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GREEN BUILDING PRACTICES AND PRODUCTS

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OVERVIEW OF GREEN BUILDING GOALS:

- Reduced consumption of natural resources.
- Reduced amount of materials sent to landfill.
- Reduced energy consumption in completed structure.
- Create a healthy, vibrant indoor environment for occupants.

GENERAL:

- Orient buildings and fenestrations to make optimal use of passive solar heating, day lighting and natural cooling.
- Use locally-sourced materials to avoid long distance trucking: i.e. stone
- Choose materials with “low embodied energy.” Wood=1, Steel =8, Plastic=30, Aluminum=80.
- Search for products that have high-recycled content.
- Save water by providing for gray water re-use
- Avoid Mold potential by eliminating trapped moisture
- Think about future “recycle-ability” of what we are building.
- Design with dimensions that match material sizing available such as lumber in two foot lengths lessening cutoffs, optimum use of 4’x 8’ dimensions for plywood sheet goods.

Listing Of Green Building Techniques And Products (With Emphasis on Cold Climate Zones)

CONSTRUCTION WASTE:

Goal: Minimize job site waste and recycle what’s possible.

- Set up job site bins for glass, aluminum and plastic from workers’ lunches and breaks.
- Job Site recycling of construction materials: aluminum, glass and plastic as well as such as cardboard, metals, woods and drywall. Cardboard can usually be stored under construction trailer for future pick-up.
- Recycle framing cut-offs by stacking in convenient locations.
- Provide a "pick-up point" of framing scraps for locals to use as firewood.
- Include contract language inducing subcontractors to reduce their waste. “Supply, Install and Dispose”.
- Reduce dumpster temptation by providing one only when necessary.
- Consolidate recyclable waste with other contractors’ and job sites to minimize pickup costs.
- Request finish products with minimal packaging. Refuse overly packaged materials.
- Provide signage at job site for employees and subs that state, "this is a green building site."
- Site Superintendent’s commitment to recycling program is key.
- Recycle batteries from cordless tools: Wal-Mart, Home Depot, or call 800-8-BATTERY.

SITE:

Goal: Minimize disruption to the site during construction.

- Orient homes to take advantage of the sun. Ideally long dimension within 15degrees of South.
- Protect trees from damage and poisoning.
- Grind up branches and cut materials into landscaping mulch.
- Make use of trees cut at the site (mulch, fence posts etc.)
- Check for radon if applicable.
- Carefully separate topsoil and keep it free of contamination.
- Pave with permeable surfaces that allow water to drain through to ground, such as paving stones or bricks.
- Design vegetated swales to capture and filter runoff storm water.
- Design and provide rainwater catchments for future irrigation.
- Use indigenous stone and local brick when possible.

SEPTIC SYSTEMS:

Goal: Create a system that’s environmentally friendly and meets the needs of the project.

- Pipe separate plumbing for gray water re-use.

- Use artificial wetlands instead of conventional system as an alternative to leach fields, which can pollute groundwater. "Trench" type leach systems allow more trees to remain than with conventional "field" type leach systems.
- Investigate new filter systems that may be advantageous over normal septic leach fields.
- Consider composting toilets.

CONCRETE/ MASONRY:

Goal: Use the least amount of concrete and formwork materials that get discarded.

- Promote frost-protected shallow foundations where possible. Don't dig as deep, less disruptive to site, significant savings on foundation labor and materials.
- Minimize use of cement (it has "high embodied energy"). Request fly-ash % as substitute.
- Use perimeter insulation on all exposed concrete edges and under slab.
- Contain concrete truck and pump "cleanout" in a pond, don't allow it to run into topsoil.
- Consider stained concrete slab as finished floor.
- Use surfaces with high thermal mass to capture heat during day to radiate out at night.
- Provide air void between masonry and inner wall to allow for drying.
- Brick & stone veneer: the smaller the cavity, the more the capillary action sucking in moisture

PERFORM WALL ICF SYSTEM

- Dealer is *ECO-build.com* products-Dave Adamson cell 303-618-0063 Ron Smith is sales manager. *rs@performwall.com*
- Lots of info for engineers to use for design
- Made of recycled products, insulated, don't need furring or sheetrock, can plaster right up to it.
- Drawbacks, heavy and dusty to cut.

LUMBER AND WOOD PRODUCTS:

Goal: Use wood wisely, especially durable woods such as redwood, and timbers that are cut from large trees.
When using virgin wood products specify certified sustainable lumber:
Forest Stewardship Council is the main reliable governing body for certifiers.

USE RECYCLED WOODS FOR:

- Siding (Barnwood)
- Flooring (Case, base trim)
- Doors and Cabinets
- Ceilings or Walls
- Timber frame
- Order lumber carefully to avoid excessive cutoffs.
- Keep the stacks of wood cutoffs handy for people to grab and reuse for blocks, etc.
- Discourage lumberyard trips for small amounts of wood that may be found on site.
- Stack material from crates and pallets to be reused.
- Set up a firewood scrap pile for items that are not usable for construction.
- Stack all cardboard and protect from weather until taken to the recycling center.
- Appoint one employee to periodically collect all recyclables from sites and take them to the local recycling center.

CABINETS:

- WOODSTALK makes fiberboard panels made from wheat straw. (Agriboard)?
- Use "medite" from Medite Corp. instead of particleboard, recycled content and non-toxic.
- Cabinets sealed inside and out with water-base sealers such as "Crystal Shield" to contain off gassing of glues and chemicals.
- Build recycling center in the kitchen, provide a "holding area" for recyclables in garage or utility room.

LUMBER:

- Buy FSC Certified lumber. Collins Companies *www.Collinswood.com* or *ljimerson@collinsco.com*.
  A large house will take up to three truckloads, worth it. Can also buy through lumber yards.
- Decking - Recycled composite products such as Trex or other wood substitutes.
- Use redwood or cedar where it can really be appreciated, these woods are a valuable resource.
- Request Borax treated pressure treated lumber. (The industry is switching over, older called CCA for "chromated copper arsenate are as toxic as it sounds).
- Use engineered lumber vs. solid virgin lumber (Consumes 30% as much wood as solid lumber.)
- Examples are T.J.I., O.S.B., finger-jointed studs, parallams.
- Certified OSB from Roy O Martin Co.
- Use locally-milled wood whenever possible.
- Request that both finish and framing wood come from certified sustainable growers.
- Use insulated headers (Superior Wood Systems Inc.)

FRAMING:
Value-engineered framing can save 30% of the wood consumed in a house and result in significant labor savings. Works best if structure is designed with this in mind: 2 foot on center grids, openings on grid, etc.
Construct 24" on center inline framing. Stacked rafters over studs.
- Use single top plate or 1 x 4 top plate if need double top plate.
- Use 2 x headers on non-bearing walls.
- Provide 2 stud corners.
- Utilize ladder blocking at internal wall sections.

STRUCTURAL INSULATED PANELS FOR WALLS AND ROOF STRUCTURE:
- Can reduce use of lumber and provide higher insulation values.

METAL:
Consider steel framing alternatives, especially when it can replace large wood timbers.
- In general, steel is made of 68% and in some cases up to 100% recycled material content.
- Steel can be endlessly recycled.
- Steel buildings can be disguised by covering the exterior with appropriate regional materials.

INSULATION:
Goal: Minimize air leakage and monthly utility bills.
- Build a tight house; minimize leakage of air or heat. Seal vapor barriers well, especially around electrical outlets, switches and recessed lights.
- Increase insulation beyond minimums, payback is quick.
- Ask for Certainteed brand recycled glass content or cotton insulation.
- Use cellulose blown-in insulation. It's recycled newsprint and should contain boraics instead of ammonium sulfide or formaldehyde.
- FIBERGLASS INSULATION without formaldehyde binder & high recycled content from Johns Mansville
- Use temperature sensitive self-closing foundation and attic vents, or better yet:
- Construct unvented crawlspaces. Treat a crawlspace like a small basement; keep it dry and warm.
- Do not allow use of HCFC-foamed insulation materials. Substitute expanded polystyrene for extruded polystyrene. Consider using AirKrete (*see www.airkrete.com*), a more inert material, in lieu of Styrofoam.

DRYWALL:
- Type X contains less biocides.
- Request sheetrock with some recycled content. U.S.G. and Domtar.
- Support manufactures that accept scrap for recycling.
- Encourage recycling of drywall scrap from your site by subcontractors or future possibilities.
- Consider Earth Plaster at *americanclay.com*. Breathes, reparable, can be sealed if want, Can vary depths can be stored. Inexperienced help can do it, because it does not set up. Should not use drywall mud behind.

WINDOWS, DOORS & CASEWORK:
Goal: Minimize heat loss from glazed surfaces.
Design natural cooling by providing ventable windows or skylights in high spaces.
- Use different glazing options for particular conditions and orientations.
- Use quality windows that function and seal properly for a long life span.
- Avoid direct set glazing attached to large wood members; separation and air leakage is likely.
- Utilize window coverings to prevent solar gain such as thermostat driven motorized shades
- Install skylights to help minimize sunlight deprivation during winter months. "Sola-tubes," add natural light where windows are not possible.
- When doors and casework will be painted, look for doors made from recycled or scrap instead of raw wood.

FINISHES - CARPET, SHEET FLOORING & PAINTS:
Goal: Create a healthy indoor environment.
- Stress natural fiber carpets and non-toxic pads and adhesives. If possible, utilize both carpet and pad with recycled material content. Select carpet suppliers that are part of Partners for Carpet Reclamation.
- Use cork or natural linoleum instead of vinyl flooring. Made from natural materials and allows the floor to breathe. Avoid vinyl floors they can be toxic with Thalades offgasing.
- Use rapidly renewable natural products such as bamboo, cork, wool, and sisal.
- Avoid toxic adhesives.
- Use "Cecure" grout, has less biocides or verify content of others.
- Insist on low VOC and Non-toxic paints. Benjamin Moore "Pristine" and PPG Pure Performance Paints
- Specify low R-value carpet pad over in-floor heat.
- Bamboo floors: ECO_BUILD and Suncoast Bamboo *sales@suncoastbamboo.com*
- For listing of manufacturers that meet California's Collaborative for High Performance Schools Specification see *http://www.chps.net* to obtain Section 01350

PLUMBING:

Goal: Conservation of water and hot water energy consumption.

- Insulate all hot water pIpes, and all cold at least 5 feet from hot locations.
- Use water-saving fixtures.

  Install a solar water heating system, payback can be a few years or less. Explore any savings programs available from utilities or government agencies. Financial Support: State Incentives For Renewable Energy : In 1995, the U.S. Department of Energy began work on the National Database of State Incentives for Renewable Energy (DSIRE), through the Interstate Renewable Energy Council. The database is designed to contain all available information on state financial and regulatory incentives (tax credits, grants, special utility rates, etc.) that are designed to promote the application of renewable energy technologies
- Install Metlund D'Mand system for controlling recirc pump on an as needed basis. *www.gothotwater.com*
- For excessively long hot water runs, evaluate use of demand heaters in remote locations.
- Pipe for future solar water heating for domestic and snowmelt. Run 1" lines and control wire from mechanical room to attic or future accessible location for roof mounted panels, or remote sited panels.
- Separate waste lines for possible gray water recycling, which is now legal in many states. Make connections easily accessible in future and document locations.
- Have an "Away" shut-off method for hot water circulation pump, and other energy consumptive functions not needed during vacant periods. Consider timers on systems during normal use periods.
- Consider Geo exchange systems.

HEATING CONTROLS:

Goal: Conserve energy

- Use Tekmar or alternate sophisticated variable boiler controllers that reduce fuel consumption by anticipating and measuring out heat demands.
- Pre-wire for ultimate use of a home automation program that controls heating functions with a goal of reducing energy consumption. Use programmable thermostats if there won't be a home automation system.
- Set up controls for easy setting of "away or vacation" mode.

MECHANICAL HEATING:

- Locate mechanical rooms in a central location to minimize length of runs and heat loss.
- Use dryer vents that prevent cold air back draft. (Tamarack Technologies 800-222-5932)
- Provide adequate ventilation to ensure fresh air circulation throughout house.
- Provide an air destratification system.
- Promote use of air-to-air heat exchangers. (Also called heat recovery ventilators)
- Use only the most efficient equipment available.
- In extreme dry air climates; install a humidifier system for comfort.
- Provide electronic air filters on forced air systems.
- Use an "economizer" in forced air systems to bring in controlled amounts of outdoor air.
- Provide proper radon gas ventilation.
- Use air conditioners without Freon.
- Explore the use of geo-thermal heat pumps.
- Minimize areas needing external snow melt; extreme use of energy.

ELECTRICAL:

- Reduce health risks from EMF (Electro magnetic fields). Avoid location of sub panels or main wires in spaces inhabited for long periods of time such as bedrooms and kitchen.
- Provide for future connection to alternate energy sources such as photo-voltaics and fuel cells.
- Use CAT 5 phone wires and RG-6 cable to all rooms and all home runs – no daisy chains.

ELECTRICAL BACKUP SYSTEM:

- Consider a hybrid system that uses photovoltaic and generator with some batteries, instead of relying totally on generator. Photo-voltaics can feed power back to the grid.
- Prepare for future fuel cell hookups.

LIGHTING:

- Request insulated recessed lighting - Halo airtight or Air-Loc IC by Juno Lighting.
- Use compact fluorescent bulbs in lights that will be on much of the time, such as exterior lights, hallways and safety lights.
- Investigate new types of lighting that consume less energy and create less heat such as fiber optics or LED.

ROOFS:

Goal: Minimize heat loss through roof.

- Use Vented roofs (lessens ice damming or over heating), or super insulated roofs.
- On super-insulated roofs, do calculations to ensure that "dew point" for a given interior humidity level falls outside of structure. There are

many problems with rotting roofs where moisture condenses within the roof structure. Put maximum limits on the humidistat to avoid excessive interior humidity, which increases condensation.
- Use baffles to retain insulation at eaves to keep air passages open.
- Use spray foam insulation for higher R value. (Inquire about Soy based foam)
- Use ridge vents. (Air Vent Inc.)
- Consider roofing material with recycled content such as: Tiles of recycled wood fiber and concrete, tiles of recycled rubber, panels made from recycled aluminum or steel.

APPLIANCES
- Consumer Guide to Home Energy Savings, Alex Wilson, Jennifer Thorne, John Morrill; American Council for an Energy-Efficient Economy. Chelsea Green Publishing Co. Updated periodically with model numbers of the most efficient appliances and information of selecting energy-efficient equipment and improving the performance of older equipment. (800) 639-4099. *www.chelseagreen.com* or *http://www.aceee.org/consumerguide/mostenef.htm*

SITE FINISHING:
- Landscape with native plants that do not require substantial watering, "xeriscape."
- Plant trees on east and west sides of building in hot climates to dramatically reduce cooling loads.
- Incorporate windbreak vegetation to block cold winter winds, or help with cooling summer breezes.
- Consider an area for a clothesline.

IF DEMOLISHING AN EXISTING STRUCTURE:
- DECONSTRUCT! instead of demolish. Dismantle the structure for re-use of valuable materials.
  Sort the materials that have to be demolished so they can be compacted prior to sending to landfill.

MOLD ISSUES:
- Terry Brennan, contacted thru *BuildingScience.com* (Betsy Petit & Joe Lstiburek)
- Basic: keep out moisture, and you keep out mold – Mold likes to hide, it likes gypboard, mold doesn't like plaster, or zinc oxide. OSB is more vulnerable, because it holds moisture.
- Brick & stone veneer: the smaller the cavity, the more the capillary action sucking in moisture
- Air tightness = higher humidity
- Moisture goes from warm to cold