ROAD Lab 1 – Preliminary Road Design

Task Description:

A reproduction of a topographic map (Map image resolution 300 pixels per inch and Map scale is 1000 ft per inch, or 1:12,000) will be used in this lab. This topographic map is shown as Map #1. A new "Visitor Center" is to be built at point '1' and your firm has been hired to identify a route connecting it to the existing road network. The potential access point has been proposed as point B on your map. Your task is to find a preliminary alignment for a two-lane road connecting point B to the visitor center. Acceptable designs should satisfy the following design controls (constraints):

- design speed = 40 mph
- depth of maximum cut = 15 feet
- maximum grade =   5%

- height of maximum fill = 15 feet
- minimum grade = 0%
- maximum superelevation = 6%

Within these constraints, the shortest road with minimal cut and fill is to be preferred.

To facilitate your design, a web-based roadway design module has been developed at the Intelligent Transportation Institute of the University of Minnesota.   You can access the online module through the following web site.

Roadway design module: http://street.umn.edu/ROAD_appl.html

Your final product should include:

1. Horizontal alignment:
    Drawings showing your proposed horizontal alignments. For each horizontal curve include:
    - superelevation
    - length of curve
    - radius

    - length of long chord
    - station of PC
    - station of PT

2. Vertical alignment:
    Profile drawings showing the existing elevations along the centerline of your road, along with your proposed vertical alignments. For each vertical curve include:
    - station and elevation of PVC curve length
    - station and elevation of PVT grades

    - station and elevation of PVI station and elevation of high (or low) point

3. A short (2-3 page, typewritten, double-spaced) description of your designs including their lengths. Identify all places where your designs violate the above design controls and justify each violation.

4. A title page, with names and signatures of team members receiving credit for the project.

ROAD Lab Scoring Sheet

Team Members:
1._____ 2._____
3._____ 4._____

Horizontal Alignment
      Curve data (15 points)   _____
      Design controls
            Superelevation (10 points)   _____
            Design speed (radius) (5 points)   _____

Vertical Alignment
      Curve data (15 points)   _____
      Design controls
            Max/min grades (10 points)   _____
            Max/min cuts and fills (10 points)   _____
            Design speed (length) (5 points)   _____

Other constraints/considerations
      Length (10 points)   _____

Appearance/Presentation (20 points)   _____

Total   _____

Developing a Preliminary Road Design:

1. Draw the initial proposed horizontal tangents on contour map.
2. For each PI, design the horizontal curves connecting the tangents and draw curves on contour map.   This is your proposed centerline.
3.   Measure the distance from the start of road to each point where the proposed horizontal alignment crosses a contour line:
    - Record the straight line distance on tangents
    - Record the arc distance on horizontal curve
4. Plot the elevation of each contour line against the station of the point where the contour crosses the proposed centerline.
5. Draw the proposed vertical grades on profile.
6. For each PVI, design the vertical curves connecting the grades and draw the curves on the profile.
7. Compare the resulting horizontal and vertical alignment with design controls.
8. If design is not acceptable, go to step 1.

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Brook

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ONARD

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