

David Todd

GREEN BUNGALOW REMODELING WITH CONSERVATION IN MIND

Houses are contradictory things. On the one hand, they are like nests and dens and La-Z-Boys — good and necessary props for comfort, security, and life itself. Not a very threatening picture.

On the other hand, the American Institute of Architects estimates that the building industry consumes 40 percent of the natural resources used by the U.S. economy. Wood makes up a large part of these resources. The appetite for lumber is gradually changing much of the East Texas Big Thicket into a clearcut, monoculture pine plantation. Once framed up and running, the typical all-electric house in Texas then annually consumes 19,000

kilowatt hours of electricity and causes the release of 10.5 tons of carbon dioxide, contributing to the risk of global warming. Some of our houses' effects are more local — witness the dune erosion on west Galveston Island, the wetland filling on the Katy Prairie, and the cedar destruction in the golden-cheeked warbler habitat of the Hill Country near Austin. Finally, after the contractors and subs and suppliers have all gone home, the construction and demolition debris they leave behind makes up 20 percent of the municipal waste stream.

Despite these dire statistics, my wife and I recently bought and remodeled a house



Wendy Price Todd

Green Building Sources

A short list of publications, publishers, agencies, nonprofits, and trade and professional groups that were useful to us in tracking down ways of building more sustainably.

- **Consumer Guide to Home Energy Savings**
American Council for an Energy-Efficient Economy
2140 Shattuck Avenue, No. 202
Berkeley, CA 94704
A handy guide that gives statistics and advice on saving money and energy in different home appliances and pieces of mechanical equipment.
- **The Environmental Resource Guide**
American Institute of Architects
AIA Orders
P.O. Box 60
Williston, VT 05495-0060
(800)365-ARCH
The *Environmental Resource Guide* is very expensive (\$98 for AIA members and \$165 for nonmembers), but it is thorough, current, and accessible (especially if you are privy to the "master format" used in Sweets building materials guides). It is particularly good for tracking the entire life cycle of impacts associated with a building product.
- **The Sourcebook for Sustainable Design**
Boston Society of Architects
52 Broad Street
Boston, MA 02109-4301
(617)951-0845 (fax)
The *Sourcebook* gives a narrative of the different issues and possible responses in

sustainable construction, as well as a listing of manufacturers and retailers for the new, more sustainable materials and technologies. As is typical with most listings in the field, this one gets rapidly out of date: many phones will have been disconnected and addresses abandoned without forwarding directions.

- **Guide to Resource-Efficient Building Elements**
Center for Resourceful Building Technology
P.O. Box 3413
Missoula, MT 59806
(406)549-7678
A list of sustainable building materials, particularly alternatives to traditional wood products.
- **Sustainable Building Sourcebook**
City of Austin Environmental and Conservation Services Department
206 East 9th Street, Suite 17.102
Austin, TX 78701
(512)499-3504
Like the Boston Society of Architects' sourcebook, Austin's *Sustainable Building Sourcebook* is a fine introduction to general sustainable building problems and solutions and provides a useful list of government agencies, trade groups, consultants, and vendors active in the field. This book is more current than the Boston version, and its information is more applicable to the issues of hot climates. The city of Austin employs a number of very helpful experts on sustainable building as well.

- **Environmental Building News**
R.R. 1, Box 161
Brattleboro, VT 05301
(802)257-7300
An informative bimonthly newsletter with timely short updates on a variety of sustainable building issues, as well as one or two well-researched, in-depth articles on single topics. An excellent bibliography of handbooks, source books, magazines, and newsletters is also available.
- **The Naturalist's Garden**
by Ruth Shaw Ernst
The Globe Pequot Press
P.O. Box 833
Old Saybrook, CT 06475
Although not focused on Texas and Southwestern habitats, this volume has a great deal of information on how to provide better cover, food, and water for wildlife in an urban or suburban garden.
- **Green Seal**
1730 Rhode Island Ave., #1050
Washington, D.C. 20036-3101
(202)331-7337
Green Seal certifies products that it finds to be environmentally sound. While relatively new, it has prepared ratings for lighting, plumbing fixtures, major household appliances, and windows so far. In a world of hype, you may find this organization's independence and objectivity reassuring.
- **National Small Flows Clearinghouse**
West Virginia University
P. O. Box 6064
Morgantown, WV 26505-6064
(800)624-8301
We found this group's staffers to be

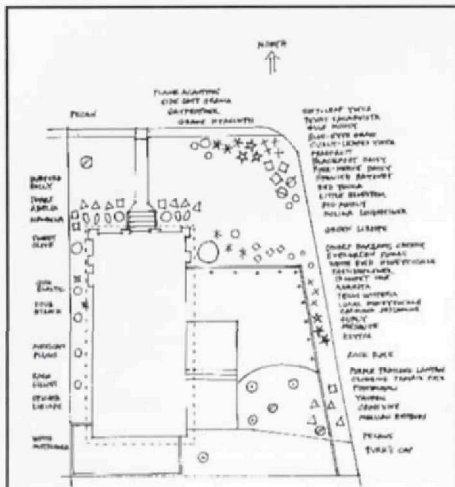
- extremely knowledgeable about on-site wastewater treatment. They are funded by the Environmental Protection Agency and have good access to the federal government's technical support. Also, they seem well connected with state and municipal officials who can give advice about technical and permitting issues.
- **Real Goods**
966 Mazzoni Street
Ukiah, CA 95482-3471
(707)468-9292
Real Goods sells a wide variety of sustainable building products, with a strong suit in energy conservation products, from fluorescent light bulbs to caulking string to alternative energy sources such as solar and wind power systems.
- **A Catalog for the Residential/Light Commercial Sector**
Rocky Mountain Institute
1739 Snowmass Creek Road
Snowmass, CO 81654
(303)927-4178
The catalogue identifies sources for efficient plumbing and irrigation products.
- **Native Texas Plants: Landscaping Region by Region**
by Sally and Andy Wasowski
Texas Monthly Press
P.O. Box 1569
Austin, TX 78767
(512)320-6900
We found *Native Texas Plants* to be the most complete, best illustrated, and most accurate landscaping book for Texas and the Southwest with regard to local range and growing conditions.

anyway. Steeped in guilt, we tried to do the project in the most sustainable, environmentally friendly way we could.

Located in the Austin neighborhood of Travis Heights, the house is a traditional 1915 two-bedroom, two-bath, one-office, 1,670-square-foot, one-story bungalow. It fits in with the context of its neighborhood, but it is not a head turner.

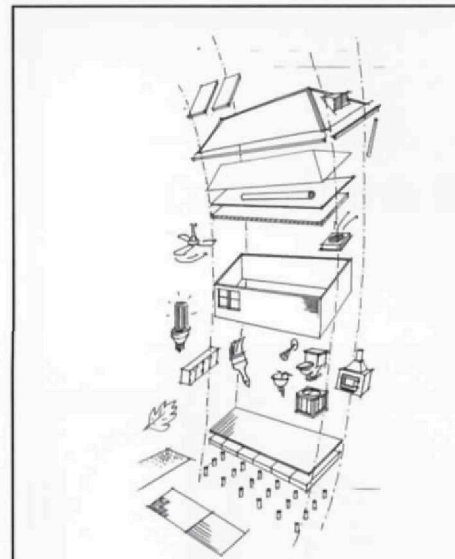
Together with our architect, Raymond Yin, we wrestled with questions of siting, energy efficiency, water conservation, and use of nontoxic and recycled materials. During our small project we found that there was no single best solution. Usually there were a number of good and competing answers with hard trade-offs among factors such as durability, cost, local availability, embodied energy, toxicity, and so forth.

We can't pretend that this is the complete and pure environmental house, nor that it is entirely novel. Still, it is a sign that we can create shelter that has a dramatically reduced environmental impact without having to huddle in a cave or build a house like a spaceship. ■



GARDEN

- Not removing trees for construction retains the advantage of natural, free cooling.
- Berms and mulching contain ground runoff.
- Surfaces are paved with locally available, water-permeable crushed granite.
- Roof gutters collect and distribute to the garden roughly 36,000 gallons of rainwater annually via a french drain and cistern, reducing runoff and lowering the need to irrigate with city water.
- The garden uses no pesticides or inorganic fertilizer and includes water, feeders, and houses for birds and bats.
- More than a dozen varieties of native, drought-tolerant plants provide berries for birds and flowering vines for bees and butterflies.

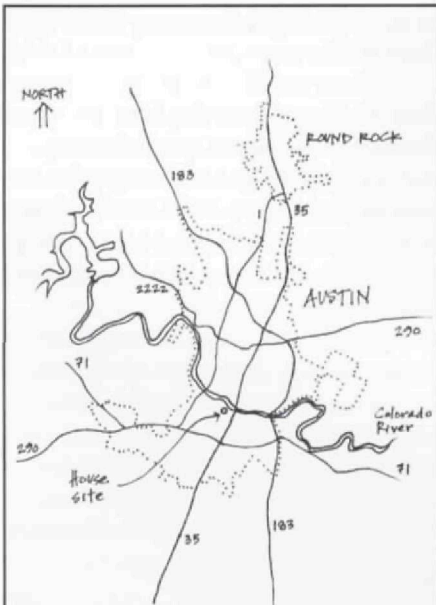


CONSTRUCTION

- The concrete slab is built on recycled broken concrete and stone taken from the site. The slab itself contains 20 percent coal fly ash, otherwise a waste product, and was set without volatile organic compounds, or VOCs, a whole family of carbon- and hydrogen-based chemicals that release a soup of fumes of varying toxicity at room temperature and pressure. These fumes are a concern on two accounts: toxicity to occupants (Americans spend 80 to 90 percent of their time indoors, where fumes from paints, adhesives, carpets, plywood, and other products can accumulate and create "sick building syndrome"); and threats to the atmosphere, such as ground-level ozone (of urban-ozone-alert fame, not the high-level, hole-over-the-Antarctic type).
- Wood and masonry are recycled in many cases. The patio and chimney are made from salvaged brick. The house also contains old doors, recycled framing studs, reused clapboard siding and beaded board, original concrete, and second-hand trim and paint.
- Exterior exposed lumber used on the fencing, garden, and deck is Colorado County juniper or ACQ-treated, sustainably grown yellow pine finished with low-toxicity boiled linseed oil. (Wood preserved with ammoniacal copper quaternary, or ACQ, is a less toxic alternative to

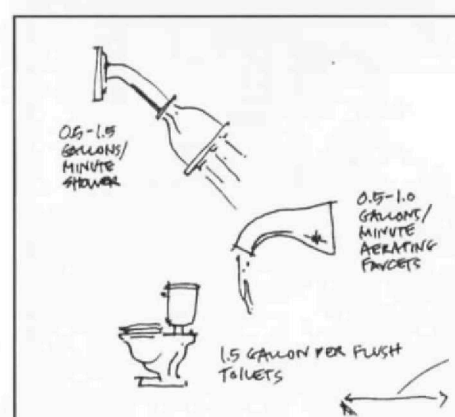
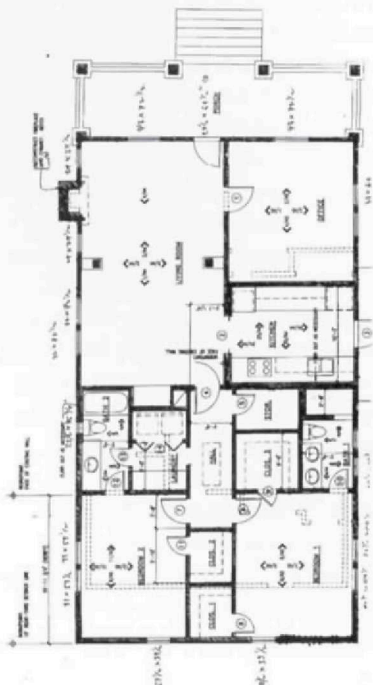
Wolmanized wood, which is preserved with the arsenic salt CCA, or chromated copper arsenate.) Small-dimension yellow-pine lumber and exterior-grade OSB and MDF were used for framing, subflooring and cabinetry. (Panels made from oriented strand board, or OSB, use chipped smaller trees, avoiding the need to cut older, larger trees. MDF, or medium density fiberboard, commonly known by the trade name Medex, is a more finely chipped wood panel, also made from younger, smaller trees than solid wood or plywood products would use.) Finish flooring used recycled longleaf pine. No rare wood species or formaldehyde-containing plywood were used.

- Fifty-year Galvalume channel-drain recycled steel-panel roof reduces the waste and new materials required for replacing typical 20- to 30-year fiberglass composite roofs.
- Borate-treated dry-blown cellulose insulation is made from recycled newspaper, keeps the interior well insulated, and avoids fiberglass. (Fiberglass is beginning to be suspected to be a carcinogen; Germany has listed it as a hazardous material in a similar ranking with asbestos.) The roof is lined with a mylar-backed, aluminum-coated radiant barrier that is estimated to lower attic temperatures by 10 degrees.
- Vinyl-framed, double-paned, low-E coated windows, coupled with 60 percent sunshade screens, were installed to protect against heat gain. Vinyl-framed windows are one-third the cost of traditional wood windows and are less likely to expand and contract, cutting down on drafts. As a result these windows have an infiltration rate of 0.03, less than a tenth of commonly accepted values.
- Low- and no-VOC adhesives, latex, castor oil, and milk-based paints, wall-texturing compounds, and water-based floor finishes were used to minimize offgassing and indoor air quality problems. Existing paint was left and covered because of lead content.



SITING

- Location within one mile of downtown cuts driving to work, shopping, and recreation, and avoids the habitat fragmentation and destruction linked to sprawl.
- Siting on a bus route permits easy use of mass transit.
- 1,680-square-foot footprint (20 percent less than average) minimizes material and energy use, while reducing impervious cover on the lot. The site has a relatively high overall permeability, with only 32 to 37 percent of its total surface being sealed. This reduces runoff and the attendant problems of flooding and pollution.



EQUIPMENT AND FIXTURES

- SEER 16.7 paired-compressor York air-conditioning unit with variable-speed blower is 50 to 70 percent more efficient than most units. Attic and ceiling fans help vent and circulate air.

- Blower-door testing helped find and seal all major duct leaks of cooled and heated air (20 to 60 percent duct losses are not unusual in houses).
- Ridge, hip, and louver vents allow convection to cool attic.
- 23,900-Btu, 70-percent-efficient wood fireplace insert can heat house without fossil fuels.
- Two 10' x 4' solar panels circulate warmed water through an exchanger to a gas-fired water heater.
- For lighting, daylight is used where possible, fluorescent and halogen lamps elsewhere, favoring task-lighting fixtures over ambient.
- Low-flow plumbing fixtures (faucets and showers at 0.5 to 1.0 gpm and toilets at 1.5 gpm) are estimated to use 41 percent less water than standard fixtures.