

SOLAR OVEN WITH HEAT-PIPE VACUUM TUBES FOR EASE OF ARCHITECTONIC INTEGRATION

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SUMMARY

Solar ovens are devices that are expected to operate for several hours without constant attention of human operator. Reflective surfaces are often used to increase the amount of radiation collected by the oven, but in this case frequent reorientations would be needed to compensate for the sun displacement. This is one of the main problems when trying to integrate them as a fixed part of a existing construction.

Instead of using reflecting flat or parabolic surfaces to make an optical concentration, vacuum tubes can be used to collect radiation and introduce it into the insulated oven cavity where it is stored.

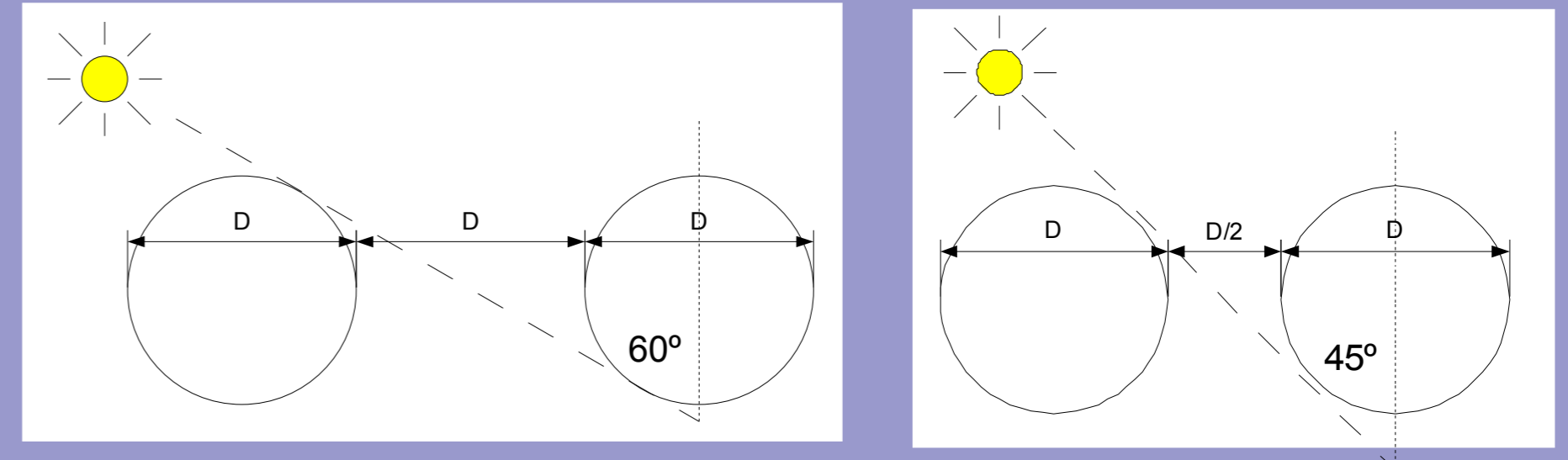
Vacuum tubes are usually employed in hot-water solar collectors in cold climates to minimize heat losses, so they meet the requirements of good insulation and resistance to high temperatures that are also necessary for the design of solar ovens. In particular, heat-pipe vacuum tubes can transfer heat without the presence of an external circulating fluid (like water or oil).

Solar ovens with vacuum tubes offer some advantages over reflecting surfaces, like a high tolerance to azimuth and elevation of sun, what is very important when the device should operate for a long time without constant attention of human operator or cannot be reoriented. Moreover, vacuum tubes can be placed in vertical position without significant loss of performance.

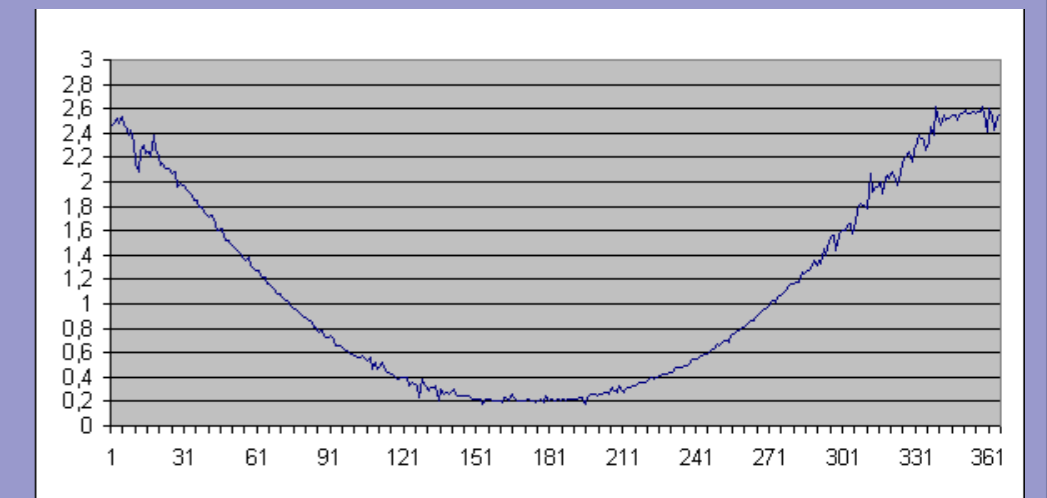
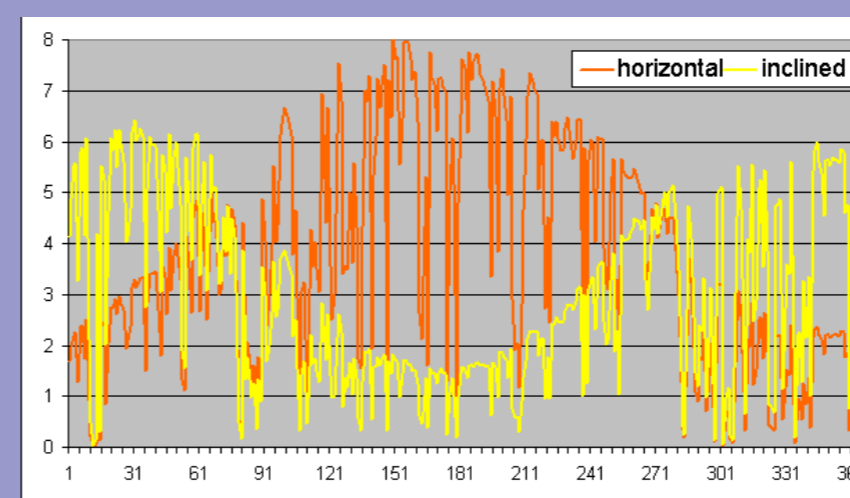
This paper is dedicated to the design and construction of a solar oven with vacuum tubes that can be easily integrated in new or existing buildings, in particular rural houses in remote areas or developing countries.

A prototype of this solar oven has been developed and tested under different positions and orientations of vacuum tubes to achieve the maximum performance.

COLLECTOR CALCULATIONS



separation of tubes to avoid shadows



energy collected with the tubes in vertical position

THERMAL TRANSFER STRUCTURE



copper tube structure



heat pipes condensers

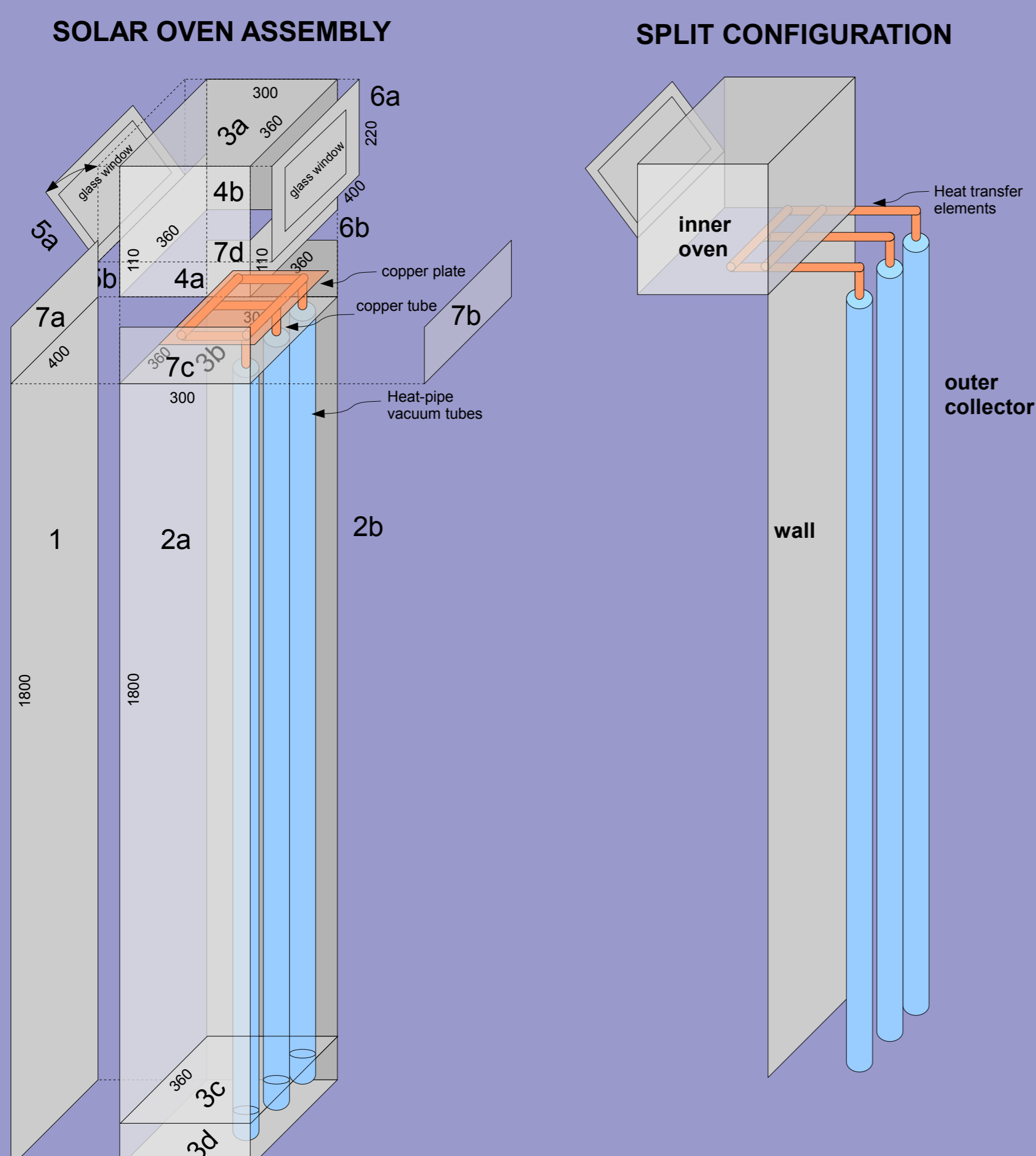


connection of the tubes



lower part of the support

OVEN DESIGN AND PLANS



COMPLETE ASSEMBLY AND EXAMPLE OF USE

