

Reverse Curve Design

This section provides information pertaining to the design of reverse curves. Common uses of reverse curves are:

- To redirect through lanes at channelized intersections and high-speed median crossovers,
- In interchange ramp alignments, and
- To realign crossroads at skewed intersections.

A reverse curve is two adjacent, or nearly so, circular curves with deflections in opposite directions, see Figure 1. The curves may have equal or unequal radii and/or deflection angles. When the curvature and design speed dictate superelevation, a length of tangent is required to accomplish the necessary superelevation transition. The minimum tangent length between the curves is equal to the sum of 70% of the tangent runoff length (L) for each curve. Each of the curves in a reverse curve is treated in a similar manner as a horizontal curve (see Section [2A-1](#)). Sections [2A-2](#) and [2A-3](#) provide more information concerning superelevation.

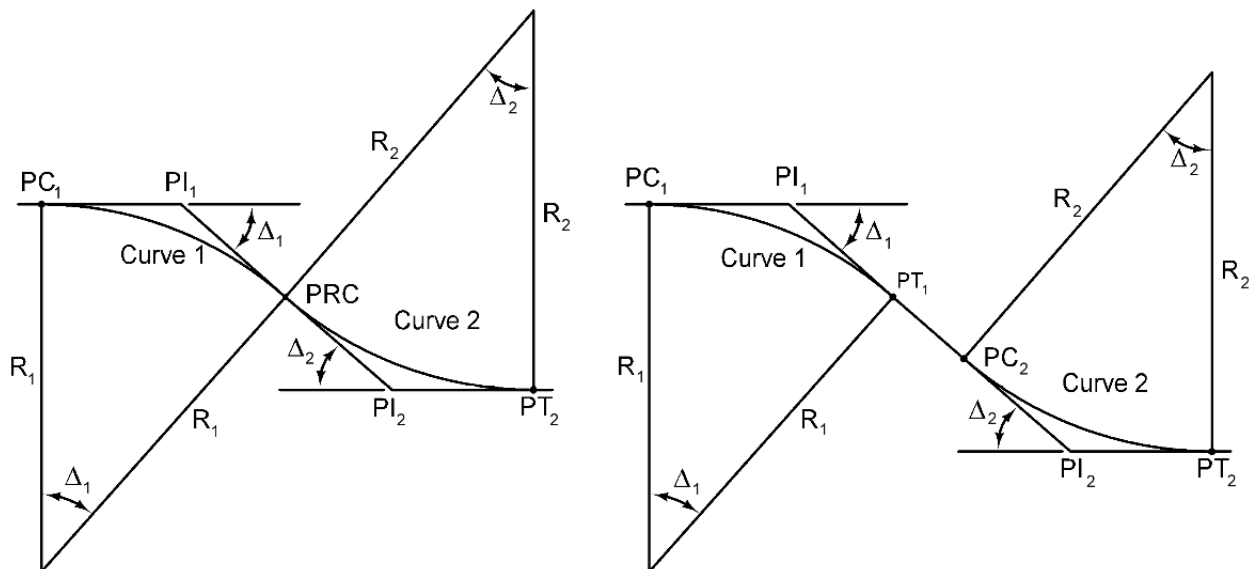


Figure 1: Reverse curves without and with a tangent section between.

Lane Redirection

Channelized Intersections

Superelevation is undesirable at channelized intersections with redirected through lanes. Past design practice was typically to use a $0^{\circ}30'$ degree of curvature (12,000' radius equivalent), but current practice is to select minimum radii to allow normal crown cross slopes at design speed with the curves located adjacent to one another. Section [6A-1](#) provides more information on auxiliary lane design.

Median Crossovers

Section [3E-3](#) provides information regarding median crossovers. The designer is encouraged to consult the Methods Section in the Office of Design for further assistance with median crossover design.

Interchange Ramp Alignments

Reverse curves are used on interchange ramps when necessary. Tangent sections between the curves are required to accommodate the high-speed superelevation transitions. More specific criteria for reverse curve interchange ramps will be detailed in a section to be issued in the future.

Realignment of Crossroads

Reverse curves may also be used when realigning crossroads to reduce skew. Refer to Section [6A-8](#) for more details concerning intersection alignment.

Example: Lane Redirection at an Intersection

Given a design speed of 50 mph and a lane width of 12', we wish to design a reverse curve to redirect a through lane to accommodate a 16' median for a left turn lane, as seen in Figure 2. Assume a normal crown (NC) section.

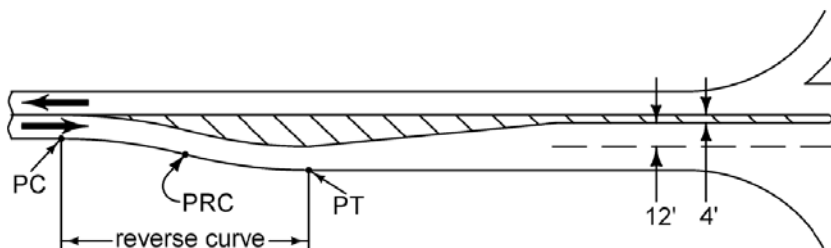


Figure 2: Reverse curve used to redirect a through lane at an intersection.

Using Table 4 in Section 2A-3 with a normal crown (NC), $R = 6500$ feet. The incomplete alignment algorithm within Geopak cogo should be used for the calculation of the reverse curve geometry. The commands below, included as a portion of an input file, produce the results illustrated in Figure 3.

```
LOCATE 9006 ON CHAIN ML001 STA 101+00 OFFSET 12
```

```
LOCATE 9007 ON CHAIN ML001 STA 109+00 OFFSET 28
```

```
ALI 9000 INC
```

```
POT 9006 TD 9001 TO 9002
```

```
CUR 9000 TL 0 R 6500 P DEF ?
```

```
CUR 9001 TL 0 R 6500 M DEF ?
```

```
POT 9007 TL ? TD 9001 TO 9002
```

```
END ALI SR1C
```

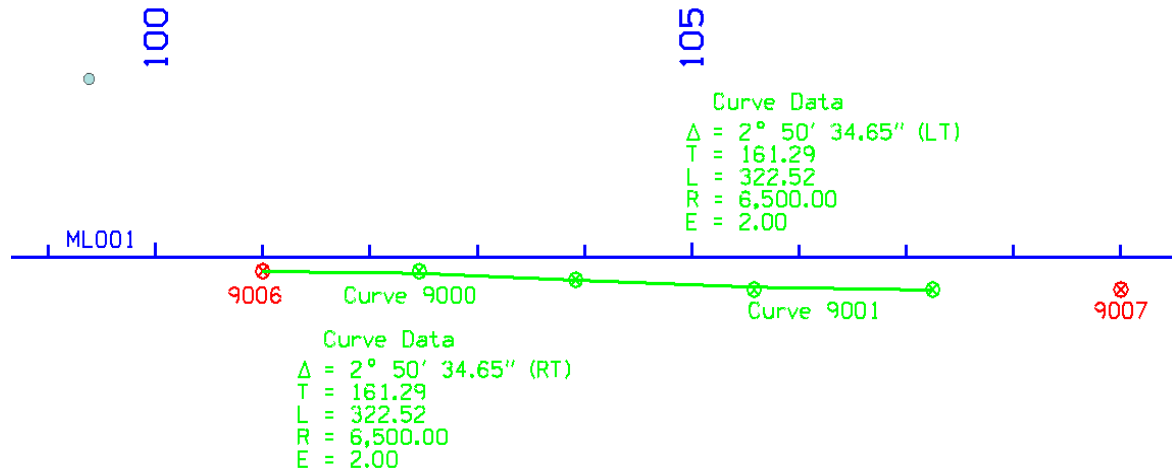


Figure 3: Reverse curve for lane redirection in example problem.

Chronology of Changes to Design Manual Section:

002D-001 Reverse Curve Design

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| 9/13/2012 | Revised
Updated references and revised example problem to demonstrate use of the cogo incomplete alignment algorithm. |
| 9/22/2000 | New material |