

The above table is intended for the definition of segments in which the relation of two centerlines will be investigated according to Rule No. 1. The table may be omitted (Application of Rule No. 1 is not required).

2.2.2 Rule 2) Relation using Equidistant

Meaning of individual items:

Start chainage and end chainage have the same meaning as in the preceding table.

<u>Offset for Road 1 and Road 2 </u>are the data O1 and O2 which acquire different values thus defining the following eventualities:

a) O1 equals zero O2 is different from zero. O2 is the offset distance of the equidistant from the second centreline in meters. In case of negative distance the equidistant is to the left from the centreline, in case of positive distance the equidistant is to the right from the centerline. If O2 equals 0.0001, the equidistant coincides with the centreline.

b) O1 is different from zero, 02 equals zero.

O1 is the offset distance of the equidistant from the first centreline in meters. In case of negative distance the equidistant is to the left from the centreline, in case of positive distance the equidistant is to the right from the centerline. If O1 equals 0.0001, the equidistant coincides with the centreline.

c) Both O1 and O2 are different from zero.

The data have no dimension, but have a sign. The dividing line is so constructed as to be distant from both roads at the ratio of O1: O2. Negative sign (-) means that the dividing line is to the left from the oriented centreline, the positive sign (+) means that the dividing line is to the right from the oriented centreline. See next figure.

2.2.3 Rule 3 Dividing line using Polyline

The below tab Task 3-polyline with two tables is enable to define dividing line by one line segment or more segments of polyline for the investigation of the relation of two centerlines according to Rule No. 3. If no segment is defined, no table is filled-in.

The form shows the following tabs and fields:

| Task1-perpendicular | Task2-equidistant/distant | Task3-polyline | Chainage of 1.align. | Chainage of 2.align. |

Range of task   ⟷ Set range of roads

RP	Road1 start (km)	Road1 end (km)	Road2 start (km)	Road2 end (km)
▶	0,000000	4,695650	0,000000	1,075771

☐ ? Polyline specification ☐ ?

RP	Coordinate Y(m)	Coordinate X(m)	Coordinate Y(m)	Coordinate X(m)
	629 607,812	1 193 654,729	629 402,296	1 193 598,809
▶				

Fill the table
Delete tables ✗

Polyline specif. type
◉ By coordinates YX (m)
○ By chainage (km) and offset (+/-m) from road1

Load polyline

⚠ Entry polyline always in direction of increasing chainage of 1.align.

☐ Skip task specified in these tables   About polyline   Draw polyline

The meaning of individual items:

Chainage (first table) beginning and ending have the same meaning as in the above mentioned rules.

 The dividing line is specified by a line/polyline segment on one (line) or more (polyline) rows of the second table. Line/polyline vertexes are defined either by absolute coordinates or by relative coordinates. In the first case the points of the line or polyline segments are defined directly in absolute coordinates, in the second case the points are defined by relative coordinates related to the centreline .(Chainage + offset distance).

Points are given by coordinates:

Coordinates of Point A: Two items are defined as coordinates Y and X.

Coordinates of Point B: Ditto, but for point B.

Points are given by relative coordinates:

Coordinates of Point A: Chainage (km) is the chainage of the cross section in which point A is situated. Offset is the offset distance of point A in meters. If the sign is negative, point A is situated to the left from the centreline, if it has positive value, is the point A situated to the right from the centreline.

Coordinates of Point B: Ditto, but for Point B.

Work with chainage:

 The master road coincides either 'with Road 1 or Road 2, depending on the road on which the chainage has been defined. Generally the chainage may be defined on both roads. In such a case the computation runs twice: for the first time with Road 1 as master road, for the second time with Road 2 as master road. The chainage for Road 1 or for Road 2 may be taken from various sources. (See next text.)

2.3   Chainage

The block of chainage enables the definition of the chainage table by means of input data for the master road if the master road is Road 1. (See fig. 1) Generally both chainage tables can be defined. In such a case the task is solved first for Road 1 as master road and then for Road 2. (See fig. 2)

Chainage on first alignment

The table CHAINAGE GIVEN BY STEP may have any number of rows. One row defines one section with a regular step. The first item means the beginning of chainage in km, the second the end of chainage in km, the third the chainage step in meters with which the individual chainage items between the beginning and end will be generated. The end of the section is used only if it is a multiple of the step.

The table INDIVIDUAL CHAINAGE may have any number of rows. One row defines any chainage in km. The computer generates a chainage table which unifies both above mentioned tables. Duplicity chainage items are eliminated. The work with the chainage file will proceed as follows. The computer will read the Chainage file and the tables and after the unification of all chainage data it will eliminate all duplicities. The maximum number of chainage data is 8000.

Chainage on second alignment

Tab on fig. 1 and tab on Fig. 2 contain identical tables. The first table defines CHAINAGE GIVEN BY STEP, the second table INDIVIDUAL CHAINAGE.

Note: Chainage of the master road may be defined by the .SSS file, or by specification of values in table or by the .SSS file and in table at ones.

3   Description of output listings

The output listing is generated in the course of the computation in the 'road' .L16 file. Its printing can be controlled from the main menu:

The Listing comprises the following information:

1) Protocol on used files   "road .SHB", "road .SSS", "road .SOM".

2) List of program functions required.

3) Protocol on the relation of two centerlines, containing:

1st line:

- Number of master road

- Chainage of point P1

- Coordinates Y and X in Point Pl on master road

- Bearing and radius of curvature in point Pl on master road, - parameter of the spiral

        (If P1 is situated on it only)

- Distance of the dividing point S from the master road

- coordinates Y and X of the dividing point S

2nd line:

- Number of slave road

- Chainage of the corresponding point P2 on slave road

- Coordinates Y and X in Point P2 on slave road

- Bearing and radius of curvature in Point P2 on slave road

- Parameter of the spiral (only if P2 is situated on it)

- Distance of the dividing point S from the slave road.

Note: Point S is situated on the dividing line. Point P1 is situated on master road.

Point P2 is situated on slave road.

4) Contents of .SOM file. After consolidation of results according to increasing chainage on centreline 1 the following values are printed and written in the .SOM file:

- Chainage of point on centreline of road 1

- Name of point on centreline of road 1

- Side limit of road 1 (Offset Distance)

- Chainage of point on road 2

- Name of point on road 2

- Side limit (if exist) on road 2 (Offset Distance)

In this listing the detailed points of the chainage file are denominated in the same way as in their initial definition in the programs RP31, RP12, etc., e.g., **, BA, CA, EA, TS, SC etc. The corresponding points on the other centreline are marked as D (dependent).

For every requested rule the program computes the distances in all points situated within the intervals of chainage on both roads. If more than one rule has been required in one program run, all results attained are consolidated in a list. In such a case care should be taken that all defined intervals on Road 1 link-up mutually without overlaps. One the other centreline the intervals may be defined with excesses. During consolidation the duplicity points may be eliminated. Also the points not satisfying the requirements for the entry into the file (e.g. those not situated between the two roads) will be eliminated. The eliminated points are listed in a report.

5) Reports on errors ascertained during data reading or during computation. Every error is provided with a brief commentary.

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 message	Alternate solution
*** Leading line is missing * 16	
*** Inaccessible type of leading line: nnn	
*** Inaccessible function code number x = nn	
** First line ignored	
*** Between leading data read no marked line *	
*** Premature data end	
*** Unacceptable combination of codes of alignment: nnn	
*** Same name for align. 1 and align. 2 is specified: aaaaaa	
** Line 999 is missing	
** Incorrect line type nnn ignored	
** More than nnn detailed points, ignored	
** Formal error, line ignored: (line description)	
** More than nnn detailed points, ignored from km n.nnnnnn	
*** Main points of hor. align. is out of memory	Task must be divided.
*** First or second centreline does not contain any main points	
** Point at km nn.nnnnnn is not located within centerlines, eliminated	
** Chainage on slave centreline comes back in km nn point will not be written into SL file	
* Eliminated duplicated point km nn.nnnnnn	Information
** Chainage shift of duplicated point about 1 mm: original chainage nnn corrected on nnn on c.l nnn	Chainage value written to listing is changed
*** Not 1 profile of side limits written	
*** Inaccessible type line: (line description)	
*** Line order 163-164 not kept (line description)	
*** Beginning chainage is greater than end chainage	(line description)
*** No rule specified	
** More than 5 rules, ignored: (line description)	
*** Inaccessible value NA (NB)	
*** Formal error in line: (line description)	

** Even after 30 interactions was not found exact solution	Point will not be written
* Solution in km nnnnnnnn out of range on slave c.l	Point will not be written
** Chainage on reliant centreline comes back in km mmm	Point will not be written
** Other results of solution is out of memory	Point will be not written
** For capacity exceed are points limited on c. line No nnn not written to file CHAINAGE	Capacity of program violation. Maximally 100 side limits are permitted. Divide task!
*** Not a 1 profile of side limits written	
** Segments of limits overlaps, previous nn segment of limits eliminated on side R/L in km xxxxxx	information
** Error while chainage sorting in km nn.nnnnnn	Cross section will not be written to chainage file.