

CE 716 EROSION AND SEDIMENTATION

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Assignment #3 - Chapters 6 and 7 due October 28, 2009

Problem # 1 (50 points)

Consider the data from the Rio Grande at Bernalillo on June 4, 1953 for Culbertson et al. (1972). The total flow depth is 3.5 ft, the channel top width is 270 ft, energy grade line S_f is 0.000083 ft/ft, mean particle size is approximately 0.69 mm, and the temperature is 62°F. The velocity and concentration profiles are provided in the following table.

z (ft)	v (ft/s)	C (ppm)
0.3	3.72	2,359
0.8	4.09	1,809
1.3	4.36	1,540
1.7	4.36	1,240
2.2	4.25	1,151

Plot the semi-logarithmic velocity profile and determine the following:

- von Karman constant
- shear stress in Pascals
- mean flow velocity in m/s
- Froude number
- Darcy-Weisbach friction factor
- Manning n
- Chezy coefficient in SI
- momentum correction factor
- energy correction factor
- laminar sublayer thickness in mm.

Problem # 2 (50 points)

Consider a sharp meander bend of the Fall River, Colorado. A 8 mm particle with angle of repose at 36 degrees is placed on the bed of a 10-m wide channel at a downstream slope angle of 0.1 degrees. Determine the following:

1. Use the method of Section 7.3 with $M=2N$ and determine the critical shear stress that corresponds to incipient motion of this particle as a function of the side slope angle Θ_1 and plot the results on a single graph.
 2. Repeat the calculations for the two cases when the streamline deviation angle is 15 degrees up, and down the side slope, and show the results on the same graph.
 3. Repeat the calculations and provide additional graphs for $M=10N$, and $M = 0.4N$.
 4. Repeat steps 1-3 above by using the method of section 7.4 when assuming a lift-drag ratio equal to 0.4, 2 and 10 respectively.
 5. Prepare a Summary Table for the critical shear stress values at a side slope angle of 20 degrees in three rows ($\lambda = -15^\circ, 0$ and 15°) and six columns (three for $M/N = 0.4, 2$ and 10 , and repeat for the results of section 7.4). What conditions will require the lowest/highest shear stress to move the particle. Are the particles easier to move when λ is positive or negative?
 6. Discuss your results.
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