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Education

We understand so much more today about how building systems and building science work. And that knowledge, coupled with proven new products, good design, and simple attention to detail, allows us now to build better homes that use fewer resources, are more comfortable, and last longer.

If you're just looking into sustainable building, here's a look at green building basics and the latest thinking about this important trend to help you better understand how to improve the performance of your home and its systems.

To start the learning process, here, in rough order of importance, are seven key green building concepts.

1 Design

The single most important green design decision is size. Smaller houses automatically consume fewer resources both during construction and after occupation. "Houses should be sized to work for you every day," says Sarah Susanka, architect and author of The Not So Big House. Susanka further suggests that we stick to basic shapes. "Simpler forms lose less energy because the ratio of exterior surface area to volume is smaller. Every projection from a house is like a cooling fin."

Solar orientation is the most important design element. Heating and cooling loads in a home could be cut significantly by orienting the long walls of houses east-west, exposing south facing windows in winter, and shading them in summer, and avoiding expanses of glass on west-facing walls that get the full brunt of the flat afternoon sun.

Even in lots where the street dictates layout of the home, there are still steps you can take. You can reverse plans to place the garage on the west side of a house. Porches and broad roof overhangs can shade south and west facing windows. Plant, or don't cut down in the first place, trees that shade the west side of a house."

2. Durability

What's the key to durability? Water is probably public enemy one, two, three, and four. Uncontrolled water rots homes, peels paint, and causes mold.

Moisture control is a huge focus of building science–inspired components like generous overhangs, proper window and door flashings, and rain-screen walls that allow siding to dry, improve paint durability, and avoid water wicking. Normal construction details assume greater importance.

Controlling air and moisture leakage from inside to out not only saves energy, but also can prevent damaging condensation from forming in framing cavities. The use of vapor barriers in cold climates is an important moisture control element.

Attention to detail is another key. We must follow a careful step-by-step flashing, sealing, and installation sequence to ensure proper performance over the life of the building.

Other details can be as basic as properly installing house wrap or builder's felt as a secondary weather barrier, so that water that gets in behind the siding was directed out again.

3. Energy Efficiency

Insulation is a job that needs careful detailing. From a green perspective, this is very important. And air sealing—filling the holes where inside air can leak out or outside air can leak in—is at least as important as insulation, because no insulation can achieve its potential if air can leak through it. Air infiltration must be kept as low as possible.

It's vital to eliminate areas that allow inside air access to the thermal envelope, including areas behind bathtubs, showers, and kitchen soffits. These areas should be closed off from the wall behind them with an air and moisture barrier. Recessed ceiling lights are another source of leakage. New models are available that are air sealed to help control infiltration.

While you're thinking about HVAC equipment, don't neglect the ducts. Don't run any ducts in

unconditioned spaces. Normal air conditioning duct leakage can be 20 percent. If those ducts are in unconditioned spaces, $20 of every $100 paid for air conditioning is wasted. The importance of properly sealing ducts is easy to see in that light. If you do an outstanding job of air sealing and insulation, you might qualify for rebates through your state's Energy Star program.

Fluorescent lighting gives you more light for your energy dollar, (compared to incandescent or halogen), and they also produce less heat than incandescent and halogens and can save significantly on cooling loads. Fluorescent lights don't necessarily give off a sickly green light anymore, either. Commonly available lamps with a color temperature of 2,600 to 2,800 Kelvin give off light that's nearly indistinguishable from a cool white incandescent bulb.

Supplying Energy Star–rated appliances is another simple way to cut down energy use. Similar Energy Star–rated appliances can vary in actual consumption, so go one step further and compare annual energy use printed on each appliance's label.

4. Waste Reduction

If ever there was a green building strategy that's a no-brainer, waste reduction is it. A simple expedient is to design in 2-foot modules to use materials most efficiently. Optimum Value Engineering is an approach to framing that questions the use of every stick of lumber to optimize materials use. For example, most openings don't require double 2x12 headers for structural purposes. If a double 2x12 can be replaced with a single member, it will save lumber and create space to add insulation.

Recycling is another simple approach. Cardboard and metal are easy to recycle. Not only does this keep material out of the landfill, but also recycling saves some of the cost of buying new, and saves the cost of a Dumpster.

5 Indoor Air Quality

If there's a downside to air sealing, it's the potential to trap pollutants inside. Typical indoor pollutants include formaldehyde (off-gassing from OSB, most forms of particle board, and some carpet and their glues), volatile organic compounds (VOCs) (solvents from paints, finishes, automotive products, etc.), combustion by-products such as carbon monoxide (from gas stoves and any improperly vented fuel-burning appliance), and excessive moisture.

There are two approaches to improving indoor air quality (IAQ). The first is reducing the use of products that off-gas. Use plywood floor sheathing, which off-gasses less formaldehyde than OSB. Detached garages separate exhausts, fuel, and pesticide storage from living spaces. Providing dedicated combustion air for furnaces, boilers, and water heaters can prevent back-drafting stack gasses into the house.

Proper ventilation, the second approach, is as important as reducing sources. Using heat recovery ventilators (HRVs) in northern climates brings fresh outside air in, while exhausting stale inside air. The two air streams pass each other in the ventilator's heat exchanger, with the outgoing indoor air tempering the incoming outdoor air. An added benefit is that in the winter an HRV ventilates the house and retains some indoor humidity. It exhausts air from bathrooms, and laundry and kitchen areas, and directs the tempered incoming fresh air into the living areas and bedrooms.

6. Water Conservation

Many of us remember the inadequate flushing and frequent clogs from the federally mandated change to 1.6-gallons-per-flush toilets in the 1980s. But that has changed, and low-consumption toilets perform very well today.

Water issues also include managing storm water runoff to maintain natural ground percolation that recharges aquifers, as well as preventing siltation of waterways. It's often possible to reduce the storm sewer infrastructure by increasing the ability of individual home sites to absorb storm flows. Techniques include draining roof runoff to absorption fields and the use of pervious concrete pavers on driveways. This approach may even ease the path through local land-use boards by showing that you're doing the right thing.

7 Green Products

Simply choosing one product over another is the easiest, yet the least important path to going green. Look for swaps that take something not as green

and replace it with something greener that requires no changes in worker skills. Examples include specifying concrete that incorporates fly ash (a waste product from coal-burning power plants) as a partial substitute for Portland cement. Another example is using bamboo flooring, which regenerates quickly, instead of wood species that are not as sustainable.

Look for Forest Stewardship Council certified lumber and low-VOC paints. Although low-VOC paints cost a little more, the major brands all include a mildewcide, which makes them an easy sell.

Prefab foundation panels are one possible swap. Not only does a Superior Wall foundation go up in a day, it's waterproof, it requires no concrete footer, and it's insulated. Elk's reflective roof shingles are another, which use a 3M mineral coating that reflects about 25 percent of unwanted solar radiation versus other shingles.

Green Building Glossary

Building science: The study of the physical behavior of buildings, particularly regarding heating and cooling and the behavior of water.

OVE: Optimum Value Engineering, the practice of engineering houses to be as strong as necessary while minimizing the use of material.

VOCs: Volatile Organic Compounds, typically substances such as the solvents used in paints and carbon-based chemicals that migrate from synthetic materials to the air.

Embodied energy: The amount of energy required to obtain raw material and manufacture and transport a product to its ultimate destination.

Rain screen wall: Technique of furring siding away from the sheathing and building paper to encourage drainage and minimize pressure differentials that admit wind-driven rain.