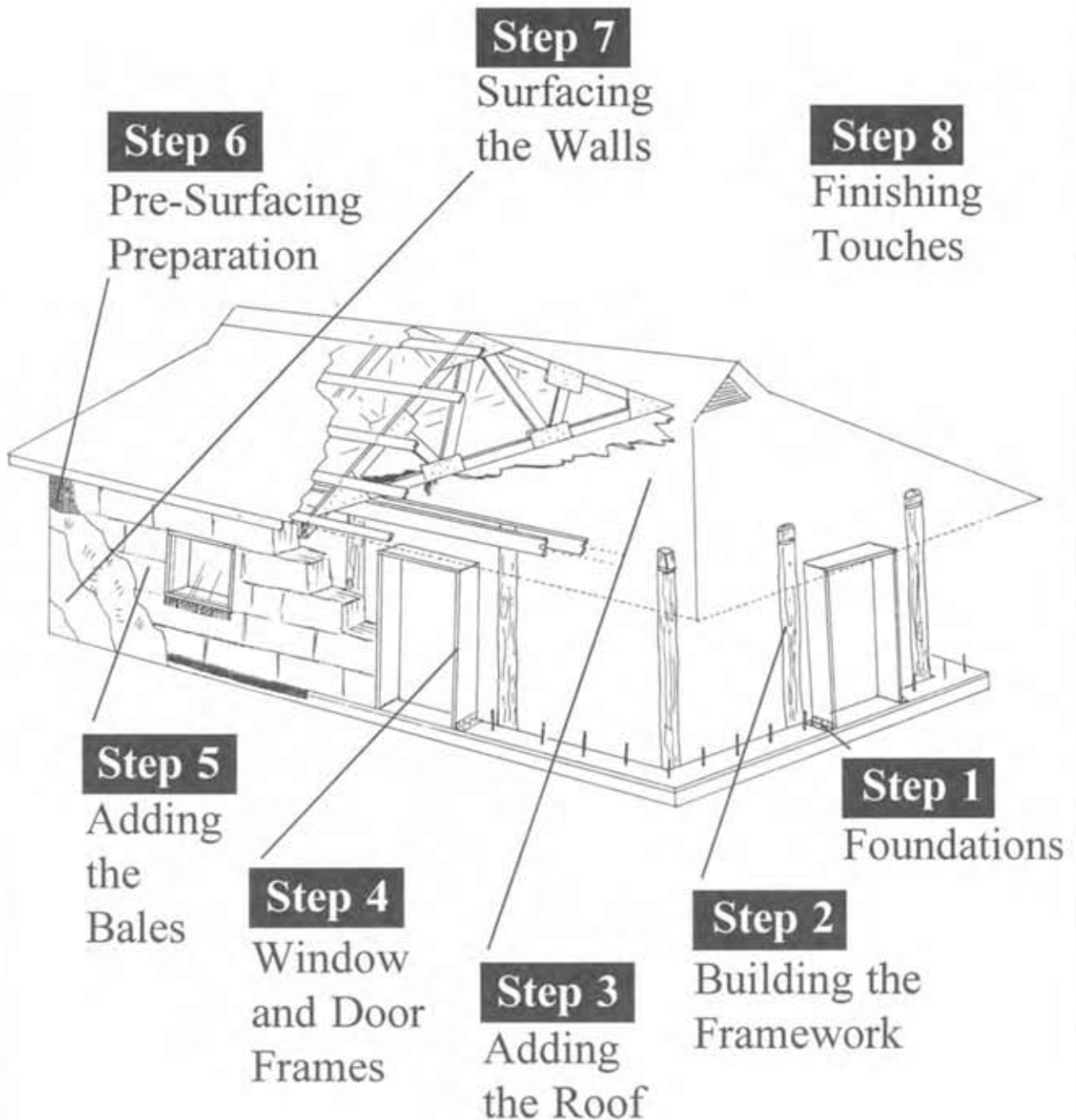


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# The Non-Loadbearing Option

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# The Non-Loadbearing Option—An Introduction

In our description of the three basic approaches to straw-bale construction, we mentioned a number of possible advantages to the non-loadbearing approach. Here are several more reasons why some people have chosen this option:

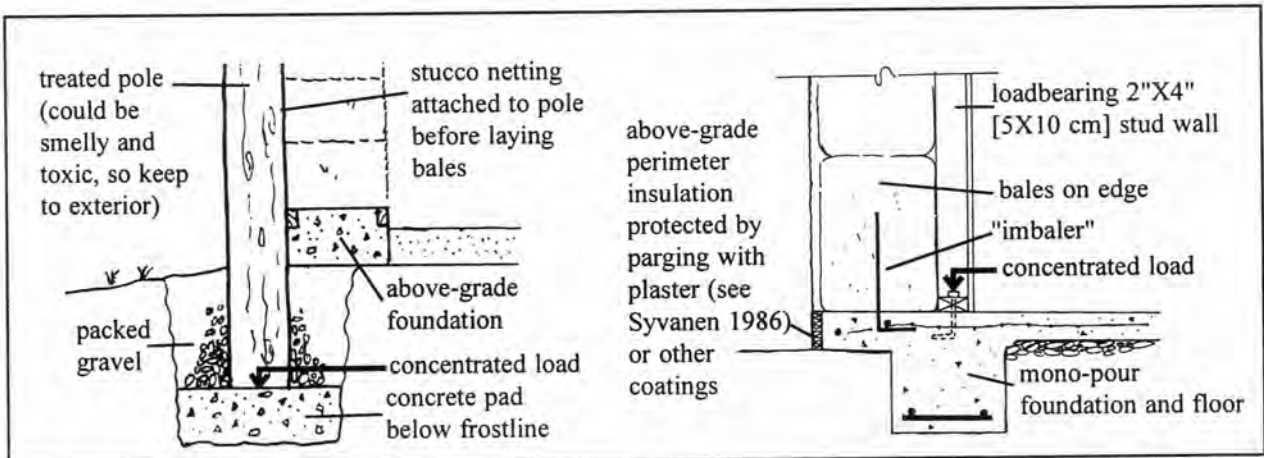
- Their straw-bale code allows only this approach (e.g., New Mexico).
- They can't find an engineer who will put the required stamp on plans for a loadbearing design (e.g., seismically active California).
- The live loads (basically the snow loads)

are so great that, even with a light roof/ceiling/insulation system, a safe span would be unacceptably short.

- The level of precision, plumbness, and straightness (e.g., of roof line or exposed rafter tails) demanded by the client or the builder would be impossible, difficult or unacceptably expensive (due to labor costs) to achieve with the loadbearing approach.
- They already owned a serviceable "old" structure to "outsulate" with "new" bales (see "temporal hybrids" on page 23).

## Step 1. Foundations\*

**Challenge:** to provide the same stable, durable base as in a loadbearing design. The details will differ, however, since the roof weight is now transmitted to the foundations by some kind of framework. If the framework involves widely spaced vertical posts, the foundations must be designed to handle the concentrated loads transferred at these points. The foundation must also properly elevate and carry the bale walls.



\* As explained near the end of page 1, you really need to study the loadbearing approach first, to learn the generic techniques for working with bales. Having done that, return to this section for details unique to the non-loadbearing approach.

# Step 2. Building the Framework

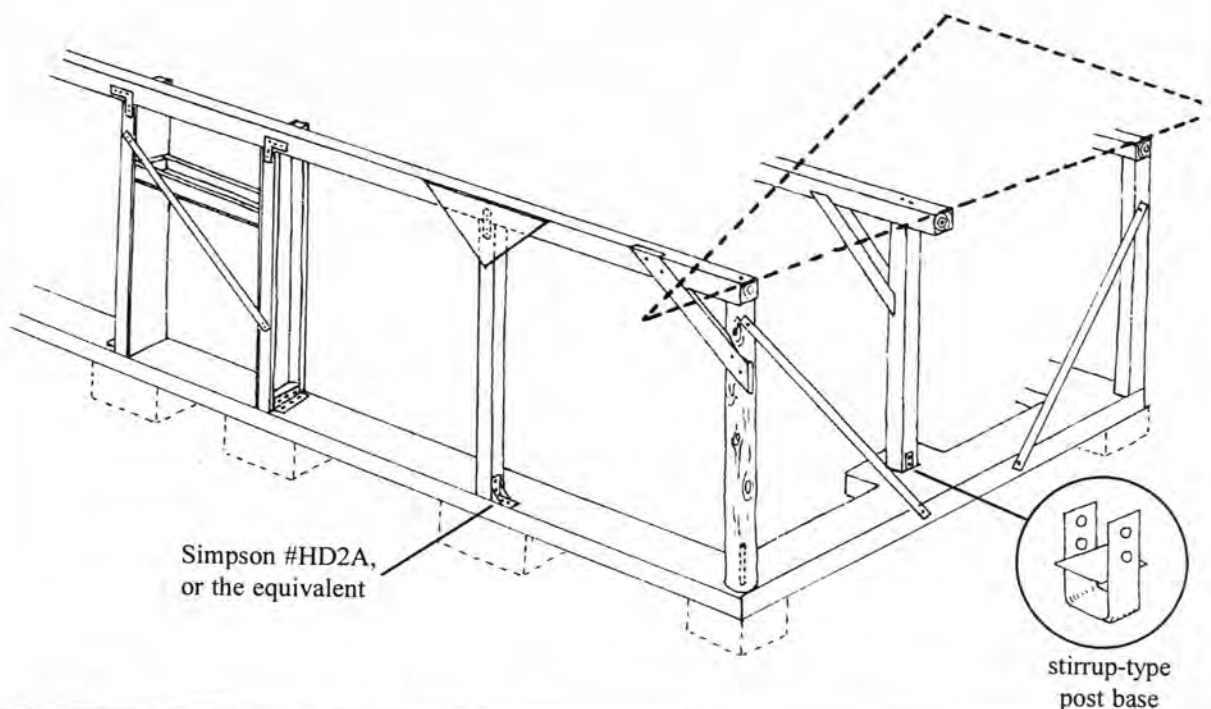
**Challenge:** to create a rigid, loadbearing framework to carry the roof weight and transfer it to the foundation. It should safely resist any horizontal (a.k.a. lateral) loads from wind or earthquakes. Multistory structures become easily possible.

In addition to occasionally carrying the total dead and live loads, the framework must also be able to resist lateral loads resulting from winds or earthquakes. With proper engineering, multistory structures become possible. The possibilities for frameworks run the gamut, from structural bamboo (a grass-like straw), to traditional wooden frames (studs, timbers, box posts, poles, etc.), to concrete block columns with a poured concrete bond beam, to steel posts topped with glue-laminated beams, to thin masonry walls or

panels. It is common practice that no additional tie-down system is used, provided the vertical elements of the framework are securely fastened to the foundation.

Most of these techniques are widely used and information on their "how to" is readily available. Recommended resources include Sherwood and Stroh (1992) and Wahlfeldt (1988) for wood frame; Benson (1990) for timber frame; NRAES (1984), Kern (1981), Wolfe (1993), and Sobon (1994) for post and pole.

## Some Framework Options



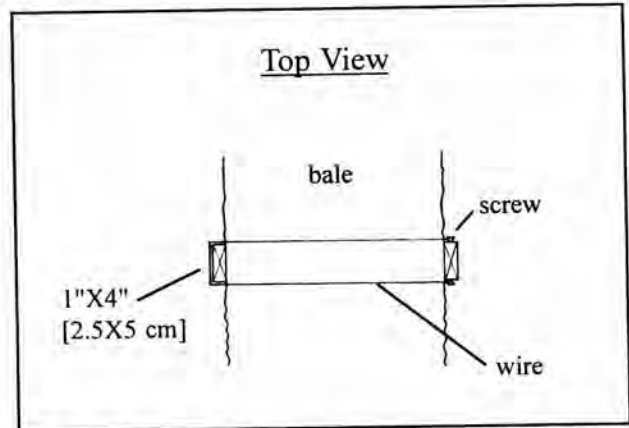
## "After-The-Fact" Frameworks

The innovative lads and lassies at Daniel Smith and Associates, Berkeley, California, have been using an unusual method to create an inside-wrapped, diagonally-braced, 4"X4" [10X10 cm] post-and-beam framework, with the posts in notches. They reverse the normal sequence for the non-loadbearing approach, stacking the bales first, then cutting the notches, then installing the posts and the beams. This reversal enables them to raise the walls quickly and to mark and cut the notches in all the bales at the same time. Since the length of the posts can be finalized after the walls are up, the beam will always rest snugly against the tops of the walls—never a gap, or a space too narrow for the final course. For a sketch of a building utilizing their system, see *The Last Straw*, Issue No. 13, page 13.

Another version of this "framework after the fact" approach was used on a small studio in southern Arizona by Bob Cook and Friederike Almstedt. Around the perimeter of a plywood-on-shipping-pallet foundation/deck (see page 49) they attached three parallel lines of scrap 2"X4" [5X10 cm] pieces to form a toe-up. After stacking and pinning 3-tie bales, on edge, and installing a light, wooden RBA, they proceeded to weave 1"X2" [2.5X5 cm] furring strips (on 2' [61 cm] centers) down through the exposed ties. This was done on both sides of the wall. Along a given wall surface, the "over and under" sequence was reversed from one mini-column to the next. Once the furring strips were nailed securely to the RBA and to the sill plate, they not only supported any further dead and live load and tied the RBA to the foundation, but

also provided strips to which interior drywall and exterior sheathing could be attached. Despite their small cross-section, closely spaced, adequately constrained furring strips can carry a significant amount of load. For further details and photographs of this project, see Steen et al. (1994, page 76).

A technique that is similar, but which uses roughcut, full-dimension 1" X 4" strips to "sandwich" 2-tie bales laid flat, was developed by Bob Bissett in Bonner's Ferry, Idaho (see figure below). No pins were needed since the wood-and-wire "ladder trusses" provided adequate stiffening.

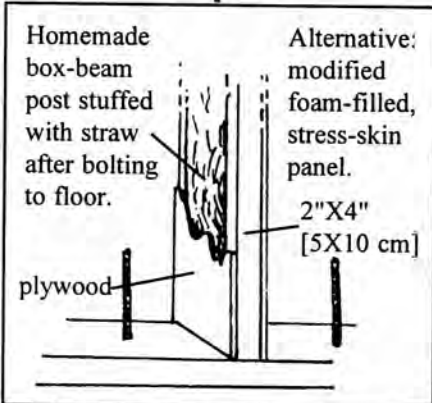
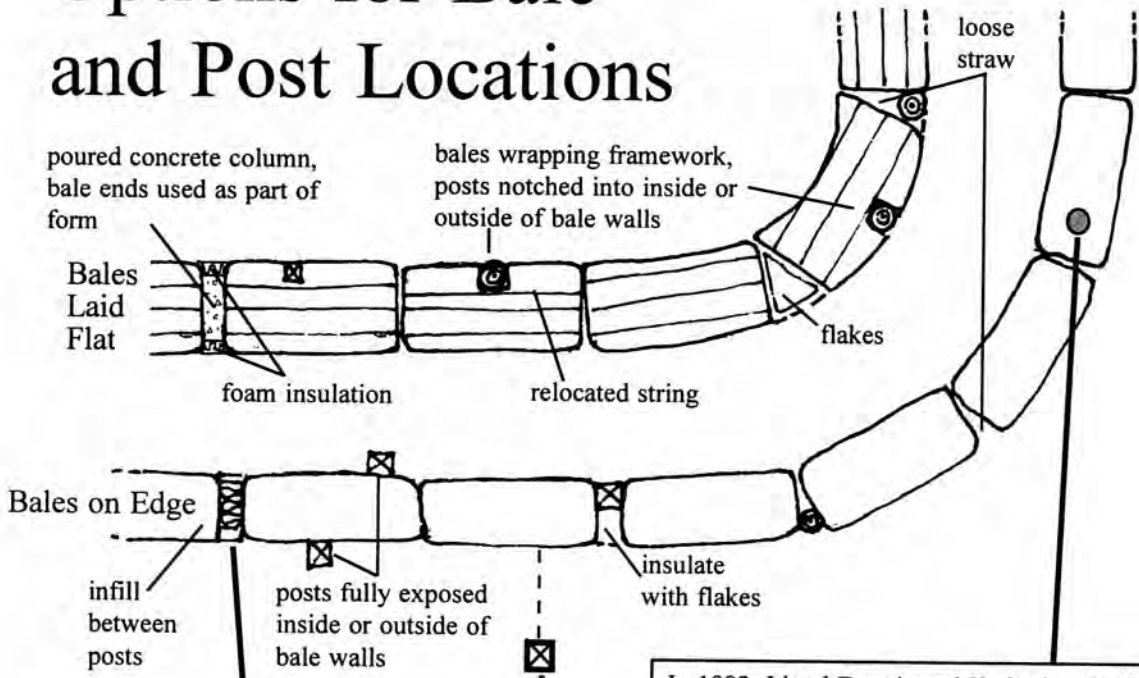


A short article about the construction of his storage shed, accompanied by excellent diagrams, appeared in *The Last Straw*, Issue No. 5, on page 14.



Drawing by Arlen Raikes

# Options for Bale and Post Locations



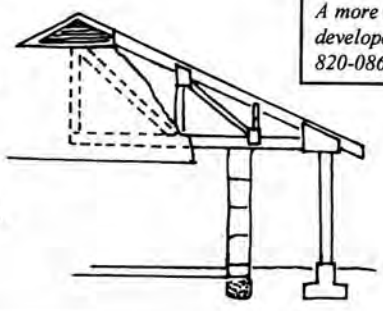
In 1992, Lloyd Dennis and Katherine Wells, Velarde, NM, used bale walls as forming and support for poured concrete posts and bond beam (see *The Last Straw* #9, pp. 25-26).

teeth cut with hacksaw

holes drilled with 4" [10 cm] aluminum pipe attached to hand-held power posthole auger

A more sophisticated version call **BALEBLOCK™**, has been developed by Birkani Architects, Santa Fe, NM, tel. (505) 820-0861. It can be engineered for two stories.

Pay a commercial company to put up an inexpensive pole barn framework, then create non-loadbearing walls inside, outside, or notched, any shape you want.

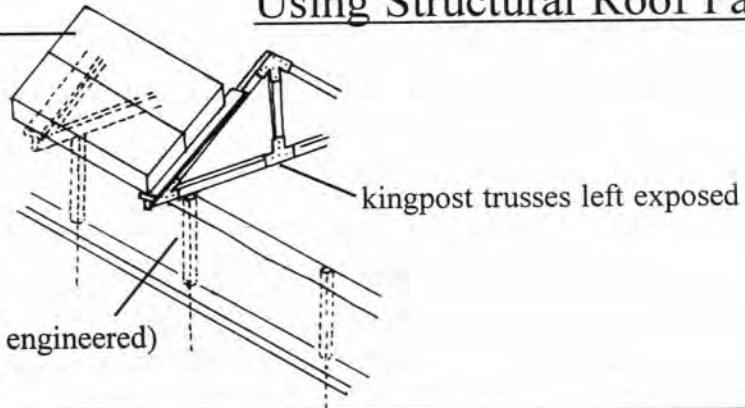


## Step 3. Adding the Roof

**Challenge:** to create the same sheltering cap as in the loadbearing option, although using a non-compressible framework does release you from some of the constraints inherent in loadbearing designs (e.g., total roof weight).

### Using Structural Roof Panels

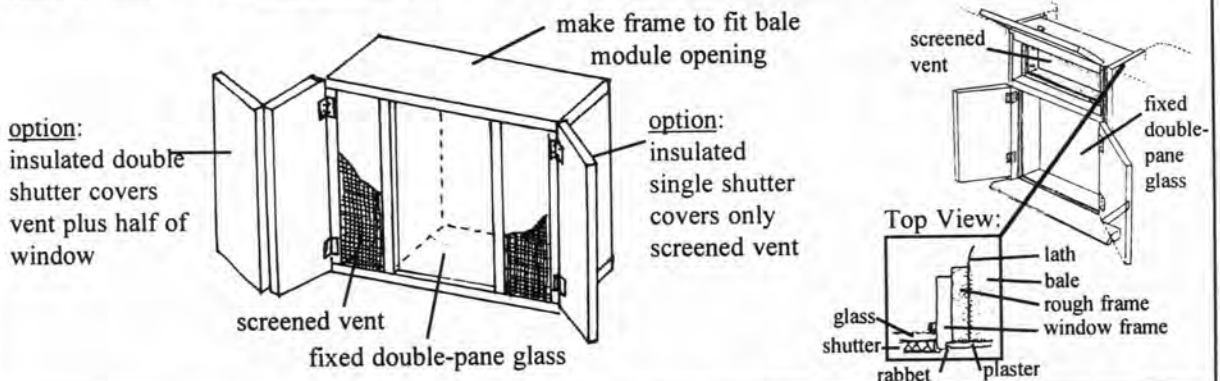
12' [3.6 m] long, 12" [30.2 cm] thick factory-customized, foam-filled structural panels (concept from Jim Wakeman)



## Step 4. Window and Door Frames

**Challenge:** to create suitable door and window frames for all openings. Since no portion of the roof load is carried by the frames, and since all the needed wall rigidity can be built into the framework, there is freedom to make the openings larger and/or more numerous. The perceived desirability of this must be balanced against the relatively low R-value of doors and windows (even in the most expensive, high-tech models), and the resulting negative effect on the performance of your superinsulated building.

### Easy to Make, Vented, Fixed-Glass Windows

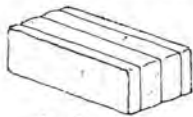


# Step 5. Adding the Bales

**Challenge:** to create walls that are properly stacked, pinned (often with shorter pins), and attached to the framework. Having posts or columns makes it easier to create vertical walls, but there's extra work in attaching the walls to the framework. For certain placements of posts, the bales must be notched to receive them.

## Bales Flat versus On-Edge

### Bale Flat



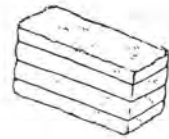
Pros:

- Wider wall for window seats, etc.
- More stable (especially for 2-tie bales).

Cons:

- Takes up more space.
- Takes more bales.

### Bale On-Edge



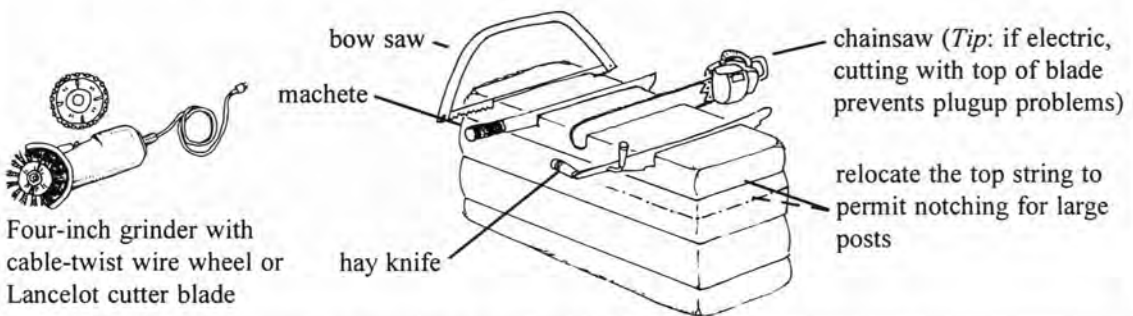
Pros:

- Takes fewer bales.
- Less space lost to wall.

Cons:

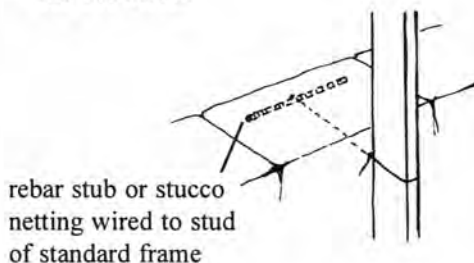
- More susceptible to fire or vandalism before covered.

## Tools for Cutting Notches

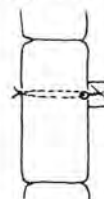


## Attaching a Bale Wrap to the Framework

Many approaches have been used. Be creative.

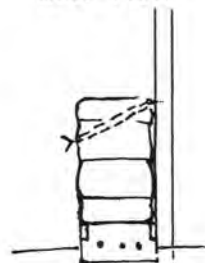


### Top View

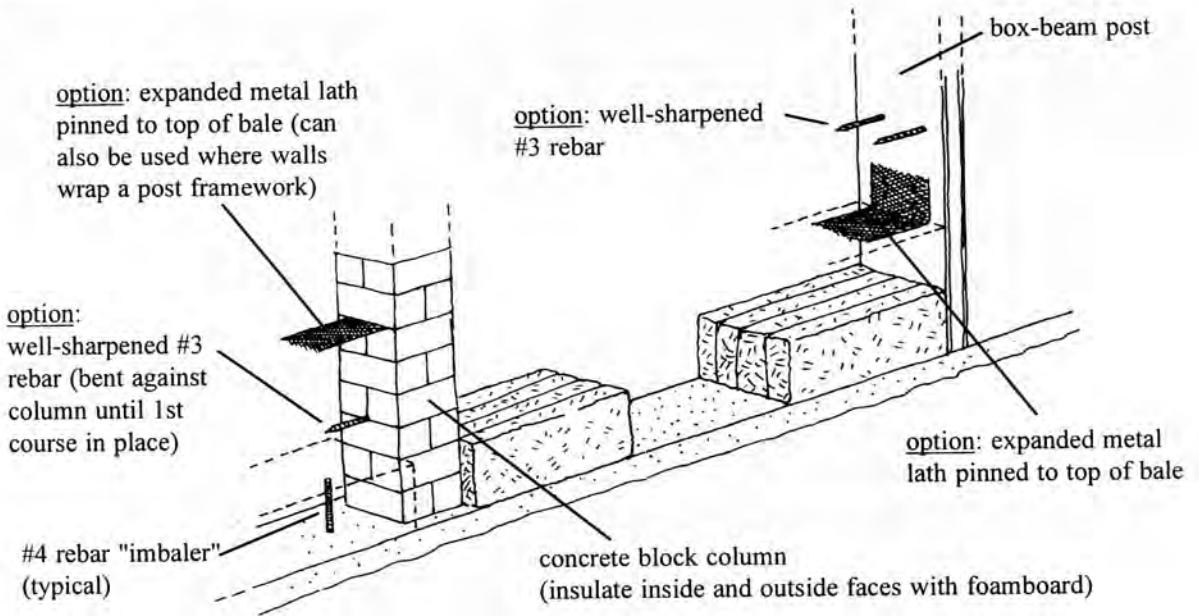


bales wired to eye bolt or equivalent (technique especially helpful at corners)

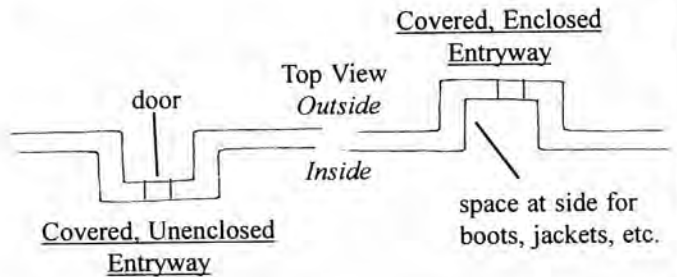
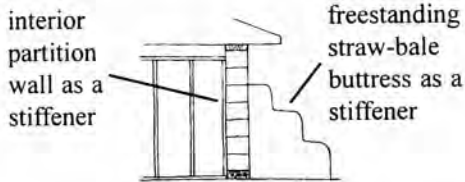
### Side View



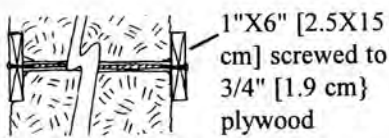
# Attaching an Infill Panel to the Posts



## Walls as Stiffeners

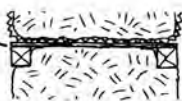


## Stiffeners in Walls

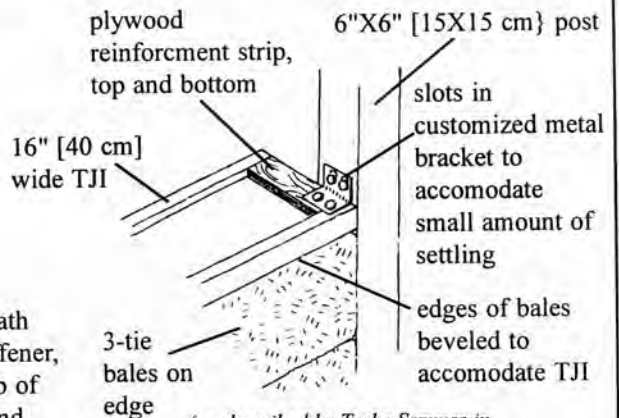


(approximately as used by Curtis Gould and Marley Porter on high wall in TX)

1/4" or 3/8" [6.25 or 9 mm] plywood fastened to 2"X2" [5X5 cm]



expanded metal lath stapled to the stiffener, overlapped on top of bale, tightened, and pinned



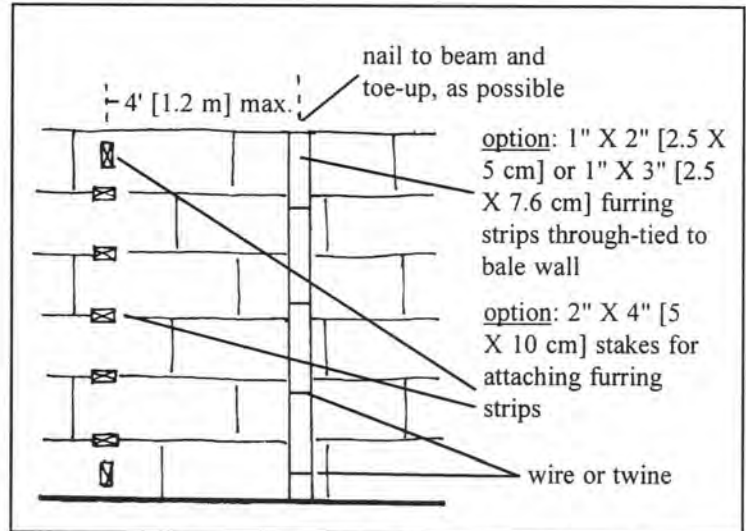
(as described by Turko Semmes in The Last Straw, Issue 13, page 16)



## Step 6. Pre-Surfacing Preparation

**Challenge:** to accomplish all tasks that need to precede surfacing the walls, as dictated by the surfacing material chosen, decisions about use of moisture barriers and reinforcement, etc.

If you choose to plaster your walls, the techniques are the same as described in *The Loadbearing Option*, Step 7, except that in some cases you will have the vertical elements of the framework to attach netting to. If you choose to cover your walls with drywall (Do you really want your walls looking that sterile?), paneling, siding, or board-and-batten, you will need furring strips (or the equivalent) attached to the walls. See the diagram to the right for possibilities.



(for two different approaches to creating the equivalent of horizontal furring strips, see *The Last Straw*, Issue 6, page 21, and Issue 7, page 24)

## Step 7. Surfacing the Bales

**Challenge:** as in a loadbearing design, to protect the wall surfaces from the elements, the occupants, infestation by vermin, and depredation by vandals or livestock.

## Step 8. Finishing Touches

**Challenge:** to get your home finished, while resisting the temptation to move in until the interior is really completed. Once you're moved in, life has a way of providing what seem to be higher priorities than getting that mortician-gray concrete floor stained and waxed, or caulking and painting in the bedroom (nobody but you sees it anyway, right?).

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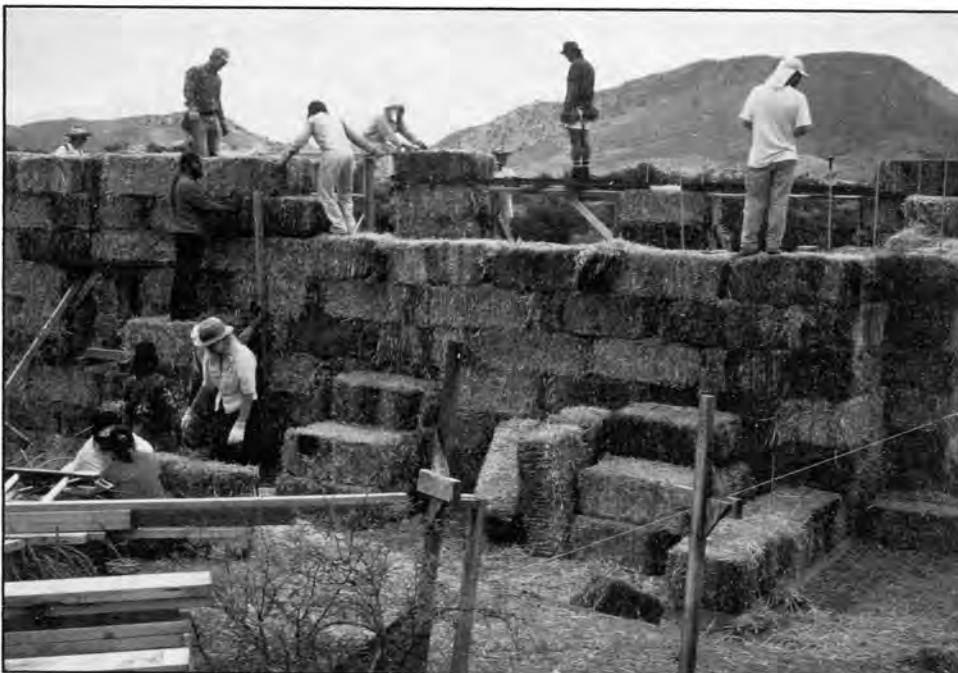
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Hybrid design with straw-bale walls carrying half the weight of each shed roof.



Photo by Matts Myhrman

Photo by Matts Myhrman



Out On Bale workshop participants raising eight-course-high structural walls, using three-string bales layed flat.

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# Index

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## —A—

Ablobe, 115  
admixtures, 104  
adobe, 12, 13, 22, 29, 93, 97,  
110, 112, 115  
Adobe Protector, 117  
Africa, 115  
Agriboard, Inc., 48, 80, 86  
air barriers, 100  
air exchanger, 11, 25, 32, 100  
air quality, indoors, 11, 100  
Alabama, 10  
all-weather wood, 54  
Almstedt, Friderike, 126  
aluminum sulfate, 19  
animal shelters, 119  
ARCHIBIO, 32, 77, 110  
architects, 6, 27, 31, 37, 50, 72,  
73, 74  
Arizona, 6, 12, 31, 37, 107, 126  
arson, 19  
artificial wetlands, 32  
asphalt emulsion, 98

## —B—

backpack sprayer, 19  
Bainbridge, David, 6  
bale(s), angled, 60, 63  
bale availability, 8  
bale benches, 20  
bale composition, 19  
bale, construction grade, 8  
bale cost, 18  
bale, custom, 17, 30, 34, 44, 57,  
61  
bale density, *see* calculated  
density  
bales, estimating the number of,  
20  
bale frenzy, 58, 59  
bales, idiosyncrasies of, 11  
bale infill, 11, 22  
bales laid "flat", 4, 15, 16, 21,  
29, 30, 44, 77, 83, 85, 94,  
126

bales laid "on edge", 4, 15, 18,  
21, 85, 126  
bales laid "flat" versus "on  
edge", 129  
bale, kinky laying options, 64  
bale laying "rules of thumb", 63  
bale layout, 34, 35, 36  
bale, mini-, 34, 61  
bale modifying, 56  
bale needle, 57, 61, 92  
bale pinning, 1, 57, 60, 84, 126  
bale quality, 17  
bale reconstituted, 16  
bale, rounded, 60  
bale shortening, 64  
bale, stacking, 1, 13, 30, 58, 65,  
101, 126  
bale storage, 38, 39, 57  
bale suppliers, 18  
bale, thinking like a, 29  
bale, three-tie, 8, 9, 15, 20, 21,  
27, 29, 34, 35, 44, 126  
bale tweaking, 16, 59  
bale tweaking tools, 84  
bale, two-tie, 9, 15, 17, 21, 24,  
27, 29, 34, 44, 126, 129  
bale "vital statistics", 15  
bale walls, prestressing, 73  
bale walls, deformation of, 17  
BaleBlock, 127  
baler, horse-powered, 4  
baler, steam-powered, 4  
baling wire, 30  
bamboo, 85, 115, 125  
bamboo pins, 60, 61, 62, 79, 92  
banding, 46  
barley, 17  
basements, 22, 30, 54, 81  
bathrooms, 11, 25  
batter boards, 44  
bean stalks, 19  
bedrooms, 25, 118, 131  
binder, 85, 95, 96, 98, 99, 116  
BioFab, 79, 86  
Birkani Architects, 127  
Bissett, Bob, 126  
Black, Eric, 12

"blood lath", *see* expanded  
metal lath  
borate solution, 10  
borax, 19, 116  
boric acid, 19  
Bowerbird Construction, 106  
breaking strength of cable and  
strapping, 72  
breathability, 99, 109, 113, 114  
brick trowel, 104, 106  
"brown" coat, 102  
building code, 2, 6, 16, 27, 28,  
31, 45, 58, 91, 93, 101, 124  
building contractors, 9, 38, 105,  
107  
building code officials, 12, 21,  
27, 28, 37, 51, 70  
building layout, 44, 45  
building materials list, 38  
building permit, 37  
building site, 2, 10, 17, 19, 26,  
38  
building site cleanup, 57  
building site, sloping, 48  
Burke House, 5  
burlap fabric, 96, 101, 110  
Burritt Mansion, 5, 10  
Butchart, Ted, 73, 108  
buttressing walls, 59, 130

## —C—

CD, *see* calculated density  
cabinets, 83, 89, 118, 119  
cactus mucilage as a plaster  
stabilizer, 110  
cage clip pliers, 92  
calcined gypsum, 96  
calculated density, 9, 16, 17  
calculated dry density,  
minimum, 31  
California, 6, 9, 86, 109, 124,  
126  
Canada, 10, 73  
Canello Project, 96  
Carabelli, Virginia, 7  
carousel pump, 107



ceilings, 9, 11, 12, 13, 21, 23, 31, 36, 54, 74, 80, 81, 85, 119, 121, 124  
 ceilings, split-bamboo fencing, 79  
 ceilings, straw bales insulating, 79  
 cellulose, 10, 19, 48, 80, 88  
 cement hardener in lime/sand plasters, 110  
 cereal grains, 8, 15, 17, 19  
 chainsaw, 63, 82, 83, 84, 101, 129  
 Challenge, 2, 3, 52, 57, 65, 74, 81, 89, 118, 124, 125, 128, 129, 131  
 Chapman, Linda, 73  
 Cherry, Mark, 115  
 Chevron CSS-1, 114  
 chicken wire, *see* poultry netting  
 cholla stems, 110  
 clay slip, 115  
 climate, 4, 10, 11, 25, 27, 28, 32, 35, 39, 48, 74, 75, 77, 81, 82, 88, 93, 97, 100, 107  
 climate, dry, 77, 97  
 climate, hot, 25, 74, 75  
 climate, micro-, 2, 32, 81  
 climate, wet, 11, 58, 74  
 cob, 13, 18, 82, 89  
 code, *see* building code  
 Colorado, 12, 116  
 "color" coat, *see* "finish" coat  
 Community Eco-Design Network, 37  
 compost, 119  
 composting toilets, 32  
 compression, measuring progress of, 86  
 compressive load, 9, 11, 32, 53, 54  
 compressive load, maximum, 11, 31  
 concrete block post, 130  
 concrete bond beam, 69, 125  
 concrete, calculating cubic yards, 45  
 concrete, curing, 95  
 concrete mixer, 45, 104  
 concrete, mixing, 45  
 concrete, screeding, 43  
 concrete, staining, 84

concrete, truck-delivered, 45  
 condensation, 10  
 conduit, decorator, 84  
 conduit, plastic, 84  
 Cook, Bob, 126  
 cooling, 12, 13, 32  
 cordwood structures, 23  
 cost, life-cycle, 2, 9  
 cost, materials, 9  
 cotton insulation, 48, 80, 88  
 counter-niches, 83  
 courtyards, 11  
 cows, 4, 10  
 crawl space, 88  
 Crews, Carole, 115  
 CRG Designs-Healthy Homes, 116  
 Crown "310", 117  
 Cuming, Juliet, 110  
 cybermodel, 36

—D—

Daniel Smith & Associates, 126  
 dead load, 31, 81, 126  
 decks, 44, 48, 81  
 Dennis, Lloyd, 127  
 Department of Housing and Urban Development, 23  
 design, finalizing, 34  
 design process, 22, 29, 33, 74, 81, 89  
 Development Center for Appropriate Technology, 6, 28  
 diagonal braces, 52  
 diamond lath, *see* expanded metal lath  
 domes, 75, 78, 80  
 door frames, 10, 25, 47, 52, 58, 59, 63, 65, 81  
 door openings, 11, 34, 37  
 Double Duty Hardwall, 111  
 double-layer ladder RBA, 68  
 dry wall footing, *see* rubble trench footing  
 drywall, 12, 79, 89, 106, 115, 118, 121, 126  
 drywall joint compound, 118  
 dust masks, 57

—E—

Earthbuilder's Encyclopedia, The, 103  
 Earth Construction, 103  
 Earth Sweet Home, 110  
 earthen plasters, 93, 95, 97, 98, 113, 115  
 earthquakes, 11, 24, 91, 102, 125, *see also* seismic easements, 37  
 Edminster, Ann, 9  
 effective bale height, 35  
 effective bale length, 30, 35, 44  
 effective R-value, 12  
 Eisenberg, David, 6, 28  
 El Rey Stucco Co., 109, 117  
 elastomeric coating, 78  
 electrical boxes, 75, 83, 89  
 electrical cable, 84  
 electrical systems, 32, 37  
 electrical wiring, 75, 82, 83  
 electromagnetic fields, 101  
 embodied energy, 60, 95, 96, 99, 100, 113  
 embossed slab floors, 84  
 emulsified asphalt, 95, 97, 114, 115  
 emulsified asphalt plasters, 95, 114  
 energy efficiency, 6, 9, 23, 75  
 energy savings, 13  
 engineered slab, 50  
 engineers, 29, 31, 32, 70  
 Environmental Building News, 26  
 enzymes, fungi, 10, 30, 97, *see also* fungi  
 Escott, Carol, 6  
 Europe, 106  
 expanded metal lath, 66, 89, 90, 91, 93, 101, 111  
 eyebolts, 37, 43, 45, 46, 129

—F—

Farrant, Tim, 92  
 ferric nitrate, 108  
 ferro-cement, 78, 122  
 ferrous sulfate, 108  
 fiberfill insulation, 80

fiberglass insulation, 12, 43, 48, 62, 80, 88  
 fiberglass rebar, 43, 62  
 Fibrehouse, Bob and Linda, 73  
 financing, 9, 12, 21  
 "finish" coat, 93, 94, 103, 109, 115  
 finishing touches, 118  
 finishing trowel, 104  
 fire, 10, 16, 18, 19, 57, 60, 79, 80, 129  
 fire retardants, 18  
 fire testing, 18  
 flammability, 1, 18, 77  
 float trowel, 107  
 floor plan, 32, 34, 35, 37, 118  
 floors, 11, 26, 30, 32, 34, 47, 48, 52, 77, 81, 82, 84, 85, 88, 89, 97, 118, 119, 121, 127, 131  
 floors, brick, 84  
 floors, earth, 84  
 floors, fired adobe, 84  
 floors, insulating, 88  
 floors, high-mass, 84  
 floors, rammed earth, 84  
 floors, soil-cement, 84  
 floors, tile, 84  
 foamboard, 47, 80, 88  
 foam insulation, 47  
 foundation plans, 37  
 foundations, 9, 10, 11, 13, 21, 22, 27, 28, 33, 34, 35, 37, 43, 44, 45, 46, 47, 50, 52, 53, 57, 58, 59, 65, 66, 70, 73, 81, 82, 91, 97, 124, 125, 126  
 foundations, cold climate, 50  
 foundations, dimensioning, 44  
 foundations, gabion, 49  
 foundations, railroad ties, 49  
 foundations, sandbag, 49  
 foundations, shipping pallet, 49  
 foundations, slab, 44, 45, 47, 50, 80, 81, 84, 91  
 foundations, tire, 49  
 foundations, toed-up, 44, 47, 58, 73, 81, 91, 126  
 frost heaving, 51  
 frost line, 28, 43, 50, 51  
 fungi, 10, 15, 30  
 fungicide, 19

furring strips, 89, 126, 131  
 future additions, 25

## —G—

glazing, 13, 25, 82  
 glue-laminated beams, 125  
 Gould, Curtis, 130  
 grade beam, 44  
 gray water, 32  
 Great Britain, 111  
 Great Plains, 4, 11  
 GreenFire Institute, 73  
 Gringo Grip, 87, 120  
 Gripple, 73  
 Gun-Earth, 115  
 Gunitite, 12, 107

## —H—

habitat for wildlife, 26  
 half bales, 30, 34  
 Hammond, Jon, 6  
 hanging things on straw-bale walls, 121  
 Hansen Kramer Stuccoing, Inc., 103  
 "hawk", plasterer's, 105, 106  
 hay, 4, 6, 10, 11, 15, 109  
 hay saw, 63, 129  
 heating, 12, 13  
 Hill Brothers Chemical, 109  
 hopper gun, 19, 106, 107, 115  
 hose level, 44  
 housewraps, 39, 100, 109  
 HUD, *see* US Dept. Housing and Urban Development  
 humidity, 10, 11  
 hurricane ties, 74  
 hybrid designs, 30  
 hybrid structures, 22  
 hybrids, "compositional", 23  
 hybrids, "structural", 22, 24  
 hybrids, "temporal", 23, 124  
 hydrous calcium sulfate, 96  
 hypersensitivity, 26

## —I—

Idaho, 126  
 identified low-flying object, 65  
 imbalers, 37, 43, 44, 57, 58  
 infill options, 85

infill panel, 130  
 insects, 10  
 insulation, 9, 13, 23, 25, 37, 79, 80  
 insurance, 10, 12, 21, 101  
 interior finishing, 9  
 Iowa, 48

## —J—

James Hardy Co., 111  
 jar test, 113  
 J-strip, 90  
 jute net staples, 92

## —K—

kaolin, 116  
 Keene's cement, 110  
 Kemble, Steve, 6, 37  
 King Arthur Tools, 83  
 kitchens, 11, 25  
 Klippenstein, Amy, 3  
 KMG Minerals, 116  
 Knox, Judy, 6  
 Kraft paper, 43, 90

## —L—

labor cost, 9  
 Lacinski, Paul, 3  
 Lancelot, 83, 129  
 landscaping, 26, 119  
 lateral forces, 32, 62  
 latex paint, 112, 118  
*lattias*, 79  
 layout squaring technique, 43, 45  
 lime, 4, 10, 12, 43, 95, 96, 97, 98, 99, 100, 101, 103, 104, 108, 110, 111  
 lime, hydrated, 96, 110  
 lime slurry, 10  
 lime, Type N hydrated, 96, 111  
 lime, Type S hydrated, 96, 103  
 limewashes, 115  
 lintel, angle-iron, 53, 54, 55  
 lintel, channel-block, 54  
 lintels, 28, 32, 52, 53, 54, 55, 58, 60, 65  
 lintels, "rule of thumb" for placement, 60  
 live load, 31, 54, 73, 126  
 livestock, 131  
 Livos brand oil, 115

loadbearing, 1, 2, 6, 9, 11, 12,  
17, 19, 21, 22, 27, 28, 29,  
30, 31, 33, 41, 42, 52, 54,  
59, 60, 62, 65, 70, 76, 77,  
86, 124, 125, 128, 131  
loadbearing design constraints,  
31  
Luddite, 92  
lumber kiln, 119

—M—

MacDonald, Nena, 6  
MacDonald, Orien, 6  
making your house a home, 119  
Malin, Nadav, 26  
masonry, 9, 12, 23, 29, 108, 109  
Matts' method, 86  
mechanical plan, 37  
Mexico, 106, 110, 115  
mica, 116  
milo, 19  
mini-pumper, 107  
Minnesota, 37  
mixing trough, 104  
model making, 35  
moisture, 10, 15, 17, 29, 30, 31,  
32, 74, 93, 107, 108, 131  
moisture barriers, 10, 100, 131  
moisture, maximum, 31  
moisture meter, 17  
moisture protection strategies,  
32  
Mongolia, 27, 68, 88  
mortar hoe, 104  
mortgage, 12, 26  
mouse, *see* rodents  
mud plasters, *see* "clay-based"  
plasters  
mulch, 20, 57  
multi-story structures, 30, 125  
Murphy's Law, 39

—N—

National Association of Home  
Builders Research Center, 51  
Naturall Fiber Board, 79  
Nebraska, 4, 5, 6, 21, 70, 77,  
109  
Nevada, 6

New Mexico, 6, 7, 12, 16, 80,  
110, 115, 116, 117, 124, 127  
New York, 114  
niches, 64, 83  
Nochar's "Fire Preventer", 19  
non-loadbearing, 2, 6, 9, 11, 15,  
16, 21, 27, 34, 52, 53, 54,  
55, 58, 59, 60, 65, 70, 82,  
123, 124, 126, 127  
notches, tools for cutting, 129

—O—

oats, 17, 19  
off-the-grid homes, 26  
Ohio, 107  
opening, maximum area of, 31  
openings, angled, 34, 52, 56, 63  
openings, placement of, 21  
openings, sizing, 52  
OSB board, 80  
Out On Bale, 6, 28, 31

—P—

Pacific Gold Board, 86  
parapets, 12, 74, 75  
partition walls, 25, 37, 43, 82,  
83, 85, 86, 87, 118  
partition walls, attaching, 87  
passive heating and cooling, 13,  
25  
pay-as-you-build, 12  
perimeter drainage, 88  
perimeter insulation, 10, 28, 37,  
43, 44, 51  
permafrost, 28, 43  
PGB3, 79  
photovoltaic systems, 122  
pipe installation, 45  
plaster, 10, 13, 16, 18, 21, 30,  
70, 74, 83, 85, 89, 90, 91,  
92, 93, 94, 95, 96, 97, 98,  
99, 100, 101, 102, 103, 104,  
105, 106, 107, 108, 109,  
110, 111, 112, 113, 114,  
115, 116, 117, 118, 120  
plaster availability, 99  
plaster breathability, 99  
plaster, cement-based, 12, 95,  
98, 103, 105, 107, 108, 109,  
111, 112, 120

plaster, clay-based, 12, 97, 98,  
101, 112, 113, 114, 115, 120  
plaster, cracking, 50, 95, 101,  
104, 107, 112, 113, 114, 115  
plaster, defined, 94  
plaster erodability, 97, 114  
plaster, gypsum-based, 12, 96,  
97, 111, 112, 120  
plaster, lime-based, 12, 96, 98,  
103, 110, 111  
plaster maintenance, 99  
plaster mixer, 103, 104  
plaster reinforcement, 101  
plaster strength, 99  
plaster workability, 99  
plastic mesh, 101  
plastic sheeting, 38, 43, 57, 79,  
88, 100, 105, 107, 112, 119  
Platts, Bob, 73  
plumbing, 37, 43, 47, 75, 82,  
118, 119  
poor man's sifter, 104  
porches, 33, 78, 97, 119, 122  
Portland cement, 45, 95, 109,  
110  
Portland Cement Association,  
105  
Porter, Marley, 130  
post-and-beam, 6, 11, 22, 28,  
126  
post-and-pole, 125  
poultry netting, 91, 101  
prickly pear cactus, 110  
privacy walls, 107, 119, 122  
pump house, 119  
purlins, 74

—Q—

quicklime, 96  
Quikspray, Inc., 107

—R—

radiant floors, 32  
Raikes, Arlen, 50  
rammed earth, 12, 13, 85  
RBA, *see* roof-bearing assembly  
rebar, 29, 37, 43, 44, 45, 57, 58,  
62, 71, 92, 129  
rebar cutter, 44  
recycled materials, 9, 77

red iron oxide, 115  
 reinforcement netting, *see* stucco netting  
 resale value, 12  
 retardants, 19, 80  
 rice, 17  
 "Roberta pins", 38, 59, 84, 90, 92  
 rodents, 10, 16, 30, 66  
 roof-bearing assembly, 11, 21, 22, 28, 31, 32, 36, 37, 46, 53, 54, 55, 58, 59, 60, 65, 66, 70, 71, 72, 73, 74, 81, 90, 91, 93, 98, 126  
 roof, adding the, 74  
 roof, cathedral, 11  
 roof, flat, 12, 78  
 roof, gable, 23, 30, 65, 74, 75, 78  
 roof, gambrel, 11, 30, 75  
 roof, hipped, 4, 30, 70, 74, 75, 76  
 roofing felt, 57, 90, 91, 93, 101  
 roof line, 65, 74, 124  
 roof, "living", 77  
 roof load, 16, 22, 27, 52, 62, 65, 70, 128  
 roof, metal, 74  
 roof overhang, 11, 33, 59, 70, 72, 74, 93, 97, 115  
 roof shakes, 77  
 roof, shed, 2, 72, 74, 78  
 roof shapes, 17, 74  
 roof surface options, 77  
 roof, thatch, 77  
 roof weight, 9, 11, 21, 22, 81, 85, 124, 125, 128  
 Rose, Cedar, 116  
 RSI-value, 8, 12, 13, 25, 75, 88  
 rubble, 43, 50, 51  
 rubble trench footing, 51  
 Ruez, Jon, 89  
 running bond, 16, 34, 44, 58, 61  
 R-value, 8, 12, 13, 36, 75, 88, 128  
 rye, 17

## —S—

salvaged lumber, 9  
 Sanchez, Pedro, 110, 111  
 Sanders, Clark, 114

Sandhills, *see* Nebraska  
 sauna, 119  
 SBBA, *see* Straw-bale Builders Anonymous  
 scaled drawings, 35, 36  
 scaled vertical wall map, 36  
 "scratch" coat, 94, 103, 106, 107, 111, 112, 115  
 seismic considerations, 69  
 seismic loads, 16  
 seismic zone, 43  
 Semmes, Turko, 130  
 Shaw, David, 110  
 shear, 72, 73, 95  
 sheetrock, *see* drywall  
 shelves, 119, 121  
 shipping pallet, 126  
 shutters, insulated, 128  
 siding, metal, 12  
 siding, vinyl, 12  
 sill plate, 47  
 Simpson #HD2A, 125  
 Simpson A35, 66  
 Sinak Corp., 109  
 single-story building, 11  
 skirting, 48  
 skylights, 28, 32  
 sloped sills, 56  
 snow, 9, 21, 54, 58, 60, 78, 100, 124  
 sodium silicate, 116  
 solar, 12, 13, 25, 27, 43, 82, 85, 107, 114, 119  
 sorghum, 19  
 space heating, 32  
 sponge trowel, 104  
 spontaneous combustion, 10  
 stabilizing clay-based plasters, 113  
 Stafford, Chris, 29  
 stairways, 37  
 step footings, 48  
 Steve's method, 86  
 stiffeners, 65, 130  
 stiffening walls, 59  
 storage, 4, 25, 32, 33, 48, 78, 85, 118, 119, 121, 122, 126  
 stories, maximum number of, 31  
 strand board, 80  
 strapping, 46, 47, 66, 70, 71, 72, 93  
 strapping buckle, 21, 70, 72

strapping, coil, 72  
 strapping, polyester, 66, 71  
 Straw Bale Builders Anonymous, 119  
 straw-bale construction, revival, 1, 6, 29, 94  
 straw-bale construction, roots, 4  
 straw bale, definition of, 8  
 straw-bale house-plan sets, 37  
 Straw Bale House, The, 6, 27, 103  
 straw-bale structures, durability, 11  
 straw-bale structures, lifespan, 11, 13  
 Straw Bale Workbook, The, 9  
 strawboard, 86  
 straw, chopped, 97, 110, 114, 115, 116  
 straw, compressed, 48, 79, 86  
 straw, enemies of, 10  
 straw, tamped, 118  
 structural testing, 6, 11, 73  
 structural insulative panels, 80  
 stucco netting, 43, 46, 66, 70, 85, 89, 91, 92, 93, 98, 101, 102, 111, 129  
 stucco pump, 103, 107  
 Sudan grass, 19  
 sunspace, 32  
 Super Shelf, 64  
 super-bale, 15  
 superinsulation, 2, 25, 36, 75, 78, 128  
 surfacing, *see* wall surfacing  
 sustainability, 2, 26, 60  
 Sustainable Support Systems, 37

## —T—

target tools, 61  
 tarps, 39, 77, 80  
 teapot level, 45  
 temporary corner guides, 57, 62  
 termite shield, 10, 28, 47  
 termites, 9, 10, 28, 47, 57  
 testing straw-bale walls, 17  
 Texas, 6, 48, 86, 106  
 The Last Straw, 1, 2, 3, 6, 18, 28, 32, 73, 74, 84, 89, 103, 106, 107, 115, 126, 127  
 The Myers Group, 77

thermal mass, 13, 23, 33, 85, 118  
Three-D Home Architect, 36  
Tibbets, Joe, 103, 105, 112, 113, 114  
tie-downs, wall, 21, 37, 46, 47, 58, 65, 66, 70, 71, 72, 73, 74, 81, 91, 93, 125  
tie-downs, wire, 71  
tile, 13, 54, 77, 84, 109, 116  
timber frame, 125  
TJI, *see* truss joist I-beam  
toxicity, 26  
troweling, 44  
truss joist I-beam, 67, 68, 71, 78  
trusses, 36, 65, 66, 74, 76, 78, 85, 128  
trusses, fink, 77  
trusses, Howe, 77  
trusses, mansard, 77  
trusses, raised-heel, 80  
trusses, scissors, 77  
trusses, Super, 77  
truth windows, 93  
twine, natural fiber, 30, 151  
twine, polypropylene, 15, 30, 102  
two-story structures, 22  
Tyvek Stucco-Wrap, 58

—U—

U.S. Gypsum, 97  
unbuttressed walls, 21  
unwanted critters, 10

—V—

vandals, 89, 131  
vapor barrier paints, 100  
vapor permeability, 109, 113  
vaults, 75, 77, 78, 80  
veneer, 119, 121  
venting, 32, 74, 76, 118, 119, 128  
ventilation, 25, 32, 33, 88  
vermin, 10, 89, 131  
*vigas*, 65, 79

—W—

Wakeman, Jim, 128







Walk-Through, 3, 43, 52, 57, 65, 74, 81, 89, 118  
wall captain, 57, 59  
wall elevations, 20, 35, 36, 37, 44  
wall height, maximum, 31  
wall length, maximum, 31  
wall map, 59  
wall paneling, 12, 100  
wallpaper paste, 116  
wall-raising, 9, 18, 36, 38, 39, 52, 66  
wall surfacing, 9, 10, 16, 72, 89  
wall surfacing, considerations, 100  
wall surfacing, decision-making, 100  
wall team, 59  
Wanek, Catherine, 6  
Washington State University, 29  
wastewater, 32  
water damage, 32, 59, 98  
water harvesting, 32, 77  
water, liquid, 17, 30, 58, 88, 91, 100  
water pipes, 82, 118  
waterproof covering, 38, 59, 60  
waterproof membrane, 74, 81  
water storage, 48  
water vapor, 10, 58, 88, 89, 96, 100, 109  
Watt, John, 92  
wattle and daub, 85  
Weed Whacker, 83  
Wells, Katherine, 127  
Welsch, Roger, 4, 6  
wheat, 17, 19, 79, 116  
wheat paste, 116, 117  
WheatSheet, 79, 85  
wheelbarrow, 104, 105, 106  
willow pins, 60  
wind loading, 6, 11, 16, 32, 39, 65, 72, 73, 100, 109, 125  
window, clerestory, 32, 78  
window frames, 10, 25, 31, 36, 47, 52, 59, 63, 65, 81, 90, 101, 128  
window openings, 11, *see also* openings  
window seats, 56, 129  
window sills, 32  
wire wheel, 83

Wisconsin, 50  
Woodin, John, 111  
working drawings, 3, 37  
Wright, Frank Lloyd, 50

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*The Authors*

**MATTS MYHRMAN** has, since 1989, been co-partners with his wife Judy Knox in Out On Bale, (un)Ltd., an international resource center for straw-bale construction. They publish *The Last Straw Journal* and facilitate workshops focused on path-changing, using straw-bale construction as a vehicle.

**STEVE MACDONALD** and his wife, Nena, built their house of straw in 1988 in southwestern New Mexico. For many, including Matts and Judy, it became their starting point in the straw-bale revival. His *Straw-Bale Primer*, also illustrated by son Orien, helped many early practitioners and became the basis for the first version of this book.

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