Staying Protected & Healthy: Shelter/Building Materials

- Insulated Concrete Forms (ICF) from the footings to the gable
- Certified Lumber for interior stud walls (only 5% more)
- Fiber Cement Board Siding (25-year paint warranty)
- Decking is 100% recycled plastic & maintenance free
- Aluminum Railing is maintenance free
- Paint: Milk Paint & Clay Paint. No VOC primer.
- Lacquer: water-based (for trim & doors & cabinets)
- Tiles: some from local/regional tile artists
- Countertops: MN Granite, MN Limestone, VT Slate
- Flooring: Domestic Red Slate, Tiles, Bamboo, Cork
- Cabinet Panels: Sunflower Shells, Millet Grass in Acrylic

Staying Warm: Heating

Systems	1: Passive Solar	2: Masonry Stove	3: Radiant In-Floor
Sources	sun	wood	sun & wood
Collection	fiberglass windows		solar water panels
Control: On	sunny day	one burn a day	thermostats in 12 zones
Off	overhang/shades	no fire	
Storage	concrete floor, thermal mass	4-5,000 pound mass of stone & firebrick	260 gallons water, concrete floor
Distribution	radiation from thermal mass, convection with open floor plan		PEX tubing in floor, DC pumps

Insulation	▪ 11" ICF (comparable to R-40 12" stud wall) ▪ 8-12" Icynene (comparable to R80+ fiberglass) ▪ 2 & 3-pane fiberglass-frame windows (U<0.32)
Passive Solar Design	▪ True south orientation ▪ Windows with high heat gain coefficient (>0.60) ▪ thermal mass for storage ▪ engineered overhang (shades sun out in summer)
Masonry Stove	▪ convoluted flue system with high thermal mass ▪ fire once a day — burns for only two hours
Radiant In-Floor	▪ hot water in tubes embedded in floor ▪ nice even heat – warmer at feet than at head ▪ 12 zones with programmable thermostats ▪ heated by solar hot water panels & masonry stove
Backup	▪ Throw another log on the fire ;-)

Staying Clean: Water

System	▪ Rainwater collection with standard septic ▪ No drinking water
Collection	▪ Standing-seam steel roof (30¢/ft²) ▪ Gutters with leaf protection ($40/foot) ▪ Downspouts (4" PVC pipe) ▪ "roof washers" – first flush diverter
Storage	▪ Three 2,500 gal cisterns & 300 gal settling tank ▪ 1,500 gal tank for garden
Conservation	▪ low-flush, dual-flush toilets, low-flow shower ▪ water-efficient laundry, dishwasher ▪ elbow-operable faucets
Filtration	▪ none to date (5-6 gal/week bought at store)
Backup	▪ water from dairy/fire truck

Sources & Resources

Accessibility Advice	Andy Bunge, Lanesboro, MN
Backup Generator	Kohler Engines – don't buy *broken connecting rod after only 770 hours- don't buy!*
Bamboo	Teragren
Battery	Hup Solar One (thesolar.biz)
Certified Lumber	CertifiedWoodProducts.net, Dan Haugen, Minnetonka, MN
Cistern Tanks	Norwesco, MN (thesolar.biz)
Construction	Lyndon Clark, Plainview
Cork Flooring	Expanko
Countertops	AFM Countertops, Rochester
DC Fans	Fanworks.com (thesolar.biz)
DC Pressure Pump	Dankoff Flowlight
Deck Railing	Crystalite, WA
Decking	RenewPlastics.com, WI
Dishwasher	Asko
Education	Midwest Renewable Energy Fair, WI; Libraries
Electrician Advice	Dan Anderson, Lanesboro
Financing:	F&M, Mary Schwarz, Chatfield
Fridge	Kenmore (370 kWh/year)
Gas stove	Premier Peerless
Gutter	Leafguard, Byron, MN
HRV/Air-to-Air	Recoupaerator
ICF Distributor:	tristateicf.com, Lyndon Lee
Inverter	Outback (thesolar.biz)
Kitchen Cabinets	Andy Bunge/Jordan Kiel, Lanesboro
Lacquer, waterbased	AFM Safecoat
Manifold	Jürgen Lüderitz, Germany
Masonry Stove	Gimme Shelter, Mark Klein, Richland, WI
Materials	Kreofsky Supplies, Plainview
Medaillon/Compass	mtiledesign.com
Millwork	Region Millwoks, Matt Sveen, Elgin, MN
MN Tile Festival	handmadetileassociation.org
Paints	BioshieldPaint.com
Primer (low VOC)	AFM Safecoat
Septic	Daren Hofschulte, Eyota
Siding	Weatherboard or Hardiplank
Slate	SheldonSlate.com
Solar Hot Water	SunEarthInc.com
Spend big money at	Menards, Rochester
Steel Roof	Metal Sales, Image II
Stove Facing	Ted Wilson et al., Decorah, IA
Sunflower Boards	Environ (Dakota Burl), Mankato
Switch Plates	switchhits.com ("funky ceramics", MN)
Tank-less heater	Takagi TK-2
Tiling Work	Dave Jorde, Eyota
Toilets	Caroma Caravelle, Australia/USA
Wind Meter	winddatalogger.com, James Jarvis, Winona
Wind Generator	Bergey XL.1
Windows	Thermotech Windows
Window Shades	cellularwindowshades.com
Winona Limestone	Biesanz, Winona

Staying Comfortable: Electricity

Systems	Small Wind Mill	Solar (PV) Panels	LP Generator
Sources	Wind	Sun	Propane
Storage	24 DC lead-acid, deep-cycle battery, 33 kWh		
Distribution	Inverter/Charge Controller, standard 120 VAC wiring		
Conservation	▪ energy-efficient fridge, gas stove, washing machine, dishwasher, air-to-air exchanger; central vacuum ▪ compact-fluorescent, fluorescent or halogen lights ▪ LED light rope for indirect ambient lighting ▪ motion detectors ▪ timed, switched & remote-controlled outlets to eliminate phantom loads ▪ home automation (planned)		
Backup	▪ Propane Back-up Generator		

Staying cool: Cooling

Passive	Active
▪ south-side overhang ▪ thermal mass ▪ low heat-gain windows on west side ▪ window shades ▪ awning on west-side	▪ Six DC ceiling fans ▪ windows placed for cross-ventilation ▪ special air-to-air exchanger mode: exhausts warm air at night

Paying for it all: Financing, Finances & Numbers

Construction Loan	▪ Gathered detailed estimates, prepared "exposé" ▪ Ongoing communication via eMail
What did the unusual stuff cost?	▪ Off-Grid Electric: $18k to date, about ~$25k total (vs. $12-15k to TriCounty to connect to grid) ▪ Rainwater Collection: $7k (versus $22k+ for well) ▪ Solar & Tankless Hot Water: $3-5k ▪ Passive Solar: Slab +$5k, Windows +$5k ▪ Masonry Stove: $25k (starting at ~$10k) ▪ Cellulose: $2,300, Icynene: $3,600 ▪ ICF: $36,000 from footings to gables ▪ Certified Lumber: 5% more ($400) ▪ Bamboo & Cork: $6.50/$7.50 per sq. ft. ▪ Milk/Clay Paint: $40/gal. ▪ Tiles, Slate, & Labor: $25k ▪ Custom Kitchen: $25k ▪ Custom trim work, doors: $30k ▪ Custom stairs: $8k ▪ 900 sq.ft. Deck: $18k ▪ 100' x 10' Winona Limestone Retaining Wall: $12k ▪ 2,000-foot Driveway: $30k
Size	▪ 4 bedrooms, 4 baths ▪ 22 finished rooms, 4 closets, 2-car garage & cistern ▪ ~1,440 sq. ft. of living space above ground ▪ ~1,000 sq. ft. of living space in lower level ▪ ~3,650 sq. ft. of total (& finished) space ▪ about $115/sq.ft.

© 2006-2009 Christian Milaster • questions@lichtnstein.org • www.lichtnstein.org • picasaweb.google.com/lichtnstein
Be!cause Consulting a division of **The Be!cause Group** • 1-866-979-6622 • consulting@because-group.com • www.because-group.com • www.because-consulting.com

Lessons Learned – What I would do differently

- Humidity control in the basement during construction to prevent mold
- Make cistern room mold safe
- Have old house "ready for sale" before breaking ground on new house
- Use a plumber for solar hot water.
- Get a 12-month construction loan
- Better Cost Management (especially in the last quarter of construction)
- Include trim and doors in estimate…
- Use timer switches that positively use no electrical energy.
- Start excavation in or before August (if you only have a 3-person team)

Serendipitous Success – What I would do the same

Construction

- **Solicit Input** from friends, colleagues, builders, & the community.
- Take **2 years** for planning and use the **Internet** for research.
- Establish **design goals & values**: What's important to you? (e.g., sustainable living, renewable energy, comfort, maintenance free)
- Be the **general contractor** and have a **time & material** contract
- Hire **Lyndon Clark Construction** out of Plainview, MN:
  - high quality, fair cost ($25-$35/hour)
  - highly versatile (driveway, excavation, footings, cement flatwork, ICF blocks, framing, siding, roofing, plumbing, ventilation, tiling, drywall, painting, flooring, trim work, etc.)
- **Long-term perspective**: Live in it "until we die"; do the right thing now.
- **Finish** everything it now – then enjoy it & save money in the long run.
- Build in: **Fillmore County**, Lanesboro; Secluded building spot.

Design

- Design it myself: Use **3D Home Design** Planning Software
- **Passive Solar** Design
- **Garage:** attached, two-car, back-to-back on North side
- **Basement:** full, basement, 8-foot ceilings
- **Deck:** wrap-around, 9 feet wide, with "balconies"
- **Handicap-accessible**: main floor living, future laundry hook-up, large-enough bathroom, 3-foot wide doors
- **Compact design:** 1,440 sq. ft. for 3 Bedrooms, 3 Baths, Kitchen, Living, Dining, Laundry, Pantry, Wardrobe
- **Optimized** for use: "How will we use it?" scenarios

Materials

- **Renewable** Materials; **Local**, Regional, or Domestic Materials;
- **Health-Friendly Materials:** Low VOCs/Offgasing (No: particle board, MDF, Formaldehyde)
- Milk Paint, Clay Paint; Cellulose Insulation; Domestic Red Slate; Domestic Stone for Masonry Stove, 100% Plastic Decking from Wisconsin
- ICF blocks, Icynene, Certified Lumber

Open Houses 2009: Saturdays from 10 AM to 4 PM (Directions on Website)

- **Sat., April 25, 10 AM to 4 PM**
- **Sat., May 30, 10 AM to 4 PM**
- **Sat., June 27, 10 AM to 4 PM**
- **Sat., July 25, 10 AM to 4 PM**
- **Sat., August 29, 10 AM to 4 PM**
- **October 3 & 4, 10 AM to 4 PM**

Three (or more) Things You Can Do In Your Existing Home Today!

1 Electrical

1. **Monitor** your monthly/weekly/daily electrical usage [$0]
   - Measure your electrical loads with a Kill-A-Watt Meter [$35]
2. **Compact-Fluorescent** (CF) Light Bulbs: [$3-$15]
   - 25%-30% energy of Incandescent
   - colors (warm, full-spectrum); "bulb" shaped; dimmable
3. Eliminate **Phantom Loads**
   - Hunt for Phantom Loads with a Kill-A-Watt Meter [$35]
   - Switched Power Strip [$10-$30]
   - Switched Outlet [$100s]
   - Remote-controlled outlet [$30-$50]
   - Timed Outlet (programmable) [$20]

2 Heating

1. **Solar Hot Water** [$2,000-$5,000]
   - $2,000 Tax Credit in 2006 & 2007
   - 5-8 years payback period
2. On-Demand/**Tankless Water Heater** [$700+install]
   - Takagi TK-2 (Propane, Natural)
   - Fuels: Propane, Natural Gas, Electric
3. Triple-**Honeycomb Shades** (up to R20!) [$100-$300]
4. A 7-day **Programmable Thermostat** [$50]
   - Turn down if out of the house for more than 4 hours

3 Water

1. **Monitor** your monthly/weekly/daily water usage [$0]
2. Have Your **Well Water** Tested (County/Extension Service) [$0?]
3. Low-Flow **Showerheads** (bricor.com) [$40-$80]
4. Low-Flush, Dual-Flush **Toilets** (caravelle.com) [$300+install]
5. Collect **Rainwater** for the Garden [$50-$2,000]

© 2006-2009 Christian Milaster • questions@lichtnstein.org • www.lichtnstein.org • picasaweb.google.com/lichtnstein

Be!cause Consulting a division of **The Be!cause Group** • 1-866-979-6622 • consulting@because-group.com • www.because-group.com • www.because-consulting.com