

WDN Architecture's Guide to

LEED Homes and

Green Residential Architecture

"Solutions and Ideas"

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The following list are solutions and ideas that have been used or suggested in Green publications and projects to create a more Green and Environmental Residential Project.

Section 1.1 Mechanical/ Electrical Systems

- *Single, High-Efficiency Mechanical Fan system allows fan to turn off
- *Zone floors individually but use single piece of equipment
- *Ceiling Fans reduce the need for Mechanical Ventilation.
- *Energy Star rated Lighting and equipment
- *Geothermal heating/cooling systems and/or use Geothermal coils to displace heat into the ground, eliminating the need for noisy condensing units while conserving electricity use
- *Vertical loop geothermal-fed radiant heating and chilled coil water cooling system
- *Solar Panels, Solar Shingles, Solar Collectors, Photovoltaics- can preheat domestic hot water before it gets to the hot water heater
- *High-efficiency water-cooled air-conditioning system utilizes an evaporative condenser, a variation of a cooling tower.
- *Pellet stoves are a primary source of heating, and send heat through typical mechanical duct system.
- *On-demand hot water heaters, tankless hot water heaters
- *High-Efficiency Heat Pump for heating/cooling
- *Seal ducting with mastic and insulate with R-11

Section 2.1 Kitchen/Laundry/Bathroom Fixtures

- *Energy Star Appliances
- *Low-flow or aerators on faucets/showers/toilets
- *Low flush or dual level flush toilets
- *Use Energy Star lighting interior, Photovoltaic (solar) lighting exterior

*Use Non-HCFC refrigerant

Section 3.1 Roof Systems

*Galvalume standing seam metal roof reflects incident radiation before heat is transmitted

*Eliminate Attic and eliminate heat gain and raise ceilings to allow heat to rise

*Solar Shingles blend into asphalt shingles and collect sun energy.

*Green roof on portion of roof or entire roof

*Light colors reflect heat, keep from creating "heat islands". Minimize roof area.

Section 4.1 Room placement/ Building Orientation

*Kitchen faces east for rising sun, Living Room faces west for setting sun, light in living spaces introduced through clerestory for indirect light at all times of day. Incorporate light shelves

*North façade insulated/blocks while south façade opens up to the sun, but with deep shading and/or trellises for winter sun over summer sun.

*Cross-ventilation in each room

*Trellis on west and south still allow winter light in

*Raise siding 12" above grade for non-toxic pest control

Section 5.1 Materials

*Exterior Wall Ideas: Reclaimed Steel Panels, Low-maintenance Materials, Salvaged Stones, Locally manufactured bricks, Long Life-span siding (Hardi-Board). Vinyl offers good insulation, but is highly toxic in its manufacture, and if burned.

*Homosote: an acoustical panel made from recycled newspaper can be used for cabinet finish

*Sustainable Flooring Ideas: OSB, Concrete, Cork, FSC Certified wood materials, Sustainably harvested Mahogany, reclaimed wood, Bamboo, Ipe for decking and woodwork. Pre-finished flooring is preferable.

*VOC-free compressed wheat-board cabinets

*Roofing system of recycled glass tiles

*Low-VOC paint

*Minimize carpeting or use low-emitting carpet.

*Plastic and wood-plastic composite lumber from plastic and wood chips, ideal for outdoor decking and railings.

*Carpet made of plastic bottles or used carpet. Up to ½ of all polyester carpet made in the US contains recycled plastic. Solution dyeing, in which fibers are dyed prior to extrusion, requires less water and generates less hazardous waste than traditional wet dyeing. Natural fibers are an environmentally preferable carpeting option because they are renewable and biodegradable. Options include jute, sisal, coir and wool floor coverings. Biodegradable carpets made from plant extracts and plant-derived chemicals are also available.

* Linoleum is highly durable resilient flooring made from natural materials, a mixture of linseed oil, wood flour, powdered cork, and pine resin, which is pressed onto a jute fiber backing.

*Tile containing recycled glass

*Concrete containing ground-up concrete as aggregate or fly ash (a cementitious waste product from coal burning power plants)

*Countertops made of recycled glass, Paperboard, Sunflower seed shells, Silastone

*Drywall made with recycled gypsum

*Straw-Bale Construction Walls

*SIP panel walls- prefabricated panels

Section 6.1 Thermal Systems

*Insulation ideas: Icynene high-density insulation, BioBased soy foam insulation, Wood Gutex insulation, Recycled denim from blue jeans can provide insulation inside for sound attenuation, High-performance spray insulation, newspaper processed into cellulose, or fiberglass with some recycled glass content, Fiberglass insulation- use formaldehyde-free and 50% recycled content.

* Kool-Ply radiant barrier plywood is used as a roof decking to reflect heat

*Thick concrete walls or 4-inch thick Concrete Floors act as thermal mass for radiant heat gain

- *Radiant heat in concrete floors or under other flooring
- *Windows- High-performance, metal-clad, low-E, argon-filled with sill plates that are borate-treated (Enviro-safe Plus contains no heavy metals or arsenic)
- *Windows- Fiberglass is energy intensive to manufacture, but is strong, durable, and has excellent insulating value. Aluminum and steel are poor insulators, and very energy intensive to manufacture. When using metal-framed windows, look for recycled content and seek frames with 'thermal breaks' to limit the loss of heat to outdoors.
- *Operable skylights or windows at clerestories for ventilation
- *Continuous vapor barrier sealed to floor, ceiling and windows
- *Rigid insulation at window-head closure, silicone sealant at window sill
- *Protect home from Radon by venting
- *Add insulation to attics, floors, walls and windows
- *Heat Recovery Ventilators uses heat from outgoing stale air to warm fresh air
- *Minimize Heat Islands by shading hardscapes, using deciduous trees and using light colors
- *Seal plumbing and electrical entrances from exterior
- *Install Humidifier
- *Correctly size/place exhaust- consult a mechanical engineer
- *Air filters of MERV 8 or greater in HVAC equipment

Section 7.1 Water Re-Use

- *Storm Water Retention system collects from roof (rain barrels)
- *Grey water re-harvesting (re-using rain water in toilets and for laundry)

Section 8.1 Preventing Waste/Construction Practices

- *Recycle construction and job site waste
- *Protect lumber from damage/theft

- *Draw up detailed framing documents, lumber count
- *Off-site fabrication where applicable
- * Use clips and stops to support drywall or wood paneling at top plates, end walls, and corners. Clips can provide the potential for two-stud corners, reducing wood, easing electrical and plumbing rough-in, and improving thermal performance. Recycled-content polyethylene clips are available as an alternative to metal.
- * For wood construction, consider 24" on center framing with insulated headers (i.e. 'advanced framing'), trusses for roofs and floors, finger-jointed studs, and engineered wood framing and sheathing materials.
- * Choose products with little or no packaging, or seek suppliers who will reuse or recycle the packaging.

Section 9.1 Contaminant Control

- *After ducts are installed, seal until project is complete. Change Filters.
- *After construction is complete, perform a flush of the HVAC system with windows open.
- *Install walk-off mats with shoe benches and non-carpeted areas at entries
- *Install central vacuum system
- *Seal garage from house properly or separate garage and paint walls and ceiling, weather-strip. Do not install HVAC.
- *Install exhaust fans in garage

This document was prepared based upon information from the following sources:

1. U.S. Green Building Council. **LEED Homes Reference Guide**, 2007.
2. Trulove, James Grayson. **New Sustainable Homes**, Collins Design, New York, NY, 2006.
3. City and County of Santa Cruz Departments of Public Works in collaboration with Ecology Action. ***"Green Building: A Guide to Sustainable Building Materials and Methods in Santa Cruz County."*** 2004.
4. United States Environmental Protection Agency website. <http://www.epa.gov>.