

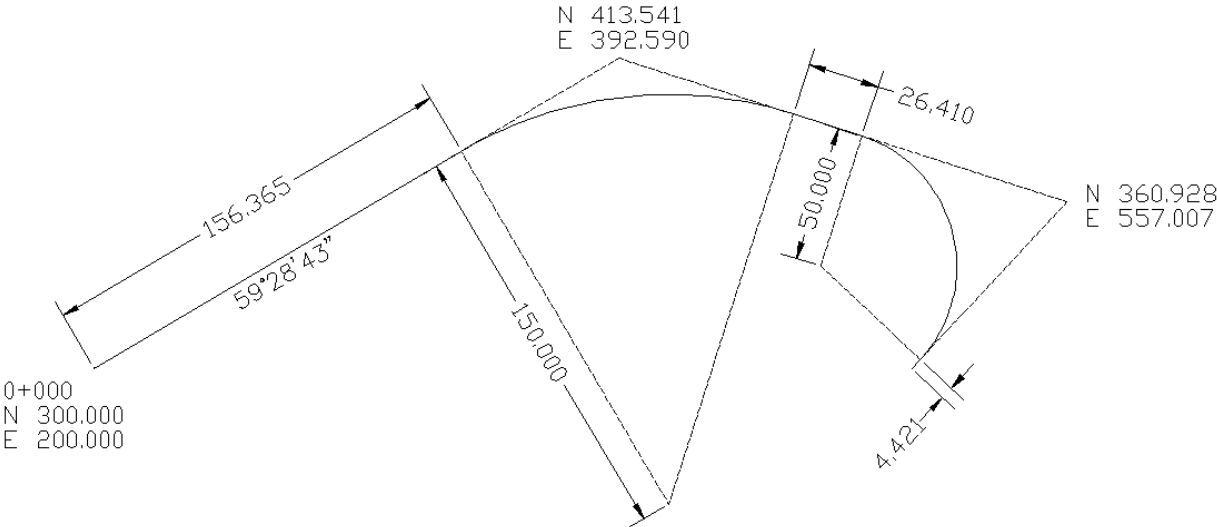
Road Alignments

Using COGO+ Pro by [Simple Geospatial Solutions](#)

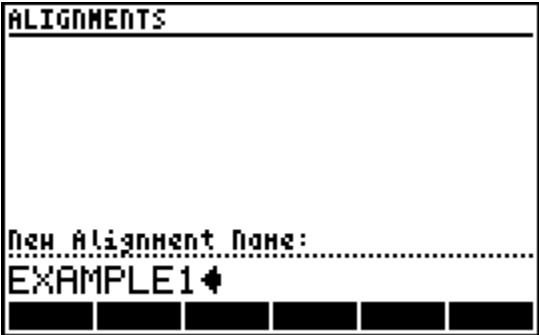
The Alignments program in COGO+ Pro is found in the SURVeying menu. Alignments are defined horizontally and vertically and cross section templates assigned, then it is possible to generate 3D coordinates for any station and offsets, or create coordinates for the entire alignment at given intervals.

Example 1

The sketch below outlines the parameters for the horizontal alignment. For this example the coordinates of the PI's are given, but any number of possible known curve parameters can be used to create the alignment.



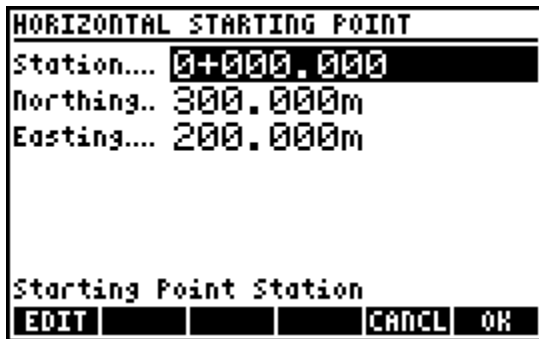
Step 1: Start the Alignments program and press **[F1]** **[NEW]** to create a new alignment.



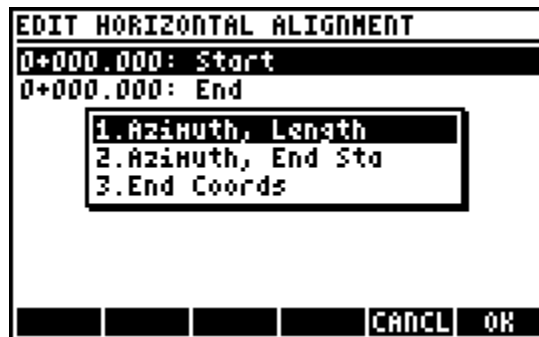
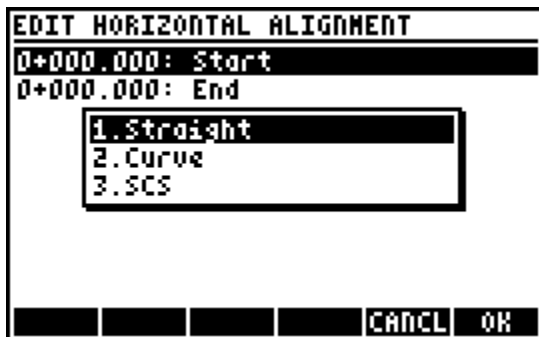
Step 2: Next press **F3** [**EDIT**] to edit the newly created alignment. Note: The EDIT HORIZONTAL ALIGNMENT screen always starts by default, use **F6** [**HZAL**] to toggle between horizontal/vertical/cross sections.



Step 3: Press **F3** [**EDIT**] to edit the station and coordinates for the selected Start point. For this example the starting station is 0+000, and the coordinates are N=300, E=200.



Step 4: Press **F1** [**ADD**] to add a horizontal element, and select "1.Straight" to add a straight element. Next choose the known parameters for the straight element, choose "1.Azimuth, Length".



Step 5: Enter the azimuth and length. The screen updates to show the newly added element.

```

ADD HORIZONTAL STRAIGHT
Start Station.. 0+000.000
Azimuth..... 59°28'43"
Length..... 156.365m

Azimuth of Straight Segment
EDIT  CANCL  OK
    
```

```

EDIT HORIZONTAL ALIGNMENT
0+000.000: Start
0+000.000: Straight
0+156.365: End

ADD  DEL  EDIT  INFO  CANCL  H2AL
    
```

Step 6: Press **[F1]** **[ADD]** to add the next element, a curve. Choose the known parameters "5.Radius, PI Coord".

```

EDIT HORIZONTAL ALIGNMENT
0+000.000: Start
0+000.000: Straight
0+156.365:
1. Straight
2. Curve
3. SCS

CANCL  OK
    
```

```

EDIT
0+000.000:
0+000.000:
0+156.365:
1. Radius, Length
2. Radius, Delta
3. Radius, PI Sta
4. Radius, EC Sta
5. Radius, PI Coord
6. Radius, EC Coord
7. CC + PI Coords
8. CC + EC Coords
9. 3 Point Curve

CANCL  OK
    
```

Step 7: Enter the parameters, and make sure you select the correct direction for the curve Right or Left. Again the screen updates to show the newly added element.

```

ADD HORIZONTAL CURVE
Start Station.. 0+156.365
Curve Direc.... Right
Radius..... 150.000m
PI Northing..... 413.541m
PI Easting..... 392.590m

Curve Direction
CHOOS  CANCL  OK
    
```

```

EDIT HORIZONTAL ALIGNMENT
0+000.000: Start
0+000.000: Straight
0+156.365: Curve
0+282.726: End

ADD  DEL  EDIT  INFO  CANCL  H2AL
    
```

Step 8: Add the second straight element. The azimuth is automatically calculated from the last element.

```

ADD HORIZONTAL STRAIGHT
Start Station.. 0+282.726
Azimuth..... 107°44'42"
Length..... 26.410m

Azimuth of Straight Segment
EDIT  CANCL  OK
    
```

Step 9: Add the second curve.

```

ADD HORIZONTAL CURVE
Start Station.. 0+309.136
Curve Direc.... Right
Radius..... 50.000m
PI Northing.... 360.928m
PI Easting..... 557.007m

Curve Direction
CHOOS  CANCL  OK
    
```

Step 10: Add the third and final straight element. All the elements of the horizontal alignment are now shown on the EDIT HORIZONTAL ALIGNMENT screen.

```

ADD HORIZONTAL STRAIGHT
Start Station.. 0+409.799
Azimuth..... 223°05'42"
Length..... 4.421m

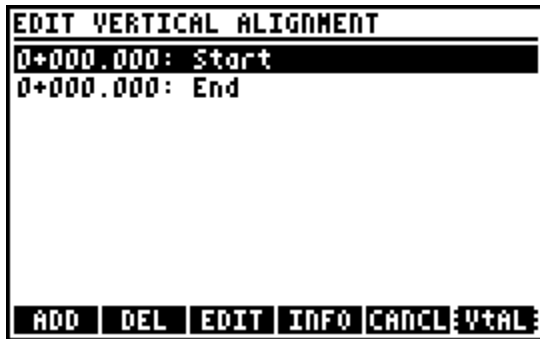
Azimuth of Straight Segment
EDIT  CANCL  OK
    
```

```

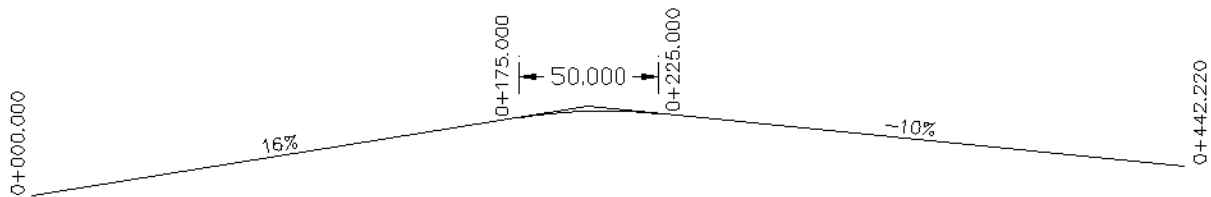
EDIT HORIZONTAL ALIGNMENT
0+000.000: Start
0+000.000: Straight
0+156.365: Curve
0+282.726: Straight
0+309.136: Curve
0+409.799: Straight
0+414.220: End

ADD  DEL  EDIT  INFO  CANCL  HAL
    
```

Step 11: Press **F6** [**HzAL**] to switch to the EDIT VERTICAL ALIGNMENT screen.



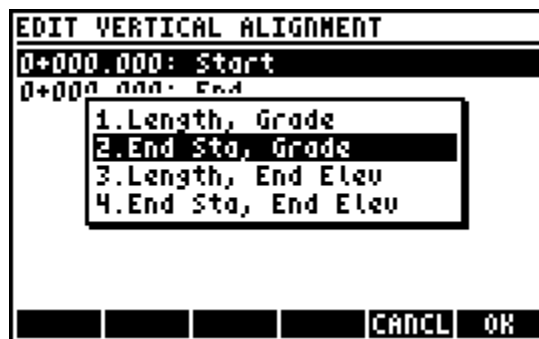
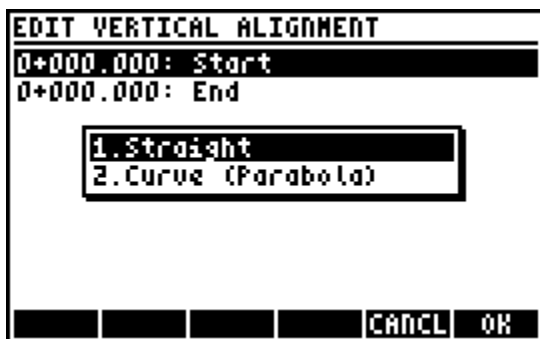
The sketch below outlines the parameters for the vertical alignment. For this example the elevation at station 0+000 is known to be 100.000m.



Step 12: Press **F3** [**EDIT**] to edit the starting elevation.



Step 13: Press **A** [**ADD**] to add the first straight element, and select "2.End Sta, Grade".



Step 14: Enter the known parameters for the straight element. The screen updates to show the newly added element.

```

ADD VERTICAL STRAIGHT
Start Station.. 0+000.000
Start Elev..... 100.000m
End Station..... 0+175.000
Grade..... 16.000 %

End Station of Segment
EDIT [endHZ] SOLVE CANCL OK
  
```

```

EDIT VERTICAL ALIGNMENT
0+000.000: Start
0+000.000: Straight
0+175.000: End

ADD DEL EDIT INFO CANCL:VtAL:
  
```

Step 15: Add the vertical curve.

```

EDIT VERTICAL ALIGNMENT
0+000.000: Start
0+000.000: Straight
0+175.000: End
1. Straight
2. Curve (Parabola)

CANCL OK
  
```

```

EDIT VERTICAL ALIGNMENT
0+000.000: Start
0+000.000: Straight
0+175.000: End
1. Length, Grades
2. EVC Sta, Grades
3. Elevations

CANCL OK
  
```

```

ADD VERTICAL CURVE
Start Station.. 0+175.000
Start Elev..... 128.000m
Length..... 50.000m
Entry Grade..... 16.000 %
Exit Grade..... -10.000 %

Length of Vertical Curve
EDIT [endHZ] SOLVE CANCL OK
  
```

```

EDIT VERTICAL ALIGNMENT
0+000.000: Start
0+000.000: Straight
0+175.000: Curve
0+225.000: End

ADD DEL EDIT INFO CANCL:VtAL:
  
```

Step 16: Add the second and final straight element. Note: Press **[F3]** **[endHZ]** to calculate the length to be the end of the horizontal alignment.

```

EDIT VERTICAL ALIGNMENT
0+000.000: Start
0+000.000: Straight
0+175.000: Curve
0+225.000: End
1. Length, Grade
2. End Sta, Grade
3. Length, End Elev
4. End Sta, End Elev

CANCL OK
  
```

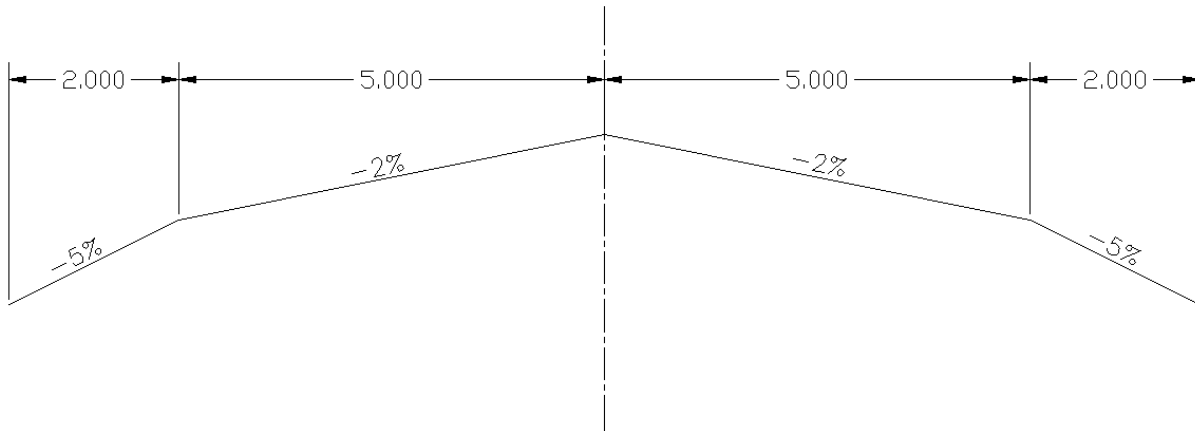
```

ADD VERTICAL STRAIGHT
Start Station.. 0+225.000
Start Elev..... 129.500m
Length..... 189.220m
Grade..... -10.000 %

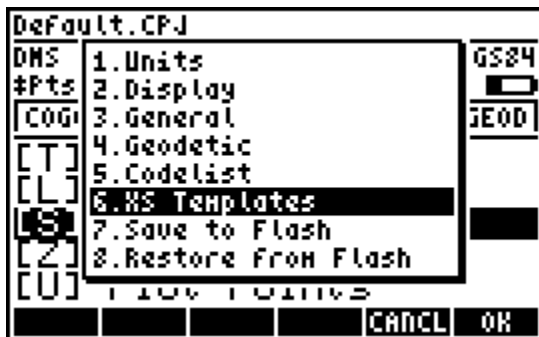
Segment Length
EDIT [endHZ] SOLVE CANCL OK
  
```

Step 17: Exit the Alignments program to create a new cross section template, return to the main menu.

The sketch below outlines the cross section template parameters.



Step 18: Go to User Settings, and choose “6.XS Templates”.



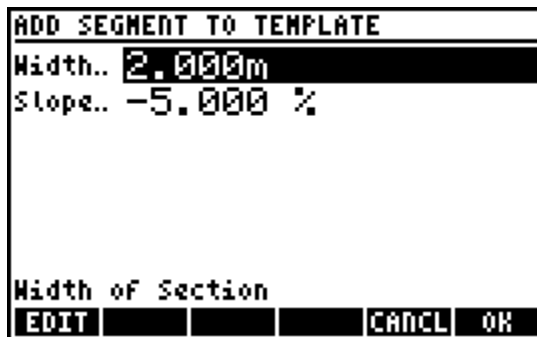
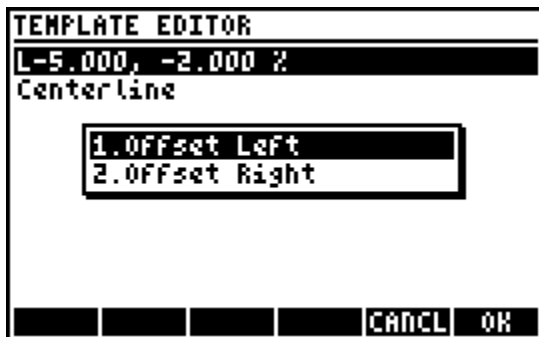
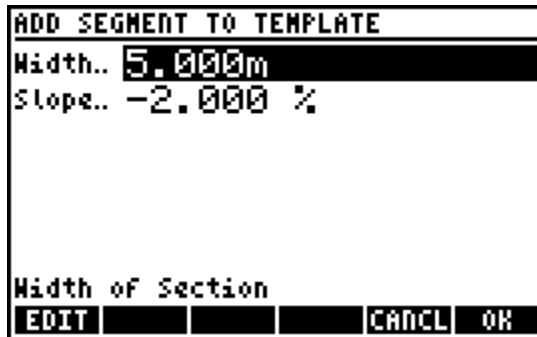
Step 19: Press **[F1]** **[NEW]** to create the new template, then choose “1.Offsets, Slopes” as the type of template and provide a name for the template.



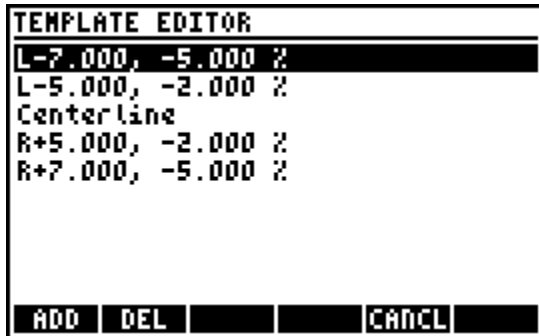
Step 20: Press **F3** [**EDIT**] to edit the new template and define the offsets and slopes. The default template contains only the centerline.



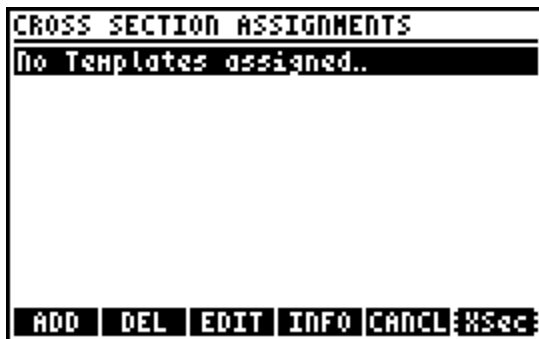
Step 21: Press **F4** [**ADD**] to add an offset, and then enter the width and slope of the offset. All offsets should be entered starting from the centerline and moving away from it. Enter the offsets left, and then right to complete the template.



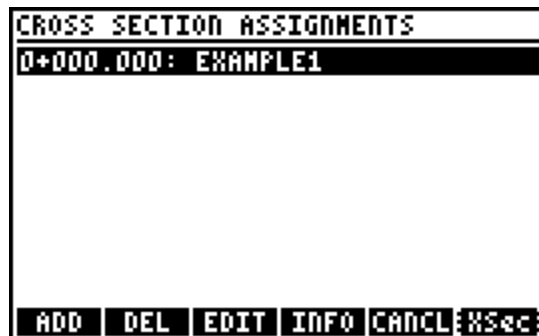
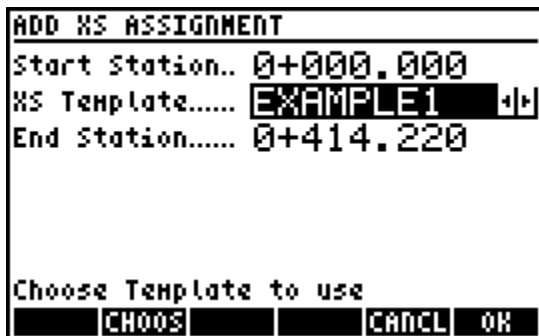
Step 22: Verify your final template looks as shown below.



Step 23: Return to the Alignments program, and EDIT the EXAMPLE1.CPA alignment, and then press **F6** [**HzAL**] / **F6** [**VtAL**] until you are at the CROSS SECTION ASSIGNMENTS screen.

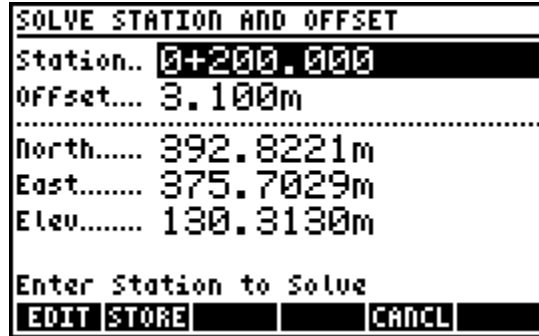


Step 24: Press **F1** [**ADD**] to add a cross section assignment. For this example we will use only one template for the entire alignment.

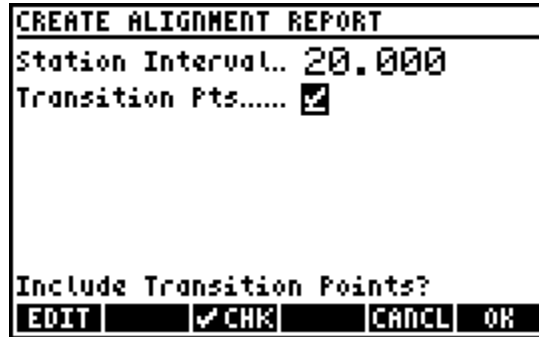
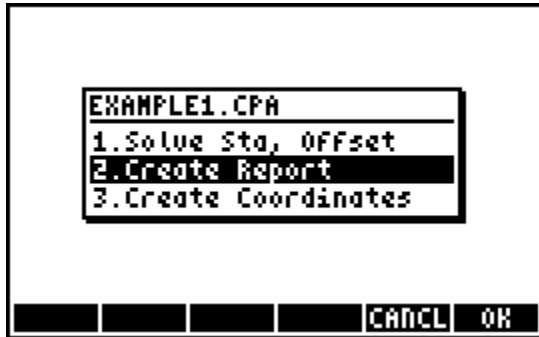


Once assigned, this completes the creation of the alignment. You can press **F5** [**CANCL**] to return to the main ALIGNMENTS MANAGER screen.

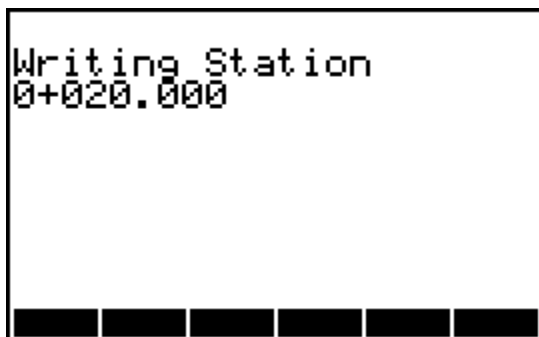
Option 1: Solve any station and offset. Press **F6** [**LOAD**], then select "1.Solve Sta, Offset". Enter any station and offset to calculate the 3D coordinates.



Option 2: Create a report of the entire alignment, at a given interval. For example at a 20m interval including all transition points.



The data is written and you are given the option to save the file as an ASCII file or to review the data on the screen.



The points 300-429 are calculated left to right across each cross section and along the alignment from start to finish.



Now these points can be used further for any number of possible uses, including staking out, etc. from known control points within the project area.