

Case Study ID:

04-0013



ENERGY OFFICE

Case Study Series

The Straw Bale Studio

- Innovative Use of Natural Building Materials -

DESCRIPTION:

In Oxford, in rural Oakland County, construction is nearing completion for a 600 square foot studio with a loft. This studio has a thatched roof, straw bale walls covered with earthen plaster, log frame, finished earthen floor and fieldstone foundation wall. The studio is designed to fit between existing trees on the site, creating an irregular and curving building footprint.



The foundation was dug below the frost line (down to a minimum of 42" to prevent heaving from frozen ground) in the fall of 1996. Foundation work continued into the spring of 1997, beginning with drainage gravel laid on the bottom of the trench. A 1-2 foot layer of fist to head-size rocks were placed on top of the gravel (a partial "rubble trench" foundation). A fieldstone wall was laid 2 feet below and above grade as the base for the straw bale walls. The nine cement piers to support the log posts were poured on the interior side of the foundation so that the log frame would be on the inside of the structure. Salvaged Norway spruce logs were used for the round timber framing.

Over 1,200 bundles of reed collected in St. Clair County during the winter of 1997-98 were used to create a thatched roof for the building. The remaining 500 bundles of reeds needed to complete the roof were collected the next two years, and the roof is now complete. The underside of the thatch roof has a layer of earthen plaster (local clay, sand and straw mix) for fireproofing.

The north, east and west sides of the structure are 2-foot wide bales of straw with an insulating factor of a minimum of R-40. The south wall has 5 large windows for passive solar gain. All wall surfaces are finished with earthen clay plaster. Interior features, such as bookshelves and benches are sculpted from "cob". Cob means "lump" or "rounded mass" in old English and refers to a clay/sand/straw mixture used for centuries in England and Europe.

The floor has a gravel base covered with 3" layer of poured adobe (a variation of cob). The floor surface will be hardened and waterproofed with linseed oil and bee's wax, and have the appearance of "waxed leather".

The studio will have no plumbing. Water to a sink will be provided by a canister or small tank with a spigot, mounted above the area. Heating is provided by wood-burning stove and passive solar design. Electricity being produced for DC lighting and AC outlets by photovoltaic panels, batteries and electronics donated by Detroit Edison.

STRAW BALE CONSTRUCTION:

Straw bale buildings boast super-insulated walls, simple construction, low costs, and the conversion of an agricultural by-product into a valued building material. Properly constructed and maintained, the straw bale walls, stucco exterior and plaster interior remain waterproof, fire resistant and pest-free.



People throughout history have used whatever indigenous materials were at hand to create shelters. In tree-poor areas of the United States, people often used sod to build. With the advent of the baling machine in the 1890s, straw bales were employed as a building material. Straw compacted into bales offers much better insulation with its high thermal resistance than sod or wood. Tests following ASTM procedures resulted in bale R-values between R-2.5 and R-3.0 per inch, depending on the direction of the straw, giving the finished wall an R-40 or above rating.

The two primary ways to build with straw bales are load-bearing, or "Nebraska" style, and post-and-beam in-fill. In load-bearing straw bale construction, bales are stacked and reinforced to provide structural walls that carry the roof load. With in-fill straw bale construction, a wood, metal or masonry structural frame supports the roof and bales are stacked to provide non-structural, insulating walls. With either alternative, the bale walls are plastered or stuccoed on both the interior and exterior.

The advantage of the load-bearing style is that it uses less wood, thereby conserving cost and trees. The advantage of the post-and-beam method is greater design flexibility. In cold climates, post-and-beam help carry the snow load weight. Straw bale construction, with either method, partners well with passive solar design. The highly insulative straw bale walls allow a greater retention of the sun's heat brought into the building through southern-oriented windows.

FOR FURTHER INFORMATION about the Strawbale Studio and activities:

Current Strawbale Studio Activities: www.uheac.org/links.html

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To read more on the Morning Glory Straw Bale Studio, building updates and links to Natural Building, visit the web site at: <http://www.geocities.com/rainforest/vines/7729>



Inside view of straw bale studio showing straw bale construction and start of "cob" wall finish

View of south facing exposure of straw bale studio. Windows are designed for passive solar heating.



Deanne Bedner, Fran Lee, Carolyn Koch and Gregory Matthews standing next to their building project.

