

# SAFER BUILDING MATERIALS FOR PEOPLE WHO CAN'T TOLERATE MANY COMMONLY-USED CHEMICALS

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Volatile organic compounds (VOCs) are toxic for most people diagnosed with environmental illness (EI) or multiple-chemical sensitivity (MCS). Many buildings make these people ill because of formaldehyde and other chemicals that diffuse into the air from materials used in construction and/or furnishings.

The following list of safer, less-toxic materials was compiled by Kata Orndorff, Ariel Barfield, Faith Spaulding, and Miriam Finkel, members of the Human Ecology Action League of Southern Arizona. Although we four have had many years of experience with the health effects of toxic materials, none claims to have any particular expertise with regard to architecture or building construction. With that limitation, we have done our best to organize this report in a useful and logical way.

The information below has come from a variety of sources: books, consultations, and advice from others who have been involved in building their own safe homes. In most cases, the list contains several alternatives within each category from which to choose. Because reactions to chemicals vary from person to person, whenever possible, sensitive individuals should obtain samples of materials before deciding to use them.

**CAUTION: ONE TOXIC COMPONENT CAN MAKE THE ENTIRE PROJECT UNSAFE.**

## EXTERIOR STRUCTURE

**TERMITE PREVENTION** *Termite problems can be minimized by not using any structural wood (framing or studs).*

Use a pure sand barrier under and two feet around the cement slab.

Use copper or galvanized steel metal termite shields where termites might enter.

If termites enter, use boric acid or other least-toxic termite treatment at point of entry.

### FOUNDATION

Plain concrete with no curing agents (accelerants or retardants) and no fly ash or other toxic additives

Concrete block

Glazed brick

### CONCRETE SEALER

Sodium silicate: Dilute for application in thin coats only. Use non-softened water, or the floor surface will be crusty. (Source: Hill Brothers Chemical Company, (520) 795-9351 or (602) 272-9363)

AFM concrete sealers

**FOUNDATION WATERPROOFING REQUIREMENTS** Do not use tar-based or petroleum-based sealers.

Below the slab: 12-mil polyethylene moisture barrier with 2 inches of tamped sand on top to prevent contact with concrete. (Concrete causes holes to form in polyethylene.)

Above the slab: 6-mil polyethylene moisture barrier

**BUILDING FRAME**

Untreated reinforced concrete

Masonry brick, block, or stone set with plain cement mortar

Lightweight steel joists, studs, and trusses: oily residue removed with detergent

Straw bale if fresh, clean, and dry, and with proper nontoxic cementitious "thoroseal" water proofing

Wood framing is acceptable only if the lumber is pesticide-free and kiln-dried and if termite prevention steps are taken.

**EXTERIOR SIDING**

MS Metal Sales enameled steel ("ProPanel II") (paint not needed)

Stucco (cement, sand, and lime) on metal lath without acrylic additives or polystyrene foam

Brick

**ROOFING**

ProPanel II enameled steel

Cement, clay, or metal tile

Slate

Aluminum, copper, tin, or galvanized steel: oily residue removed with detergent

**INSULATION** *Not needed with straw bale framing*

Pink Plus with MiraFlex Insulation, made by Owens-Corning

Cementitious magnesium-oxide foam

Perlite

Air Krete

Certain Teed's Insulsafe

**EXTERIOR VAPOR BARRIER**

Untreated building paper

Kraft paper

**INTERIOR VAPOR BARRIER** *Seal seams with 3M 8086 Shelter Seal tape.*

Aluminum foil

Foil-backed paper

Tu-tuf #4 (4 mil cross laminated polyethylene)

Foil-Ray's Thermo-barrier

**INTERIOR STRUCTURE****INTERIOR WALLS & CEILING** Limit the number of interior walls. Use metal studs for termite control.

Foil-backed drywall (U.S. Gypsum's) with foil toward inside of room; seal seams with Ace brand adhesive aluminum foil tape.

Plain plaster on metal lath

Plain plaster on Gypsum lath

Brick with plain mortar joints

Pesticide-free, kiln-dried lumber with no visible signs of mold

Ceramic wall tile set with wall tile grout containing no acrylic additives

**SUBFLOORS**

Untreated reinforced concrete

**FLOORS**

Untreated concrete, smooth polished, sealed with cement-based nontoxic material (See section on Caulks, Mastics and Sealants.)

Ceramic tile in cement mortar with cement-type floor tile grout containing no acrylic additives (See section on Caulks, Mastics, and Sealants)

Brick, slate, or marble (See section on Grouts)

**DOOR & WINDOW FRAMES**

Anodized aluminum, porcelain steel, or enameled metal

Solid wood sealed with non-toxic sealer, such as AFM sealer.

**DOORS**

Metal

Solid wood

Glass

**WINDOW REQUIREMENTS**

Able to be opened

Thermally broken, double-glazed

**WEATHER STRIPPING**

Metal bound felt strip

Hard vinyl strip

**PLUMBING REQUIREMENTS**

Incoming water: copper pipe connected with 90% silver solder

Drain water: hard plastic pipe

All exposed pipes should be metal.

Filtration system to purify water for drinking, cooking, and bathing

**DRAINS & VENTS**

Copper, brass, or iron pipe

ABS plastic covered with foil tape

**WIRING & ELECTRICAL FIXTURE REQUIREMENTS**

Steel conduit (E.M.T. or rigid type)

Metallic-clad wiring, twisted throughout to minimize extraneous electromagnetic fields

Metal receptacles and boxes

Electrical cover plates of steel, porcelain, enameled steel, or enameled cast iron

Metal and glass fixtures for incandescent bulbs only: If fluorescent lighting must be used, the light switches should be easily accessible and there should be convenient electrical outlets for lamps with incandescent bulbs.

**HEATING, AIR CONDITIONING, VENTILATION** *Degrease all machinery before installation. Acetone is acceptable for degreasing because it is so volatile that it out-gases immediately. Use galvanized ducts, cleaned with white vinegar, insulated on the outside. Provide accommodation for special filtration of recirculating air. Air intake area should be free of automobile exhaust and other pollutants. Swamp coolers should not be used.*

High efficiency electric heat pump mounted outside

Radiant hydronic heating in slab with electric air conditioning

**CABINETS**

Metal with baked-on finish

Solid wood sealed with nontoxic sealer.

Sheet rock frame with sliding metal or glass doors

Open metal, sealed wood, or glass shelves closed, if desired, with cloth curtain

**COUNTER TOPS** *If set on plywood, use exterior plywood, which contains less formaldehyde than interior plywood, and seal it with a nontoxic sealant.*

Ceramic tile with cement mortar

Marble, granite, or stainless steel

Corian or other hard plastic laminate

**SHOWER STALL**

Ceramic tile with cement mortar

Pre-cast terrazzo

Stainless steel

**SOME SPECIAL MATERIALS****GROUTS**

For ceramic tile -- Portland Cement "Thin Set" (no fungicides)

L & M Acid R (without dyes if possible)

Marble Dust & Cement

**CAULKS, MASTICS, & SEALANTS**

Exterior caulking -- Dow Corning Building Sealant #790 or equivalent

Interior caulking -- Dow Corning Silicone Rubber Sealant, paintable #8644

Blind caulking window casings -- Dow-Corning Silicone Rubber Sealant #732, or equivalent

AFM adhesives, sealants, concrete sealers, and wood sealers

Phenoseal Vinyl Adhesive -- (800) 343-4963

Polyken Foil Tape or Ace Foil Tape

**PAINT**

AFM Paint

Benjamin Moore Pristine Paint

Crystal Aire Paint (Pace Chemical Industries, 3681 Sagunto #104, PO Box 1946, Santa Ynez CA 93460, (805) 686-0745)

Glidden 2000 Paint

Miller Paint Company, 317 SE Grand Ave, Portland OR 97214, (503) 233-4491

No VOC Pioneer Paint (Pioneer Paint, 919 N Swan, Tucson AZ 85711 (520) 795-2284)

Southwestern Paints latex has no formaldehyde. (Southwestern Paint & Varnish Company, 4401 E. Broadway Blvd, Tucson AZ 85711 (520) 795-0545)

**WOOD** *Use solid wood if possible. Presswood should not be used.*

Wood preservative: (Do not use pentachlorophenol) AFM wood preservative. AFM folks are very helpful advising which of their products will best suit an application and with problem solving. (AFM Enterprises, Inc., 1140 Stacy Ct., Riverside CA 92507; (909) 781-6860, (909) 781-6861)

AFM Dynoseal moisture barrier wood finishing: alcohol-based shellac

AFM wood finishers

Plywood: exterior plywood contains less formaldehyde than interior plywood so is preferred if plywood must be used.

## GENERAL CLEANUP

No structural waste, particularly wood or paper, is to be left in backfill.  
Use nontoxic, all-purpose cleaners for final cleanup.

## FURNISHINGS

### APPLIANCES REQUIRED

Electric range, hot water heater, washing machine, and clothes dryer  
Refrigerator with porcelain enamel or stainless-steel interior

**CARPETS** *Bare floors with washable area rugs preferred. If standard carpeting must be used, seal in the adhesive by applying AFM Carpet Guard to the underside before installing and periodically, depending upon traffic, to the surface. Synthetic jute or cloth backings are less toxic than latex backing. If padding is used, make sure it is tolerable.*

Wool  
Cotton  
Hemp

**FURNITURE** *Avoid upholstered or fabric-covered furniture because such fabrics are treated with fire-proofing and stain-proofing chemicals.*

Metal  
Wood (Avoid aromatic woods such as redwood.)

## MISCELLANEOUS

A built-in vacuum system is more efficient and easier to use than a vacuum cleaner.

Use plain concrete around the building. If asphalt must be used, use a top quality that will not need frequent refinishing.

The process of outgassing VOCs can be speeded up by closing the building, turning the heat on high for 8 to 24 hours, then opening up the building to let it air out.

## SOURCES AND REFERENCES

1. ProPanel II metal siding and roofing is sold by Metal Sales Manufacturing Corporation, 6260 Downing St, Denver CO, 80216, (800) 289-7663.
2. AFM Enterprises, Inc., PO Box 124698, San Diego CA 92112-4698, (619) 239-0321. Some AFM products are available at the Allergy Vacuum Store, 3455 E Speedway, Tucson AZ (520) 319-1738.
3. *Healthful Houses: How to Design and Build Your Own* by Clint Good and Debra Lynn Dadd, Guaranty Press, 7315 Wisconsin Ave. Suite 615E, Bethesda MD 20814, (800) 541-9185.
4. *Healthy House Building: A Design and Construction Guide* by John Bower, Healthy Homes Institute, (812) 332-5073
5. *Healthy by Design; Building and Remodeling Solutions for Creating Healthy Homes* by David Rousseau and James Wasley, Hartley & Marks, Point Roberts WA.
6. *Less-Toxic Alternatives* by Carolyn P. Gorman can be ordered from the American Environmental Health Foundation, Inc., (800) 428-2343.