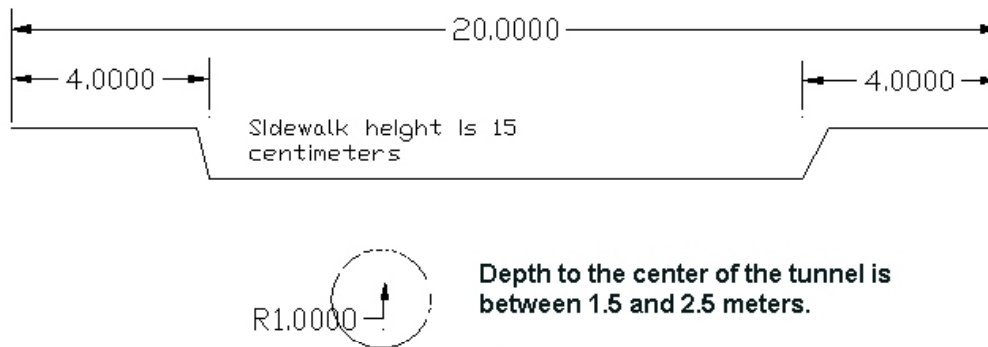


The Problem

Rumor has it that there is an old Chinese tunnel underneath the main street of Virginia City, Montana. An ancient resident, more familiar with the modern bars than most citizens, claims to have seen an entrance in the hotel basement during his youth. If a tunnel is there, it must trend north-south somewhere under the street and sidewalk system which is about 20 meters wide. The local historic society requests a gravity survey to determine if the tunnel exists.

Expectations and Observations

The suspected tunnel has a radius of about one meter. The tunnel's center is between 1.5 and 2.5 meters below the street surface. Assume air fills the tunnel and that the surrounding rocks have a density of $2,600 \text{ kg/m}^3$. The street surface is flat but the sidewalks are 15 cm higher than the street surface.



Assignment

Use a spreadsheet or the [CSM java applet](#) to calculate the gravity anomaly caused by the tunnel at the minimum and maximum proposed depths. Present your results as a two page (without figures) bid to do a gravity survey designed to determine the existence of the tunnel. The street is flat so the only elevation corrections you will need to do are for the height of the sidewalk.

Your bid should include:

1. A short description of the problem (one paragraph).
2. The number of gravity observations you propose collecting; you determine this by experimentation. You must justify this with a figure demonstrating that your proposed number of stations will be sufficient to reveal the tunnel if it exists.
3. Explain carefully the impact of the sidewalks on your proposed gravity observations. Include a figure that shows the gravity anomaly if a tunnel is centered under a sidewalk edge.
4. Breakdown your proposed survey costs assuming 5 minutes per gravity station, three hours of travel, time for report writing and of data processing at \$45/hour.
5. The differences in the deep and shallow targets and the required instrument sensitivity.
6. Figures of the calculated gravity anomalies. You can capture a screen image in windows with ALT-Print Screen and then paste that into a Word document.