Solar Household Energy, Inc.
Solar Cooking for Human Development and Environmental Relief

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Test Procedure for Cooking Pot Heat Loss Measurement

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Assumptions:

This procedure can be used to measure heat loss from cooking vessels or retained heat baskets or similar items intended for cooking or storing hot foods or liquids. The test items are assumed to be small, but larger than 1 liter capacity, and suitable for household use. They must have a lid.

Equipment needed for test:

- 2 samples of the cooking pot to be tested, with lids
- 1 liter polypropylene graduated pitcher
- Large (2 to 3 liter) metal pot for heating water
- Kitchen scale calibrated in grams
- Ruler calibrated in centimeters
- Kitchen timer or stopwatch
- Hand-held pyranometer or fast-reading thermometer that may be immersed in hot water

Test Procedure:

1. This procedure is to be conducted indoors, in still air, away from sunlight. First make dimensional measurements and take photographs of the test item, and add to the experiment record form (see below).
2. Place the cooking pot to be tested on a flat table on a cotton hot pad. The pot must be at the local ambient temperature. Take the lid off and leave it beside the pot.
3. Measure the ambient temperature near the test pot, and record it on the experiment form.
4. Measure 1 liter of water into a large metal pot.
5. Put the pot on a stove and heat until it reaches a full boil. This means that steam bubbles reach the top of the water surface.
6. Quickly but carefully pour the hot water into the test pot and put its lid on. Start the timer and set it for 15 minutes.
7. When the timer rings, immediately take the lid off and measure the temperature of the water. Record this temperature on the experiment form.
8. Measure the ambient temperature and record it on the experiment form.
9. Repeat the steps 1-8 using the other test sample. Calculate the heat loss using the formula shown below.

Heat Loss Experiment Record Form

(print copies of this form as needed)

Test pot description: _____

_____

Pot brand: _____

Pot dimensions (cm): Height _____ Diameter _____ Capacity, liters _____

Pot material(s): _____ Weight (g): _____

Lid material(s): _____ Weight (g): _____

Lid gasket description: _____ Is there a steam vent hole? _____

Experimenter(s): _____ Date: _____

Location: _____

Elevation, m. _____ Photographs taken? _____

	Test 1	**Test 2**
Ambient temperature at start of test		
Temperature after 15 minutes		
Ambient temperature at end of test		

Notes:

Calculation of Heat Loss

(All temperatures are in degrees C.)

Tamb1 = Ambient temperature at start of test
Tamb2 = Ambient temperature at end of test (after 15 minutes)
Tboil = Boiling temperature of water at elevation of test (see graph below)
Tend = Temperature of water in pot at end of test (after 15 minutes)

Temperature reduction = Td = Tboil – Tend + (Tamb2 – Tamb1)

Check on repeatability after two tests, yielding Td1 and Td2:

Mean temperature reduction = Tmean = (Td1 + Td2) / 2
Difference in two experiments = Tdiff = Td1 – Td2
Variation in two experiments = Tvar = 100* |Tdiff|/Tmean %

Mean heat loss in Joules = m c Tmean = m x 4.186 x Tmean
Where m = mass of pot, lid, and water in g.

Figure 1. Boiling point of water vs. altitude