

# 2015Fall PROJECT--Thru-wall solar cooker prefabricated parts, reflector box and door frame

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Two main prefabricated parts that fit together for a house kitchen thru-reflector wall solar cooker are: a nonimaging fixed reflector box (unglazed) and attached cookware door frame. This project is for a low cost house with earthen masonry, compressed stabilized earthen block (CSEB) walls (24cm thick/around 9.5in). A construction sequence plan is: the two prefabricated parts are transported to a house construction site and attached together in alignment as they are placed securely on partly built walls in accord with the specified counter height above the finished kitchen floor level. The reflector area on the cooker door-frame is part of a larger reflector area on a nonimaging shaped masonry wall, one side of a short EW line CPC trough. Design, fabricate prototypes, and cost estimate a thru-masonry-wall solar nonimaging fixed reflector unglazed cooker reflector box substrate (for flat glass mirrors to be glued in local workshops) and door frame, mass produced for a selected regions latitude range, and stackable for compact shipping. Select target cookers to include the steel 3-Pound Roaster (9.75 inches/24.77 cm diameter x 5.75 inches height) offered by SCI, with improved cooker-bag cover-glazing. This project is for low cost small houses with low cost building materials and CSEB (compact stabilized earth blocks) walls are suggested for possible coordination with the Earth Architecture program of UNESCO. Consider masonry shrinkage and construction accuracy tolerances. Select a top-hinged non-insulated solar cooker door size with anodized reflective aluminum attached to a rectangular frame sized with clearance for the selected cookware that will slide in-out of the cooking solar caustic zone thru the door. The part of the prefab wall directly above the cooker door should not overhang the reflector box for gluing flat glass mirrors without mechanical fasteners, and the incline is related to the latitude of the selected region(s). The unglazed reflector box (around the size of a wheelbarrow box), with drain has a horizontal inlet aperture, sized to block wind to the cookware. A grill is supported on posts for sliding cookware in-out of the cooking zone above a ridged shape reflector area. A full size mock-up physical model of a solar cooker door frame is pictured. The manufacturing process is for mass production and cost estimate selected production quantities: 100, 1000, 10,000. Evaluate injection molding manufacturing and 3d printing with bio-plastics and recycled materials. Materials should be insect-termite resistant and durable in high humidity regions. Quantify thermal energy process requirements. Project emphasis is for design and fabrication of a full size reflector box substrate with glued flat glass mirrors.

**Reference:** Hayes, Andy, Chaz Keller, Hayley Gigous, and Nathan Kahle; Reflective Solar Cooker- Food By Fusion, Light by Night; PACCE project May 2015 final report, Renewable Energy Systems, U. of Wisconsin Platteville, asst professor Dino Ress; community participant: Joel H. Goodman.

