The Oil Drum: Campfire

Discussions about Energy and Our Future

Practical Passive Solar Renovation - Part 1: Easy First Project

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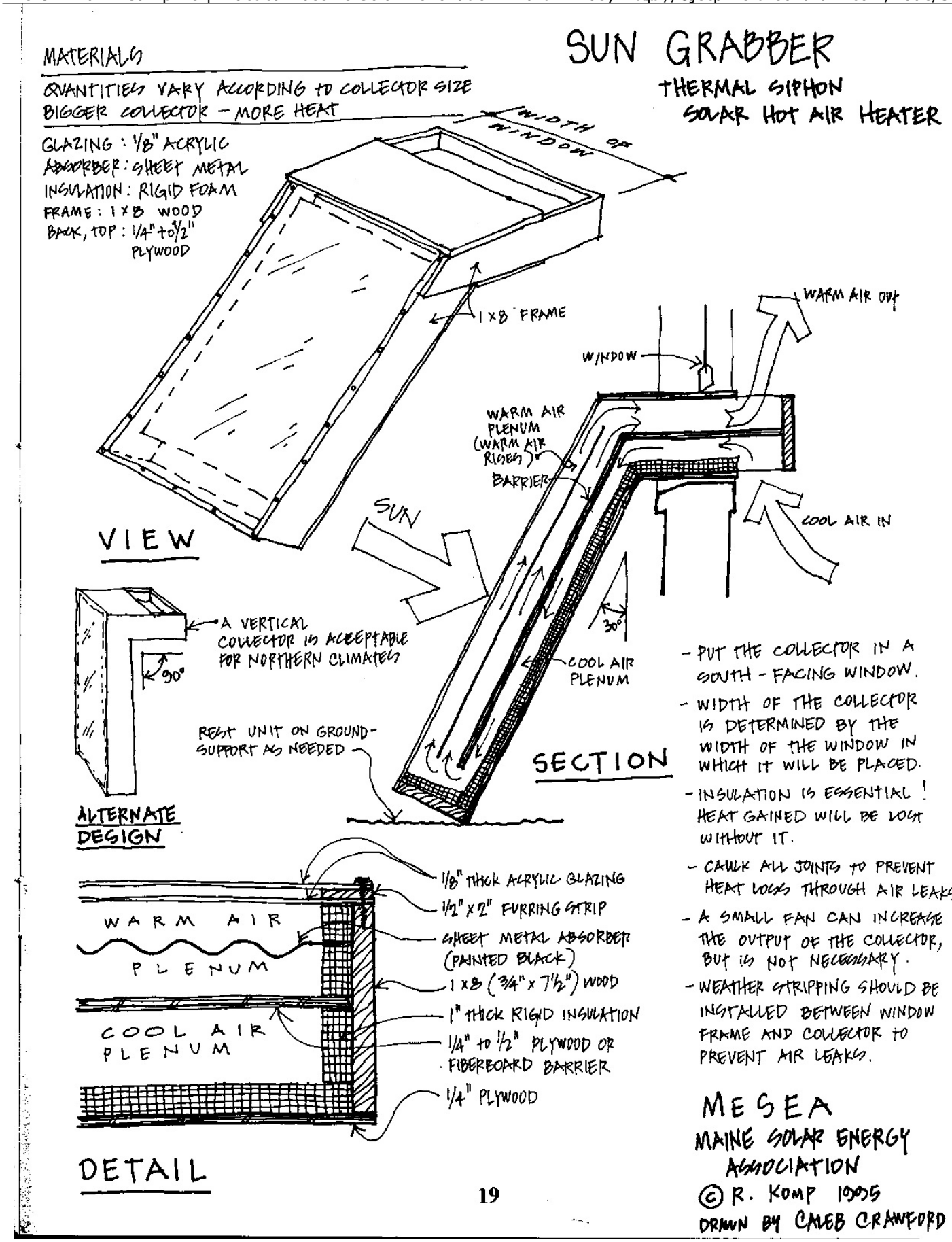
Editor's note: Below is a guest post by Will Stewart on practical passive solar improvements that we might implement right now. Please also see his series of Passive Solar fundamentals

While you are absorbing the fundamentals of passive solar design, you might also be itching to put some of you new found knowledge into action to realize lower energy bills, help a son/daughter with a school science project, or simply have a winter project to occupy you enough to keep you out of the Mayberry jail. With that in mind, the first project we will look at is one that has applicability across a wide range of homes, whether owned or rented. And if you move, you can take it with you. You can even configure it as a solar dehydrator for your garden and fruit tree produce. And once you gather the materials, you should be able to put it together in a couple of hours.

Before you jump on this fun project, though, make sure that your home's significant infiltration points have been sealed. On a windy day, pass a small candle (or punk or even incense stick) around all of the penetrations in the house shell, such as the windows, doors, foundation sill, wall joints, fireplace, even electrical outlets. Whenever you see the flame/smoke shift, you've found a leak. Discovering leaks on the downwind side of the house requires more careful attention, but is still very important. Warm humid house air that works through infiltration points in walls can lead to condensation in the cooler insulation, lowering the insulating value of the wall and leading to mold problems. There are many ways to seal infiltration points, including tube caulk, string caulk, weatherstripping, expanding spray foam, and others. We'll cover this in more detail in a

future article, but make sure you seal the major leaks first. Once you've done this, and have reasonable amounts of insulation, let's jump into the project.

This project is about solar windowbox heaters, which you can insert into a equatorial-facing windows to collect solar energy in the form of heated air that is thermosiphoned into the interior. I built one of these in the early 1980's (live in a passive solar house now) using primarily scrap materials; one side of a sliding door set (a 6' x 3' dual pane door), salvaged lumber, and cardboard for insulation. It went together in an afternoon, and was pumping warm air into my parents house the next day. Let's look at one from Richard Komp's Maine Solar Primer, found on BuildItSolar.com (click to enlarge);



There can be any number of variations and substitutions; indeed, other plans exist at [Mother

Earth News and J.R. Whipple. These are a few lessons I learned when building mine:

- Used windows can normally be easily found, just look for them (window replacement companies, for example); if you can get more than 1, consider making more than one windowbox.
- The interface between the windowbox and the window frame it is inserted into must be carefully sized and well-sealed (weatherstripping, etc) to prevent infiltration leaks.
- Use good exterior caulk (silicon) or other infiltration seal between all exterior lumber joints
- A short drape of modestly stiff material can be fashioned to the intake to draw the cooler air from floor level.
- A heavy window like a sliding glass door must have ground support of some kind (e.g., staked supports or resting on the ground)
- A good rule of thumb is to design for a tilt of latitude plus 15 degrees (e.g., at 39°N, the tilt should be 54°), though make sure to take ground height into consideration.
- Using a felt or similar weather stripping between the collector window and the window box frame makes it easier (less messy) to take the window out if needed.
- If you don't want to drill through the window frame to secure it to the window box frame, dimension the frame so that the window fits down inside it on a 1"x1" (2cm x 2cm) lip for a gravity 'fit' with a strap or similar restraining device.
- Careful not to get a 'heat mirror' window that has a low SHGC; these reject most of the sun's energy. Plain glass would be better.
- Strengthen the dogleg joint with a decking joint brace or similar.
- While rigid insulation will work, I used layers of cardboard as an insulator on the insides of the lumber pieces, and between the cool plenum and hot plenum.
- If you plan to use it for a solar dehydrator as well, design that aspect at the same time. Some people build tilt-adjustable frame with wheels on the larger size dual-purpose window boxes.
- Paint it to blend in with the color scheme of your house, in order to enhance its aesthetic appeal
- If you are in a Homeowner's Association, or other restrictive covenant, find out if you are allowed to do this first. It's often better to work with the system and get an amendment to the bylaws that allows "solar collectors and passive solar improvements" than to fight a hostile architectural committee that is miffed you didn't at least ask first.

  Note that the thermosiphon effect stops when solar insolation drops in the evening. The air left in the windowbox cools, but does not enter the house, as there is no reverse thermosiphon effect with this configuration.

  We'll be looking for comments from those who need more information, or those who put them together and can share their experiences.

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