

TITLE: AUTHENTIC WATER PROPERTIES MODEL FOR INFRASTRUCTURE APPLICATIONS.

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Equipment: PVC columns, 110 mm, 30 mm tubing, water catch basin, meter stick or tape,

References:

Arms, Karen, 2005, *Holt Environmental Science*. Holt, Rinehart, and Wilson.. New York.

Coleman, R. and 623 Sadistic Students (1995) ADVANCED PHYSICS EXPERIMENTS, MORGAN PARK HIGH SCHOOL 1995 Edition. As downloaded on July 20, 2006 from URL: <http://www.iit.edu/~rcoleman/apmanual.html>

http://kdf.mff.cuni.cz/Heureka/Clanky/ReportHeureka_Nachod2005.pdf

(Primarily motivated by my personal observations and curiosity in quests for simple inexpensive inquiry examples for my students.)

Anonymous, (2005) PHYSICS 141 LABORATORY NOTES as downloaded on July 20, 2006 from URL: http://fr.physics.sunysb.edu/phy141/main_files/all.pdf

JUSTIFICATION: Water is critical to life on Earth. 77% of the Earth’s surface is covered with water of which most is salt water (Arms, 2005). In physics and in many other disciplines, including biology, environmental science and earth science, water properties must be studied in order to understand how life systems and ecosystems function. Organized societies including large cities were only made possible by the ability to move water in large quantities from a source to where it is used. Water quality, quantity and location affect water use. (Arms, 2005)

WATER PROPERTIES

What are some of the properties of water that are used to deliver water to locations distant from remote sources of water?

i.e.; what is(are) the physical state(s) of water that we encounter at the temperatures of life:

what is the composition of the water molecule?

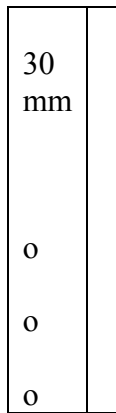
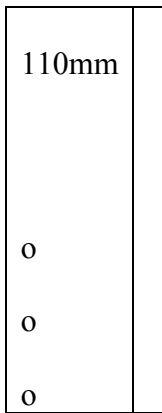
Many of these properties were discovered as early as the start of the Roman Empire. Given two tower models, of different sizes, with holes drilled in equivalent heights, predict whether a water stream will be pushed further from higher or lower holes of the same diameter.

Predict whether the diameter of the tower will influence how far water might be projected.

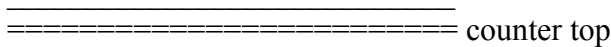
SETUP AND EXERCISE

Part 1: the water columns

Assembly: Set up the 110 MM column and the 34 mm column adjacent to each other on a stand at the edge of the table or sink overlooking a catch basin with the three holes on each column overlooking the basin



Set up the two columns with holes down as shown. Both columns and holes should be at the same height



What is your prediction for which hole (or holes) will project the water stream the greatest distance from the base of the tower?

Add water to both columns – you can plug with rubber bands or duct tape the holes on both columns and then start the flow of water by opening the holes on both columns at the same time.

Measure the distance from the column obtained by each stream at a point 1 meter below the bottom of the column, enter the data in the table below:

Use a meter stick to mark and measure how far the stream of water from each hole is projected out from the base of the column fill in the data in the following table:

Hole Height	110 mm Column Horiz. distance from base	30 mm Column horiz. distance from base	time	observations
40 cm				
25 cm				
10 cm				

When these properties of water are used as part of the infrastructure of society, what are some applications where you can observe structures that uses these properties?

What is one advantage of the liquid and hydraulic properties of water that can be used in the absence of power to move water?

What form of energy is present in the water before flow begins?

To what form of energy is the original energy transformed when the water begins to move?

Write a brief summary of your observations during this exercise. Explain what force(s) cause the water to move and to stay in a coherent stream.