PRAGOPROJEKT

ROADPAC´14

PROGRAM RP15

Intersection of two Roads – Simple ramps of junction

User guide

Release 25.05.2014

© Pragoprojekt a.s. 1986-2014

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

1.   INTRODUCTION

The program INTERSECTION OF TWO ROADS - Simple ramps of junction forms part of the RoadPAC program system. It is used for the computation of horizontal alignments of a junction ramps with simple geometry comprising a spiral + circular curve + spiral. The program computes in the coordinate system the data of the individual main points of the junction ramp in connection with the previously computed roads representing the main centerlines of the junction.

1.1   Program Functions

1.   Computation of the intersection point of two intersecting main roads. Each main road must be stored in the main points of road file (with .SHB extension).

2.   Computation of offset point in equidistants to both main roads.

3.   Computation of coordinates of main points of the junction ramp from the defined parameters of spirals and the circular arc including their linkage.

4.   Control of centreline continuity in main points.

5.   Printing of data on the main points of the connection road and save of these data to file. SHB file, if no fatal error has taken place.

6.   Filling of the computation protocol and the computation results in the type .L15 file.

1.2. Processed Files

Input files:

.V15 - Input data

.SHB - Main points of horizontal alignment of road 1

.SHB - Main points of horizontal alignment of road 2

Output files:

.L15 - Output listing

.SHB - Main points of junction ramp horizontal alignment.

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 immediate results.

The input data of the program INTERSECTION OF TWO ROADS – Simple ramps of junction are prepared by means of a 2 tabs placed on form, which appears 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.
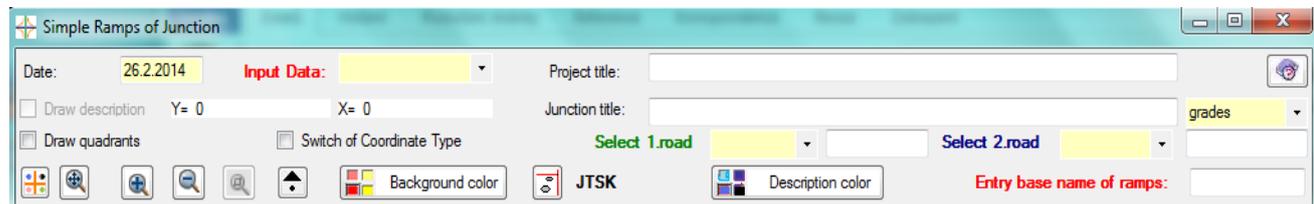
Warning, for program RP15 an exclusive rule is valid. Name of input data is in whole system usually equal to name of „**Active road**". For user is for program RP15 recommended to specify different name of input file .V15 in proper combo box **<Input data>** placed on form.

The meaning of the individual items:

 Date - the date of input data entry.

Project title and Junction title is an arbitrary text printed in the headings of output listings.

 Note: In further text the files are named as "road". The name of road meaning either the name defined in the textbox or the name of road defined in the main menu.

Input file of Road 1

Name is not specified, nothing will be read as the main road, i.e. that the main road will not be processed.

Name is specified the main points of Road 1 will be read (from type .SHB file).

Such file must be available.

Input file of Road 2

Ditto as above, but for Road 2

Code of angle unit in outputs **(grades/degrees/decimal degrees)** ….see combo box

0   Means that 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   Range of Junction Area Data Block

The tab "Range of junction area and nose points" is intended for the definition of the junction area range. The junction area is defined by a pair of chainage in km for Road 1 and Road 2 in the table. The first chainage is the beginning of the junction area, the second chainage the end of the junction area. It is recommended to select the

junction areas somewhat larger, because if the intersection point falls beyond this area, the program reports an error.

IP of roads calculation is requested: (☐/✓)

☐   Means that calculation of intersection point will not be processed

✓   Means that calculation of intersection point will be processed

The table NOSE POINTS defines the intersection points of equidistants. The number of rows in the table is practically unlimited. One row contains the definition of one intersection point by the following three items:

Offset from Road 1 in m defines the distance of the equidistant from the centreline of Road 1.

Offset from Road 2 in m defines the distance of the equidistant from the centreline of Road 2.

In both cases the distances are oriented. The positive sign means that the offset is to the right from the oriented centerline. The negative sign means that the offset is to the left from the oriented centerline.

IP number of nose point is the number of the point in the output listing.

2.3   Ramps Definition Block

The ramp can be defined by means of the following. In the framework of one job the data for one junction ramp can be prepared by the definition of 10 input items with the following meaning:

Code of ramp quadrant position
(First/second/third/fourth/reversed1/reversed2/reversed3/reversed4)

The coding concerns always oriented main Roads; their numbering is arbitrary. The above relations are illustrated in lower left corner. Number of curve is the number of junction ramp in the listing.

Linkage on Road 1

Linkage mode   (S1/L1/A1)

The connection mode is a text code defining the validity of certain data as follows:

   S1 - For the connection the defined chainage on Road 1 is binding (the value of the entry spiral is approximate only)

   L1 - For the connection the entry spiral is binding, defined by negative length in meters (the chainage value is approximate only)

   A1 - For the connection the entry spiral is binding, defined by a parameter (the chainage value is approximate only).

Chainage on Road 1 is the chainage on main Road 1 in km. In this chainage the junction ramp will be link-up if the value of the preceding code has been specified as 1.

Ramp offset D1 is a positive figure expressing the offset of the junction ramp from the main Road 1 in meters in the point of access. If it is defined as 0, the junction ramp will be connected directly to the centerline of the main Road 1. The offset direction is always considered inward the quadrant in which the junction rump is situated.

Ramp Parameters: (See fig. 1)

Entry spiral: The negative sign means the length of the spiral in meters L1; the positive sign indicates the parameter of the spiral Al. The type of spiral definition must agree with the connection mode to the main Road 1.

Circular arc: concerns the radius of the circular arc in meters. It is always defined by a positive value, as the program can construct right-hand arcs only. Left-hand arcs are constructed by solving the problem from the main Road 2 as the construction of a right-hand arc.

Exit spiral: The negative sign means the length of the spiral in meters L2, the positive sign the parameter of the spiral A2. The type of spiral definition must agree with the connection mode to main Road 2.

Linkage on Road 2

Linkage mode   (S2/L2/A2)

The connection mode is a text code defining the validity of certain data as follows:

S2 - For the connection the defined chainage on Road 2 is binding (the value of the entry spiral is approximate only)

L2 - For the connection the entry spiral is binding, defined by negative length in meters (the chainage value is approximate only)

A2 - For the connection the entry spiral is binding, defined by a parameter (the chainage value is approximate only).

Fig.1
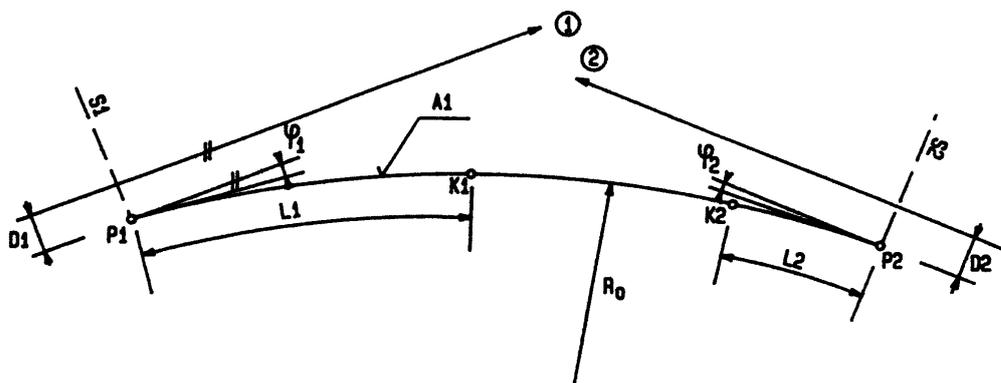
Chainage on Road 2 is the chainage S2 on main Road 2 in km. In this chainage the junction ramp will be linked, if the value of the preceding code has been specified as 1. (See Fig.1)

Ramp offset D2 is a positive figure expressing the offset of the junction ramp from the main Road 2 in meters in the point of access. If defined as 0, the junction ramp will be connected directly to the centerline of Road 2. The offset direction is always considered inwards the quadrant in which the junction ramp is situated.

Notes on task definition:

1. In the point of access P1 or P2 the spiral (if defined) has the same curvature as the equidistant of the main road centerline passing through the point P1 or P2 respectively.

2. The job may be unsolvable, either the length of circular segment between the points K1 and K2 appears negative, or the solution passes beyond the junction area.

3.   *Description of output listing*

The output listing in generated in the course of computation in the file "road" .L15. Its printing can be controlled from the main menu of the RoadPAC.

The listing contains the following information:

1. Protocol on the used files "Road1" .SHB, "Road2' .SHB, "Road" .SHB.

2. Protocol on the Road intersection point.

3. Protocol on the equidistant intersection point.(Noses)

4. Protocol on linkage to both main Roads.

5. Protocol on main points of the junction ramp. Every main point is described on two lines.

The meaning of data on the first line:
NP	consecutive number of main point
PT	point type (e.g. CS, ST, etc.)
STA(km)	chainage of main point
YP (m), XP (m)	coordinates Y and X of main point
SIGMAM	bearing in main point (grades or degrees)
R (m)	radius of curvature in main point
YC (m), XC (m)	coordinates of the center point of the osculating circle in main point

The meaning of data on the second line:
VN	consecutive number of the vertex of tangential polygon to which the given section belongs (for a straight = 0)
TP	type of curve in the given section
DIF (m)	length of section
YI (m)	Coordinate Y of the spiral inflexion point
XI (m)	Coordinate X of the spiral inflexion point
SIGI:	bearing of the spiral inflexion point (grades or degrees)
A	parameter of spiral
YT (m), XT (m)	coordinates Y and X of the tangent intersection point of the segment
T1 (m)	length of tangent in case of circle, Length of the first tangent in case of spiral
T2(m),RISE(m)	length of rise in case of circle, Length of the 2nd tangent in case of spiral
ALFAT	angle of tangents

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 * 15	
*** 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	
*** Specified the same name of road 1 and new ramp: aaaaaa	
*** Specified the same name of road 2 and new ramp: aaaaaa	
*** Inaccessible code combination for roadway x: nnn	
*** Specified the same name of road 1 and road 2 : aaaaaa	
** line 999 is missing	is added
*** Line 151 is missing, calculation cannot continue	
** Offset of clothoid of nn road entered negative	replaced by absolute value
** Taper of clothoid of nn road entered incorrectly(greater than 50 grads)	line ignored
** Taper of clothoid of nn road entered negative,	replaced by absolute value
** Radius of ramp curve entered negative.	replaced by absolute value
*** Radius of ramp curve entered 0	line ignored
*** Connecting code entered incorrectly at road No nn .line ignored	
*** Connection of ramp No nn out of road segment	
** Line ignored	
*** At nn iterative step access point out of road.	
*** Incorrectly entered code of placing and shape of ramp No nn ignored (description of line)	

*** Linkage No. n is out of road n range (Copy of rows)	
*** Position of con. ramp No nn cannot be determinate iteration not exact	
*** Position of con. ramp No nn cannot be determinate overlaps of circles	
*** Line type 153 read with error (description of line)	
*** Incorrectly entered chainage of access point No. n (description of line)	
*** Connecting ramp No nn is not continues, not saves to file SHB	
*** Total of main points on both roads higher than nn	
** Inaccessible type of line (description of line)	

Next warning messages see USER GUIDE RP12, RP16 respectively.