

THRU-WALL fixed nonimaging (NI) reflector concentrator solar cooker/autoclave prototype Joel H. Goodman Sept. 13-2013

A schematic design has been developed for a thru house kitchen wall fixed nonimaging (NI) reflector concentrator solar cooker as a site built construction and it is a reference for this project. A focus of this project is the design, construction, and testing of a full size thru wall fixed concentrator prototype. Current schematics have a nonimaging reflector box made of bent sheet aluminum reflectors and a center reflector base pyramid with grill posts adjacent to a reflector 'wall' structured with a minimum frame with wind fail-safe attached reflector fabric, and an E and W end reflector repositioned at noon. The NI reflector 'box' is about the size of a wheelbarrow box. Select a target(s) for the NI concentrator and your ray-trace design to include: the SCI round 3-Pound Roaster (9.75 x 5.75 inches); the HotPot™ oven (SHE Inc.); and a small autoclave. Select: a latitude-range (i.e. 0-20 deg. N and S) for your optical-thermal design and include higher latitude sites for seasonal applications.

Produce design drawings for a prototype NI 'box', reflector pyramid, 'wall' reflectors, and reflector oven door; and a full size construction for testing, and report energy collection. The nonimaging concentrator reflector 'box' has a standard quadrant shape with variations. The reflector 'wall' frame may be constructed with wood. Consider stacking for the NI 'box' aluminum reflector elements for reduced volume economic shipping. The reflector NI 'box' is a priority for the construction part of this project that can be temporarily attached to a wall (trailer, etc.). Estimate cost for selected quantities up to 10,000 per year. Research: potential for jobs creation, and evaluate eco-indicator indexing for embodied energy and pollutants in the materials and fabrication processes that you specify in your design, and avoided cost of burning fuel for developing countries applications. You are encouraged to submit your design project for the EPA's annual sustainable design exposition.

References:

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- (3) Fairey, Philip, John Harrison and Mark Thornbloom, "Solar Oven Development and Testing", Final Report, FSEC 26-58-876, 15 2-2002, (rev. 6-2002), Florida Solar Energy Center.
- (4) Goodman, J.H., Building Size Fixed Reflector CPC Troughs and Bowls for Food Processing Facilities, International Solar Food Processing Conference, ISES, 1-2009, Indore, India
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