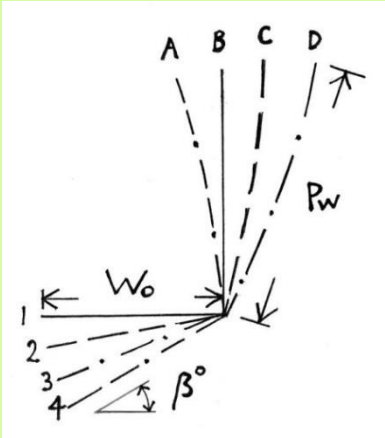
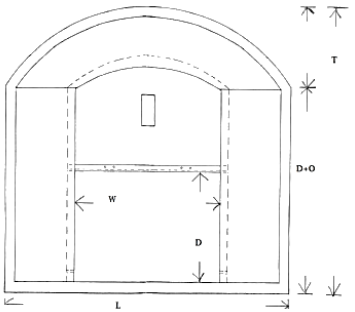
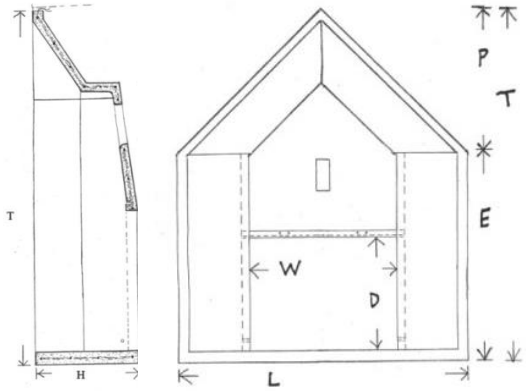
HOUSE Thru-wall solar kitchen studies

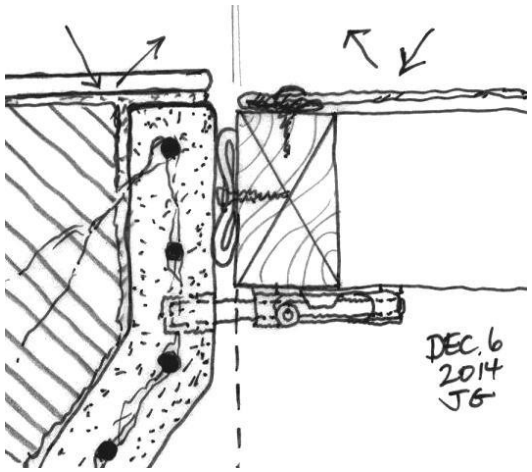


Nonimaging reflector concentrator thru-wall trough solar kitchen studies

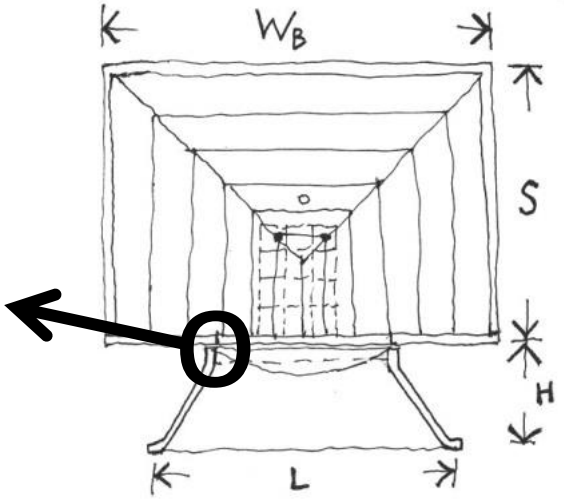
Joel H. Goodman July 7, 2014







Detail at reflector wood oven door and ferrocement frame



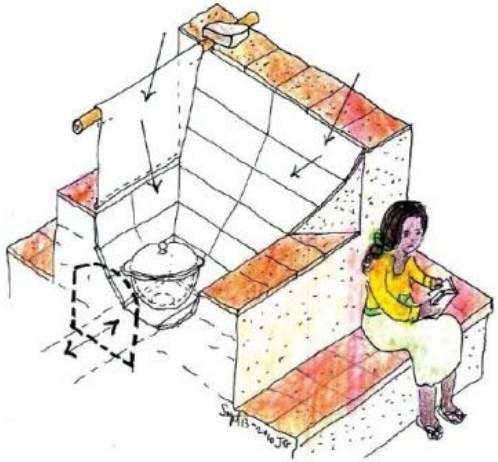
PLAN

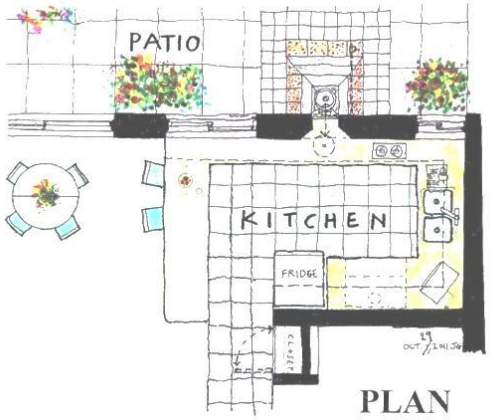
A wood-frame top hinged oven door has anodized aluminum reflector and a ferrocement door could have glued glass mirror. An unintended door swing hitting cookware is a concern. The door has a gasket and bolt locks. Selected cookware sets doorway clearance and volumetric target for reflectors optical-thermal design.

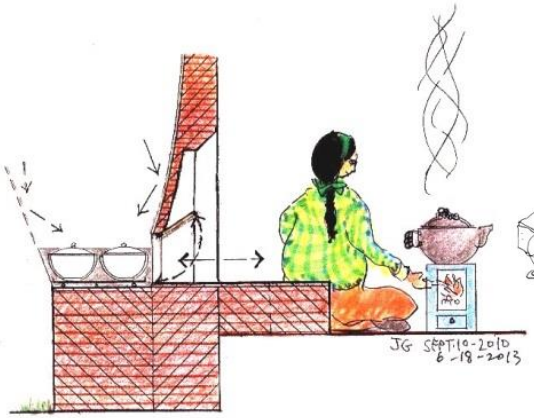
Prefabricated thru-wall (slide in-out) solar oven doorway frame (bio-plastic, ferro-cement) form for masonry walls.

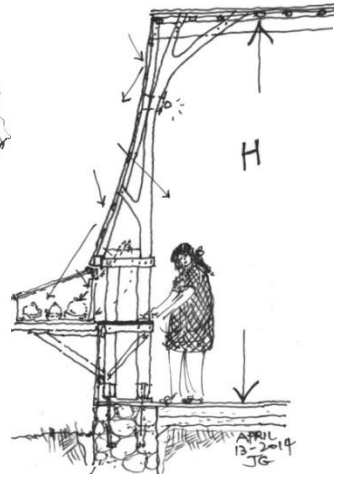
Nonimaging reflector concentrator thru-wall trough solar kitchen studies

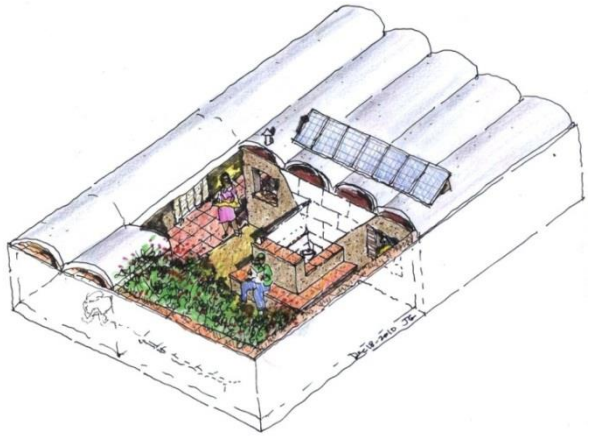
Joel H. Goodman Dec. 6, 2014







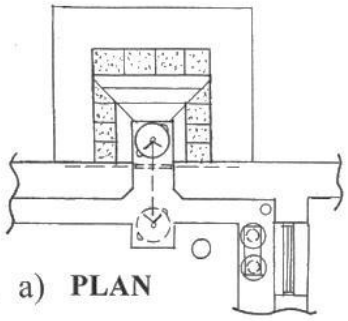


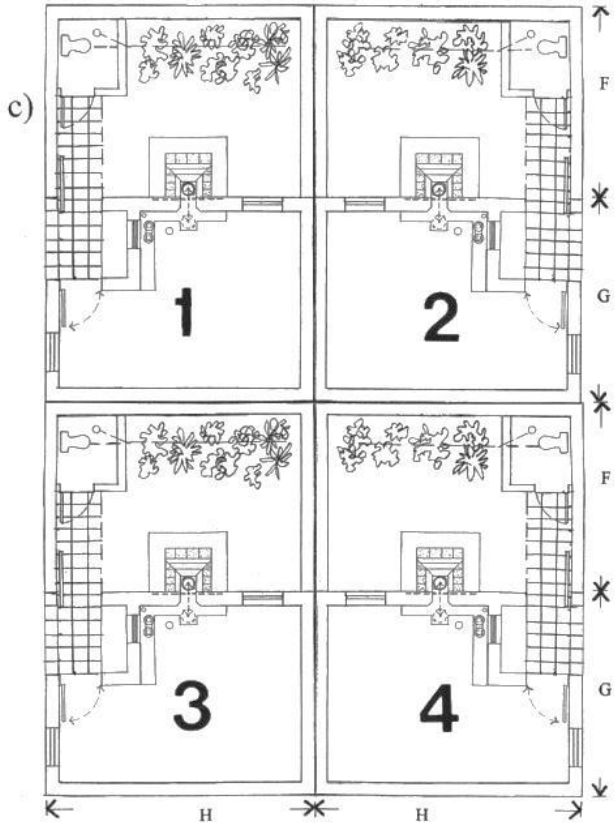


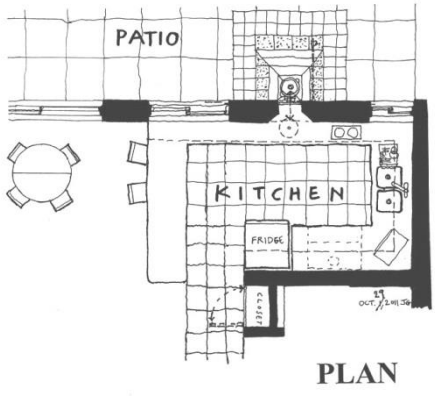
HOUSE Thru-wall slide out-in kitchen studies
Counter height is a design factor.

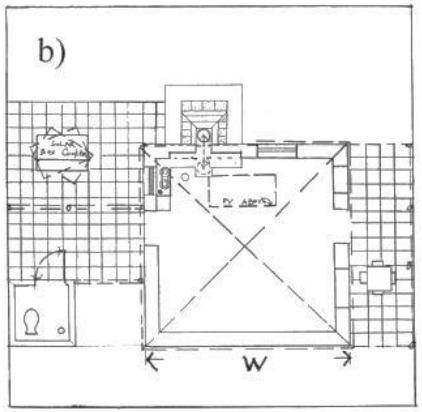
Nonimaging reflector concentrator thru-wall trough solar kitchen studies

Joel H. Goodman July 7, 2014





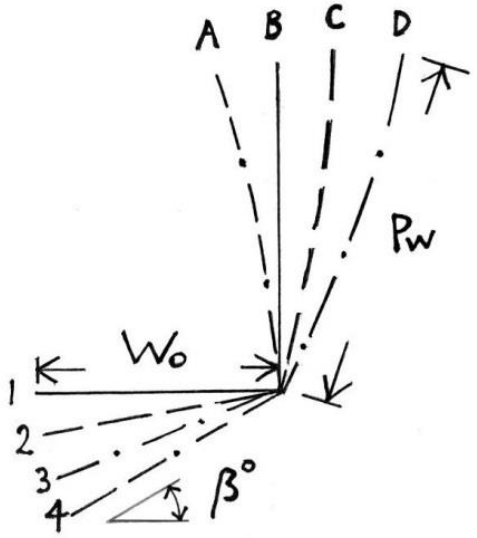


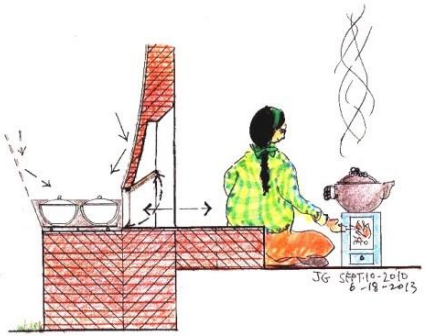


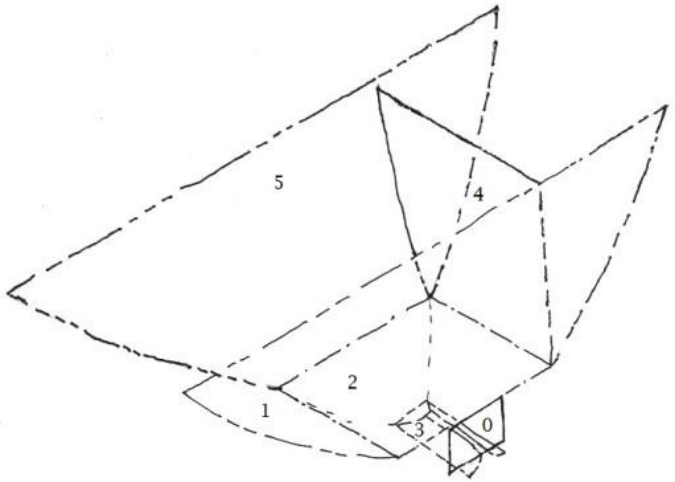
Thru-wall solar cookers have convenience for cooks however, there are significant solar access requirements for kitchens, buildings and site plans. Therefore it is of interest to study house and cluster site planning before finalizing individual thru-wall solar kitchen house plans

Nonimaging reflector concentrator thru-wall trough solar kitchen studies

Joel H. Goodman July 7, 2014







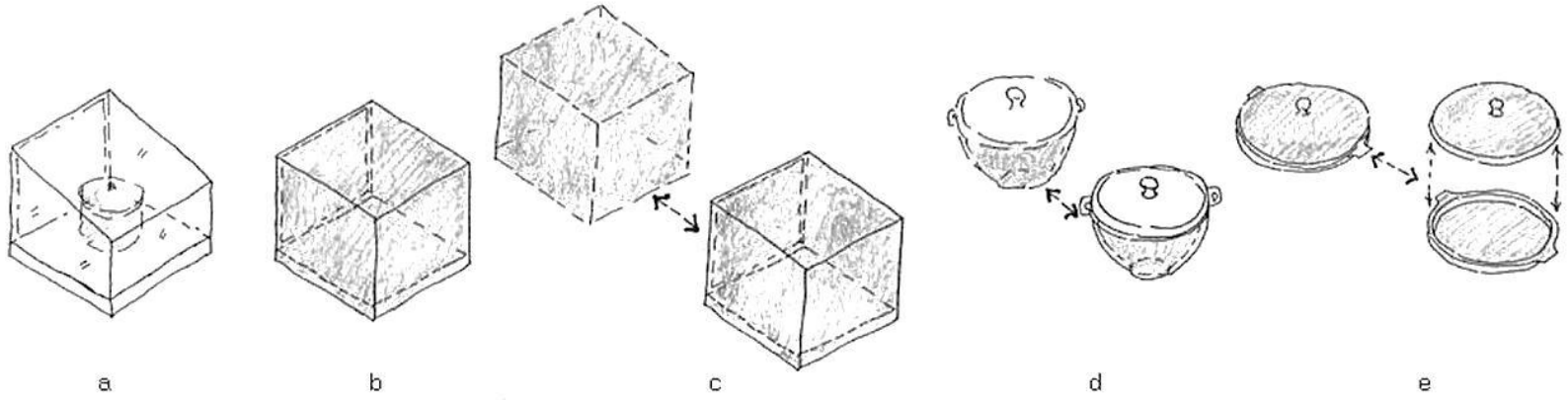
A **B**

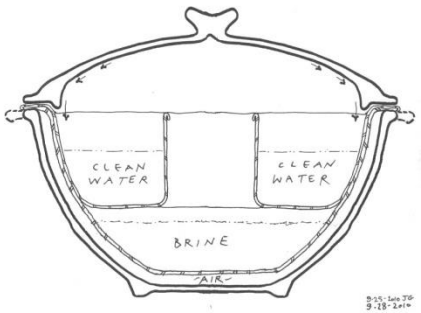
Thru-wall nonimaging reflectors optical configuration

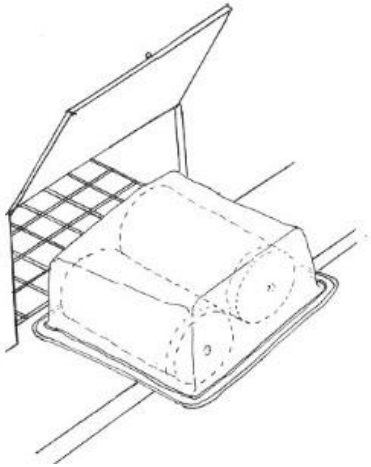
Nonimaging reflectors **optical-thermal design references** for selected regional latitude-range locations based on selected cookware and autoclave targets are needed for building technology studies.

Nonimaging reflector concentrator thru-wall trough solar kitchen studies

Joel H. Goodman July 7, 2014



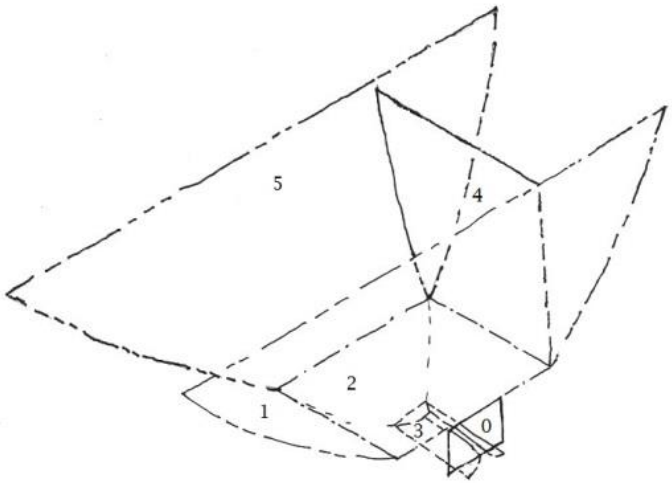


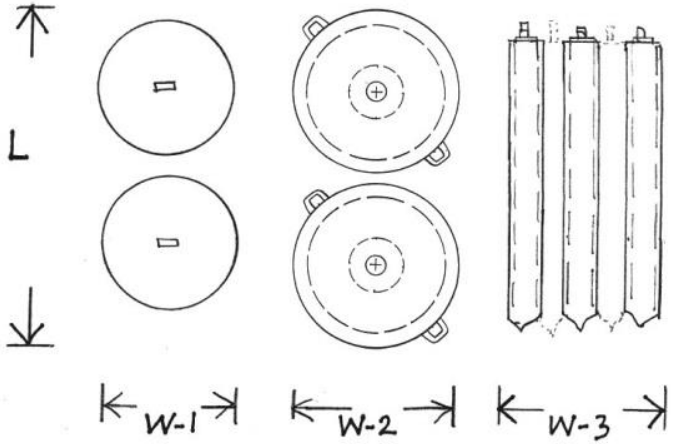


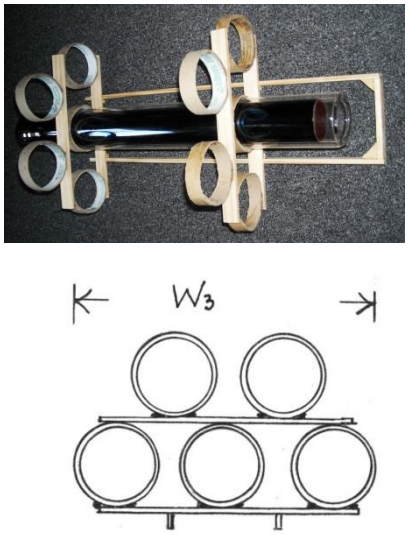
Selection of cookware, ovens, autoclaves, stills, etc. defines thru-wall doorway and concentrator target shapes/volume and sizes for nonimaging reflectors solar thermal-optical design studies

Nonimaging reflector concentrator thru-wall trough solar kitchen studies

Joel H. Goodman July 7, 2014





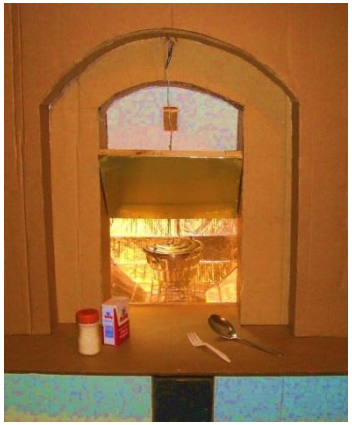


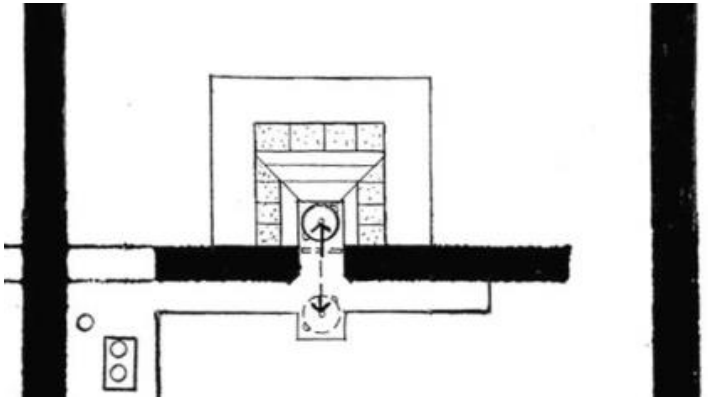
A B C

A **thru-wall solar kitchen building** or trailer has a vertical oven door (0 in Fig A); and reflector parts (Fig A): 1 is a reflector wall above the oven door; 2 is a box with horizontal or inclined inlet aperture (unglazed or glazed); 3 is a ridged-pyramid base/bracket; 4 is an E and W end adjustable or repositioned at noon; and 5 is the other side of a two-sided trough.

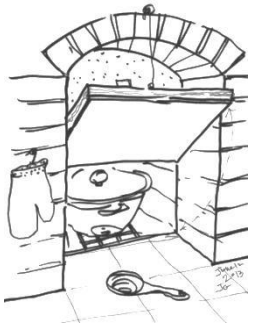
Cookware targets (Fig B)include: w-1 roaster pots; w-2 HotPots TM; and w-3 all-glass evacuated tubes. Multi-tube racks rolls/slides in-out thru the oven door into the exterior cooking zone. A five tube rack is illustrated in Fig. C. The tubes are horizontal or near horizontal.

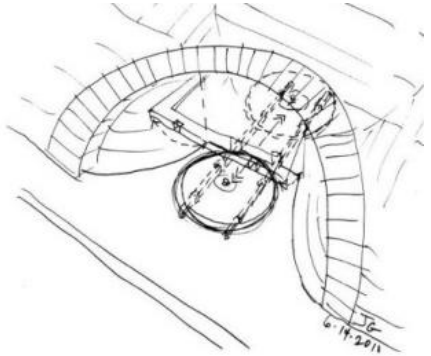
JH Goodman 7-21-2014





PLAN





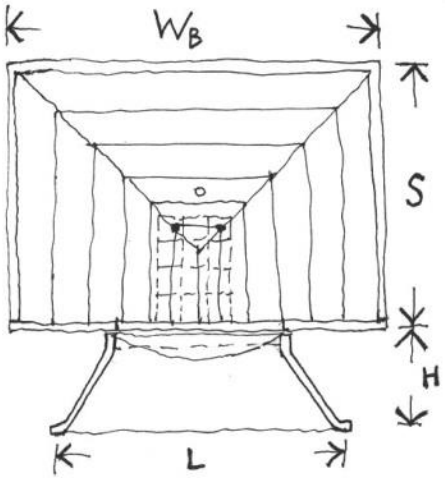
Thru-wall fixed concentrator slide in-out oven-cooker

(full size mock-up model photos)

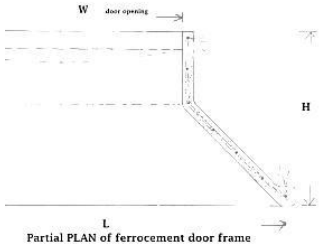
A small window for daylighting is above a top hinged reflector oven door. A rubber-type material surrounds the door frame to keep water and insects outside. The door is held open by a wire hooked to an eye screw above the door.

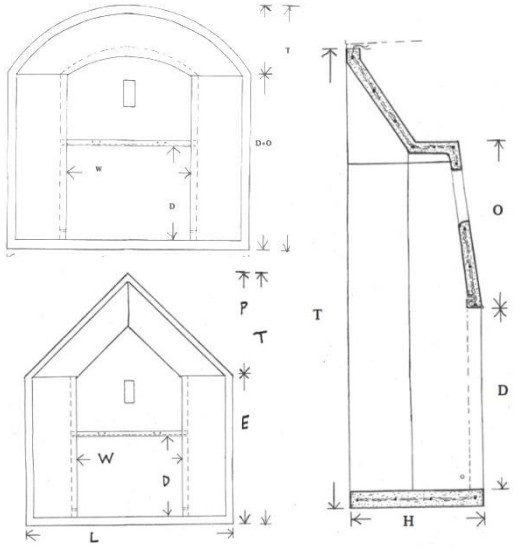
Nonimaging reflector concentrator thru-wall trough solar kitchen studies

Joel H. Goodman July 7, 2014



PLAN



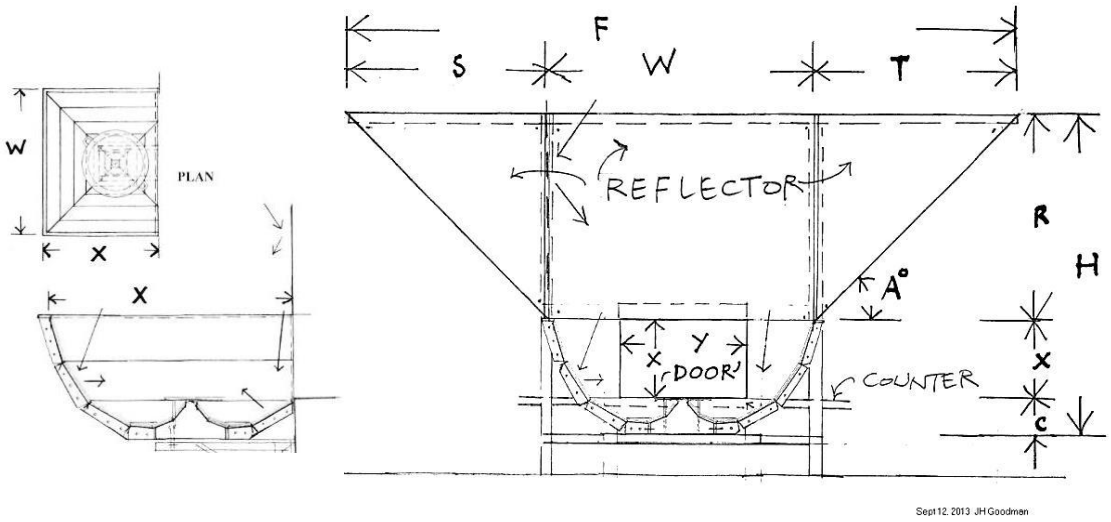


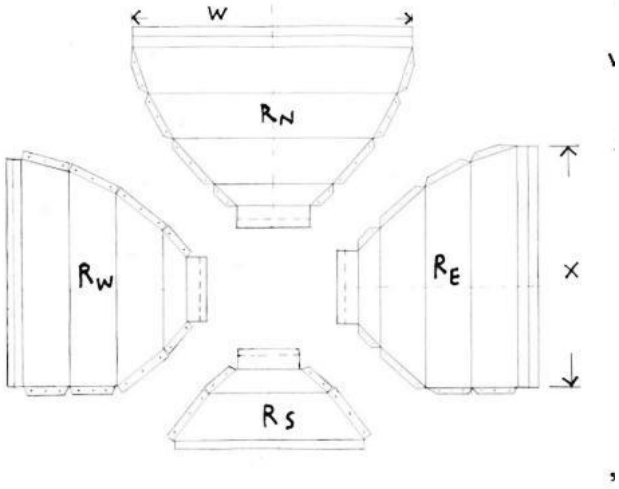
Prefabricated thru-wall (slide in-out) solar oven doorway frame (bio-plastic, ferro-cement) form for masonry walls.

Two prefabricated parts: a fixed reflector concentrator ‘box’ (WBxS in plan) and a thru wall door frame are secured together for on-site building construction . The lintel above the oven door is a substrate for mirrors which is part of the CPC-type wall. The door frame fits with the NI reflector substrate concentrator ‘box’ which is about the size of a large wheelbarrow ‘box’. The door frame is around 11in/280mm x 23in/580mm x 27in/700mm, related to the size of the selected oven-cooker pot/pans. Various lintel arch types are possible above the thru wall oven door. Shrinkage of different materials is a concern.

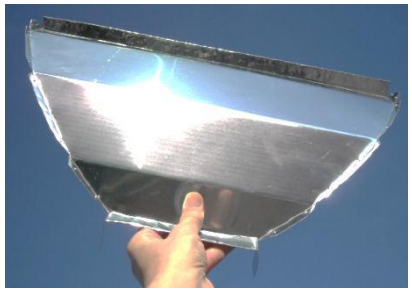
Nonimaging reflector concentrator thru-wall trough solar kitchen studies

Joel H. Goodman July 7, 2014





Quadrant reflectors

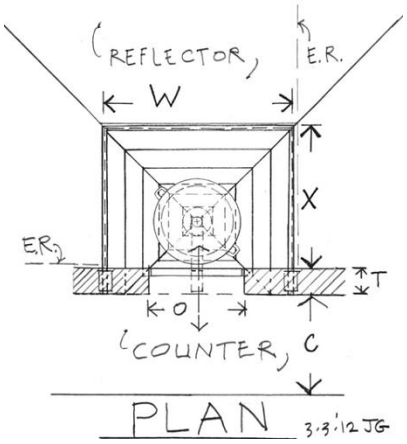


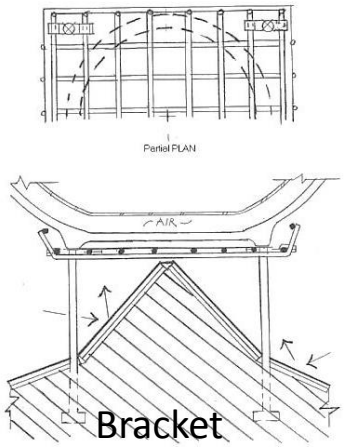
Thru wall fixed concentrator nonimaging reflector box

A reflector box (aluminum or bio-plastic substrate) attaches to a wall (house, trailer) with a ridged reflector bracket with grill posts. A quadrant reflector pattern is similar for all four quadrants of the concentrator box. Four creased aluminum-reflector attached elements are secured to the grill reflector bracket structured to the wall.

Nonimaging reflector concentrator thru-wall trough solar kitchen studies

Joel H. Goodman July 7, 2014





Thru wall fixed concentrator nonimaging reflector box

A full size reflector box prototype was fabricated with lightweight aluminum reflector sheet (0.020 in) with a scissors, pliers, and clamps. After cutting out patterns, and bending, quadrants were clamped together and bolted. The ridged reflector base-bracket reflects solar radiation upwards to the underside of the cooker-oven.