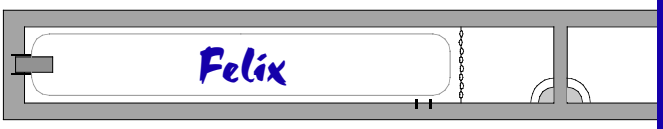
PhyzSpringboard: Thermal Conduction



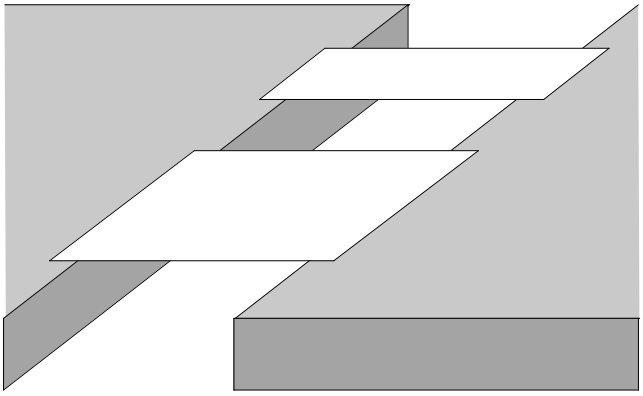
BUILDING A BETTER BRIDGE

Suppose you need to get a crowd of people from one side of a river to the other as rapidly as possible. You are in charge of designing a bridge to span the river. Which choices should you make about each of the characteristics below?

1. Width

Which would be more effective: a wide bridge or a narrow bridge? Explain.

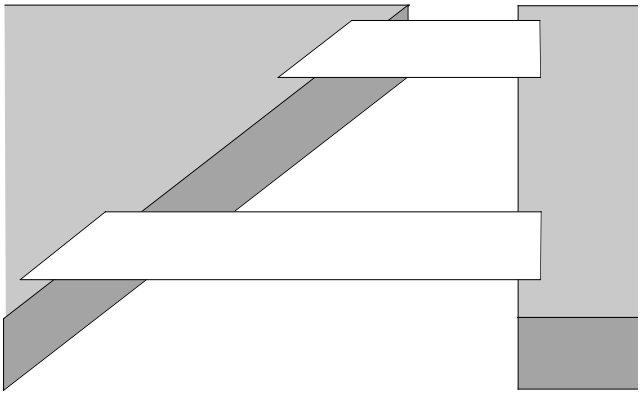
Wider is better: it's like many narrow bridges side by side.



2. Length

Which would be more effective: a short path or a long path? Explain.

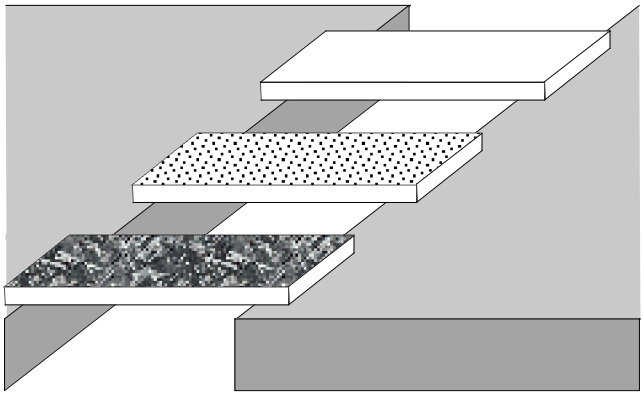
Shorter is better: people move slowest when on the bridge, so keep the bridge as short as possible.



3. Surface Material

Which would be most effective: a hard surface (like concrete), a soft surface (like sand), or a sticky surface (concrete covered with molasses)? Explain.

Hard surface is best; people move slower through sand or molasses.



BUILDING A BETTER HEAT SIPHON

A hot object and a cold object are separated by a certain distance. If they are connected by a conducting object, heat will flow from the hot object to the cold object until thermal equilibrium is attained.

Suppose we are interested in conducting the heat from the hot object to the cold object as rapidly as possible.

1. Cross-Sectional Area

Which would be more effective: a thin bar or a thick bar? Explain.

Thick bar: it's like several thin bars side by side

2. Length

Which would be more effective: a short bar or a long bar? Explain.

Shorter is better: the bar is a bottleneck so make it as short as possible.

3. Material

If you have a choice of otherwise equivalent bars, which would you choose: aluminum, copper, brass, or steel? Explain.

Copper: highest conductivity (k)