

Solar Greenhouse Design

Additional Nuts and Bolts



Climate Control in the Greenhouse

- **Shading**
 - Roof overhang (width = $1/4$ to $1/3$ height of glazing)
 - Be careful not to create icicles over slanted glazing
 - Snow jacks on edge of roof overhang prevent this
 - If too hot on summer afternoons, translucent shade material on west wall
- **Venting**
 - Cover vents with mosquito netting to keep out pests
 - Open at night to cool, close during day
 - Inlets face breeze, outlets (equal area) away from breeze
 - East/west walls light color (get most solar exposure of any surface in summer)
 - Stack effect — inlets low, outlets high, creates a draft (warm air rises)
 - In attached greenhouse, need vent area of 25-30% of total glazing (much less in Ward)
 - Need less vent area (20%) in freestanding greenhouse
 - (will lose more heat, won't overheat house)
 - Need less venting with exhaust fan placed away from entry vents, aimed toward exit vent
 - Self-operating window vents: \$80.00
- **Fans**
 - Important for plant health, pest prevention
 - Plants more resilient, hardier
 - More CO₂ passes over leaf surface
 - Noisy!
- **If too cold in winter**
 - Insulated window and skylight coverings
 - Monitor conditions to see if greenhouse is an energy sink
- **Backup heating for extreme conditions**
 - Sandy's greenhouse only needs when colder than -10 degrees (4 or 5 nights a year)
 - Easily visible hi/low thermometer
 - Electric space heater?
 - Automatic thermostat?
- **Movable insulation**
 - Seal at edges to prevent disintegration
 - Pop-ins, shades, beads, shutters, sun-powered louvres, bubbles
 - Labor intensive, varies with time and weather changes, awkward with slanted glazing
 - Vegetation can obstruct
 - Can go with triple pane glazing, sacrificing some heat/light for convenience
 - Movable snow insulation (ask about this at next class)
- **Greenhouse/structure connection**
 - Thermal storage wall with vents
 - Circulate hot greenhouse air into house in winter
 - Circulate warm air from house into greenhouse during extremely cold periods
 - Or, without direct air circulation, greenhouse insulates/protects house like big air bubble, creating intermediate climate zone

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Miscellaneous Details

- Interior colors
 - Pretreat for longevity
 - Once vegetation grows, hard to work on interior
 - Floor — medium to dark
 - Walls
 - Dark colors help thermal mass absorb heat where sunlight hits
 - Paint everything else white to reflect as much light as possible
 - Non-toxic paints may not have durability for extreme greenhouse conditions
 - Consider using highest quality oil-based enamel
 - Check with Planetary Solutions for latest info
(17th Street 1/2 block north of Pearl in Boulder)
 - Long periods of direct sunlight on dark masonry may be uncomfortably hot
 - For more reflectiveness in summer, place light cloth over dark masonry surfaces
 - Apply exterior grade products only
- Wood treatments
 - Pretreat; once vegetation grows, may be hard to work on
 - Paint white for reflectiveness and UV protection
 - Exterior grade only
- Screens
 - To keep out critters and pests, use screening
(microfine good for pests but cuts ventilation)
- Shelves
 - Paint white
 - For flats of seedlings, bedding plants, nursery, fish tank
 - For storing materials, plant containers, tools
- Soils
 - Do not compost or sheet mulch in the greenhouse (encourages pests)
 - Build compost pile (in place if possible) the year before construction
 - Avoid too much nitrogen — leads to aphids, etc.
- Containers
 - Plastic is unbreakable, keeps soil more moist
 - Check Sturtz & Copeland dumpster for recycled pots (N. side Valmont east of 28th St)
 - Always have a drain hole
- Instruments for observing normal/extreme conditions
 - High/low thermometer (visible from house if possible)
 - Soil thermometer
 - Humidity gauge
- Greenhouse scraps
 - Feed to animals (design easy interface)
 - Recycle into nearby compost pile, NOT inside greenhouse