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California Straw Bale Code Update

By Martin Hammer

The effort to bring the proposed appendix for Strawbale Construction into the California Building Code was put on hold in 2008. The sponsoring State agency, the California Department of Housing and Community Development (HCD), was faced with too many obligations and insufficient staff to assist moving the appendix forward during this year's code cycle. Last year, progress was made refining the language and making adjustments based on input from key stakeholders. Those stakeholders include the California Building Officials Association (CALBO), the Structural Engineers Association of California (SEAOC), and the California Seismic Safety Commission (CSSC). Another key stakeholder that hasn't fully weighed in is the State Fire Marshall (SFM).

Developing consensus with these stakeholders is necessary for the proposed Appendix's ultimate adoption by the Building Standards Commission (BSC). All of these stakeholders have voiced strong support for straw bale construction to be incorporated into the California Building Code, but they have also expressed numerous concerns regarding particulars of the proposed Appendix. About 75% of these concerns are in the realm of structure. The remaining relate mostly to moisture, plaster finishes, and fire.

The representatives of these stakeholder groups have little or no previous experience with straw bale construction, so the review process has often been a matter of education. It is not unlike the situation many CASBA members have encountered, when needing to convince a **willing but uninformed building o cial about the viability of straw bale** construction. However in this case the proposal is comprehensive in scope, with the prospect of broad application throughout the state, so the stakeholders are being especially vigilant in their review. So, progress on a true California straw bale code will have to wait until next year, OR . . . .

I've had recent discussion with CASBA member and civil engineer Bruce King about the two of us writing an ASTM Straw Materials Standard. Last year Bruce wrote a proposed ASTM Earthen Materials Standard (with input from more than 20 worldwide experts). It is currently under review by ASTM (American Society for Testing and Materials), which is an internationally recognized and independent standards development organization . If a Straw Materials Standard (which would include straw bale, light straw-clay, straw panels, cob, etc) is approved by ASTM, it could then be adopted with relative ease by

***Article**...continues page 4...*

EVENTS

Upcoming West Coast Happenings related to straw building…

CASBA announces the 2008 **Introduction to Plastering Workshops**
The Plastering Workshop dates are Friday – Sunday; October 10th, 11th, and 12th
See the CASBA website www.strawbuilding.org for details.

GreenBuild, Boston
November 19-21st
The theme of this years annual USGBC expo is "Revolutionary Green: Innovations for Global Sustainability"
www.greenbuildexpo.org

Send your event information to CASBA Editor at <dmsilvernail@got.net or send to CASBA Central, <casba@strawbuilding.org>

to register for List Serve- the CASBA members info. pg., go tp:
http://lists.sonic.net/mailman/listinfo./casba-members
Near bottom of the page is where you can sign up & select options.

CASBA

THE CALIFORNIA STRAW BUILDING ASSOCIATION

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CASBA is a non-profit organization whose members are architects, engineers, builders, and people interested in straw building. Our mission is to " ...further the practice of straw building by exchanging current information and practical experience, promoting and conducting research and testing, and making that body of knowledge available to working professionals and the public at large."

Editorial

Last week I had the pleasure to sit with prospective clients – a couple - to interview as their prospective architect. As it turns out, it's a dream commission: great folks, smart, organized, excellent decision-makers, fantastic site on a ridge in the Santa Cruz Mountains commanding a 360 degree view shed over the Pajaro Valley, Monterey Bay's blue crescent, the Monterey peninsula jagged against the south horizon beyond that, and the vast Pacific as foreground to future fiery sunsets, to the west.

They had brought their initial program, their draft architectural brief. Listing of priorities, goals, aspirations, and one item stood out, of course. It read, "explore alternative materials – straw bales… etc."

In due time we worked our way down to that line item, and as we got into the item in more depth I was confirmed in what I'd already learned about this couple, that sustainable practice was indeed among their goals, that saving energy mattered to them, that they were indeed interested in ecological design, and the breadth and sweep of our conversation touched on everything from greenhouse gases to embodied energy of materials to day-lighting principals to passive solar design strategies. And then the talk came round to initial cost to build with straw…

And that's where the straw bale train derailed for, contrary to their expectations, I couldn't responsibly represent to them that they could count on saving money but should instead be prepared to spend perhaps 10-15% more for a straw bale home. That was disappointing news, they said, making it clear that their budget was not open-ended, that essentially their project budget had been allocated to a certain cost per square foot and no more.

I offered a few talking points. That for example the prospective increase might be countered by right effort such as alternative plastering systems to offset the higher costs associated with plastered walls. That they might perhaps consider shrinking their targeted square footage a tad as a guaranteed offset against the risk of going over their project budget. But the outside walls would be thicker, too, they countered, so wouldn't their livable space would be shrinking anyway, just by building with straw?

And when after that they asked me what could possibly justify a prospective increase in cost, or decrease in the size of their dream retirement home, I knew discussion of the item had foundered, and could only finally reply that it was conviction to an environmental ethos, ultimately, that will guide the committed homeowner to build with straw, to outlay capital to build something smaller and greener as opposed to something bigger and more conventional.

They got past the "straw bale" line item pretty quickly after that, and I know better than to belabor a non-starter. But, obviously I've not quite composted the chaff and stems of that meeting yet.

Yes, we got the commission, and yes, if the opportunity presents itself farther down the design path I'll certainly test the waters on straw construction with them again. But in the face of so many decisions, so many risks and unknowns in launching my client's retirement home how can I possibly blame them from shying away from any unknowns in the construction budget pie than are absolutely necessary?

At this point in my essay I was prepared to close by pondering upon the uncertain nature of straw bale construction costing, and leave the reader to brood upon the chicken-and-egg nature of an unconventional building system in a conventionally-weighted building industry. But that's not how I'll close my essay.

Instead, I'll close not with that particular sweeping and impersonal speculation but rather on a more intimate, personal level: I choose to think that it was my inability to offer assurance to my client about the technology that deterred them, not the technology itself. That with more straw buildings under our firm's collective belt, and more importantly, more experience partnering with local builders having proven track records in building straw bale homes, the percentage of folks willing to commit to that technology in working with us as designers will increase.

And so, pondering the stems and chaff of that meeting here, now at the keyboard, that is the renewed and fertile understanding which has emerged, at least for this practitioner, your humble author.

Daniel Silvernail,
Santa Cruz

NOTES FROM CASBA CENTRAL

Joy and Maurice Bennett - Angels Camp

Well, summer is ending – and it hasn't been a particularly hot one! Our straw bale house is performing better than ever in the heat since we installed two solar attic fans in the roof and a "misting" system– when the outside temp goes up 30 or so degrees inside goes up only 3-5 degrees – of course when the diurnals don't kick in then the inside temp can go up to the low 80's – but PG&E says to set your air conditioning at 78 – and we don't even have air conditioning! Now – to CASBA business:

The plastering workshop, originally scheduled for Sep 12-14 has been rescheduled to October 10-12.

CASBA would like to thank those members who volunteered their time and effort for the straw bale workshop in seaside – C J Cavet , our fearless workshop coordinator, Greg Mcmillan, Jim Furness, Barbara Russell, Jay Tulley and of course storm and Kathy Gregor who just keep on giving to CASBA. The generosity of all these individuals is one of the core things that makes CASBA the special organization that it is.

We had a videographer at the July bale raising workshop and she has produced an excellent video which we will post on the new website. On another note the Spring 2009 conference is booked for March 20-22, 2009 at Walker Creek Ranch, outside Petaluma – you know the place, we've been there before – no excuses for not having advance notice. Registration information is forthcoming...

Web site – the web committee is zeroing in on redesigning and upgrading our web site – if you, or someone you know would be interested in helping maintain the site once it's redone please let us know – a very part time volunteer opportunity.

Additionally I want to apologize to those professionals who have made an effort to list their service(s) on our resource list. We have had some delays in keeping their information current and adding new businesses. These problems will be resolved with the update.

California Code – Martin Hammer informs us than any code updates will probably not happen this year - we all appreciate the work and effort martin has made to keep this project alive and well.

As a general note, CASBA central has noted a marked down-turn in inquiries and interest in building with straw – what interest there is remains deep and sincere but the current building malaise seems to have been across the board – but we have also heard that some CASBA professionals are busier than ever and CASBA has more paid members than at any other time– go figure!

Finally, I ask each of you to contribute articles to this Journal – remember, its yours: your articles and photos are what make it rich and informative.

California, as well as other jurisdictions in the US and throughout the world.

In the meantime, what does this mean for the design and construction of straw bale buildings in California? They will continue to be permitted in one of two ways:

1. Using the "California Guidelines for Straw-Bale Structures" (Health & Safety Code 18944) as adopted by a particular jurisdiction. (see the link on CASBA's homepage for the text of this document).
1. Using the "Alternate Materials, Designs, Tests and Methods of Construction" section of California Building Code (Section 108.7) AND probably (but not always) HS18944.

HS18944 has been officially adopted by very few jurisdictions, but in practice it continues to be used as the de facto straw bale code in California. It is useful in many ways, but is greatly flawed or outdated, and is sometimes the source of problems for all parties involved, and for straw bale buildings themselves. We continue to use and negotiate it the best we can, and I and others will continue to work towards replacing it with a bona fide straw bale code as soon as possible.

(Please direct any inquiries to Martin Hammer at 510-525-0525 or mfhammer@pacbell.net)

Natural Building Apprenticeship Offered for Monolithic Adobe (Cob) Project

By Misha Rauchwerger

Construction is commencing on a bathhouse addition to the charming monolithic adobe studio that was the featured cover story of the Fall 2005 Real Goods catalog; the story celebrated the first, and possibly the only, monolithic adobe structure to be seismically engineered and permitted in the USA. The studio is nestled into the secluded oak woodlands overlooking a picturesque pond in the Sierra Nevada foothills of California.

With over 13 years of traditional and natural building experience, Misha Rauchwerger will lead the project. This is a unique opportunity to work and learn on an historic natural building with an expert in the field who is actively designing and building professionally and legally within the building codes. Experience foundation through finish work. Learn design, construction, engineering, laboratory materials testing, and building codes. Explore your personal interests with access to a phenomenal library of natural building, architectural design, and permaculture books.

The apprentice needs a basic background in construction; it would be ideal if the applicant is equipped with a basic set of tools, and has had previous experience in a natural building workshop or program, however these are not requirements. Construction is beginning immediately and will continue through early November, possibly longer.

Please view our website for details and pictures of our property and location, and our Craftsman-style straw bale home and curvaceous, hand-sculpted adobe studio: www.strawbaledreamhome.com

Rustic accommodation in the adobe studio is offered. Terms of the apprenticeship will be negotiated based on skills, experience, and needs. Phone (209) 532-3972 or e-mail misha.rauchwerger@gmail.com to apply for the position.

What The Other Two Little Pigs Didn't Know: How Rural Chinese Housing Can Influence US Food Safety, Air Quality, And Global Climate Change

By Max Perelman

Mrs. Wang and her family live in a mud and straw home in rural northeast China. It is drafty and cold in the winters and they are locked in a vicious cycle of poverty and sickness as the family struggles to heat their small 700 ft^2 home with four tons of ever-pricier coal. Despite the fact that almost a third of their income is going to coal purchases, the Wang family has managed to save enough to build a new "modern" home made of red-fired brick. This new home will have solid, uninsulated brick walls almost three feet thick that will not only represent an enormous amount of embodied energy, but will require the same four tons of coal to heat annually and could prove even less safe if an earthquake were to strike.

As Mrs. Wang dreams of her new brick home by the coal-fired, inefficient heating stove, the smoke slowly makes its way past her asthmatic child and up through the chimney. Portions of the surprisingly sweet smelling coal smoke's fine particulates, sulfur dioxide, nitrogen oxides, and airborne mercury pollute the local gray air above. Some of it stays in the region to settle on Korea and Japan. Much of it, however, travels the long journey along air currents over the Pacific Ocean to end up in California. China is responsible for a quarter of US airborne mercury, a quarter of the particulate matter above Los Angeles, up to a quarter of California's nitrogen oxide, and nearly a third of the state's smog-forming air pollution. Even more troubling, China's coal combustion is predicted to quadruple California's current levels of nitrogen oxides and volatile organic compounds in the next fifteen years.

Geography and winds funnel pollution from the California coast into inland air basins. Comprising two-thirds of the Central Valley landmass, the bowl-shape topography of the San Joaquin Valley Air Basin provides a particularly ideal conduit for trans-Pacific air pollution. This does not bode well for our food supply. California's agriculture industry is the world's fifth-largest source of food and agricultural

produce and California's Central Valley supplies a quarter of America's food. While China's atmospheric pollution has doubled in the past ten years, Chinese desertification and coal combustion is forecast to quadruple atmospheric pollution by 2020 in China as well as in the Central Valley.

Coal is the source of 80% of China's energy and it is inefficiently burned to produce the country's steel and cement, to generate its electricity and to heat its buildings. The built environment is responsible for a large portion of coal demand and between now and 2015, roughly half of the world's new building construction will take place in China. The fastest way to address Chinese coal is through demand-side reduction via environmentally preferable construction and building operation.

Last summer, I set out to learn more about the barriers and opportunities to expanding China's green building industry. One of the outcomes was a film documentary and multi-media information source that you can learn more about at www.greendragonfilm.com. Urban buildings are only part of the story and perhaps the largest part since the majority of Chinese will live in cities within the next decade. Nevertheless, the plight of ordinary rural Chinese is a bit closer to my heart and I have found that oftentimes a dollar spent in the countryside will not only have a greater impact, it will be more emotionally satisfying.

While in China last year, a grassroots initiative to build environmentally friendly, energy efficient housing in the rural northeast region struck me close to the heart. This project, led by the Adventist Development Relief Agency (ADRA), is the largest straw bale building initiative in the world. Since introducing straw bale construction to northern China in 1998, the program has worked with local communities training local construction teams, and building over 600 (known) energy efficient, earthquake-resistant, and culturally appropriate homes and schools using straw and other local building materials. In this extremely cold environment, villagers can take advantage of straw's amazing insulative qualities and homeowners burn an average of three tons (75%) less coal per year to heat versus the mainstream red brick alternative. Over its lifetime, the straw bale version of a typical rural Chinese home will produce over 300 tons less carbon dioxide.

When I arrived at one of the ADRA partner villages outside of Harbin, China, I found numerous satisfied straw bale homeowners. Unfortunately, I also found a number of newly built brick homes. The village head explained they had to give their straw baling equipment away to another village to use. Without a straw baler, the straw bales used to produce the insulating external walls could not be produced. I quickly communicated the latest developments to ADRA's managing director, Linda Zhu, who was happy to hear of the project's success but concerned by the lack of straw baling equipment. Last autumn, ADRA China put together a proposal for a new straw building initiative that focuses on training local builders and purchasing baling equipment. While the local government and ADRA China have raised about two thirds of the required funds, they need our help to raise the remaining US$30,000.

ADRA China is the kind of environmental operation you want to support – they are locally managed and efficient. ADRA has a proven track record and funds focus on training locals so their efforts will last for years to come. This project will not only prevent large amounts of greenhouse gas emissions but will also create numerous "green collar" jobs and raise the environmental awareness of thousands of rural Chinese – right at the very period

when they are becoming modern consumers.

My environmental focus is mitigating global climate change through more sustainable building and this project is the most financially efficient way I know of to reduce greenhouse emissions. Below are some numbers to help you estimate the impact your potential financial contribution could make:

- $1 will reduce greenhouse gas emissions by 1 ton
- $22 will offset the average American's greenhouse gas emissions for a year
- $70 will ensure 1 home is built
- $100 will train one Chinese builder in straw bale construction techniques
- $3,500 will subsidize the purchase of one straw baler and guarantee at least 50 homes are built during the 2-year project period

In a wonderful example of interconnectedness please join me in helping to improve our local environment by helping others across the ocean. You can learn more about the China rural straw bale building project, read detailed FAQs, and contact me via my project website: http://www.greendragonfilm.com/strawbale/index.php

The most efficient way I've found to donate is via check. Please write a check made payable to "ADRA Limited". Write "Straw Bale Houses" in the note area, and then send it to me (Max Perelman, 3108 Golden Oaks Lane, Monterey, CA 93940). Every month, I send all checks to the ADRA Hong Kong regional headquarters to save on mailing charges. They can also supply a receipt for tax deduction purposes.

Max Perelman is earning an MBA as well as an MA in International Environmental Policy at the Monterey Institute of International Studies. Max is also the research director and producer of a recent documentary on green building in China. Learn more about the film at www.greendragonfilm.com and China straw bale at www.greendragonfilm.com/strawbale/index.php

The Year Of The House: Stacking And Modifying Bales

by Jim Reiland

We had planned to build a small straw bale workshop first, then live in it while we designed and built the house. It was a good plan, but things didn't work out that way. We found ourselves instead building both post and beam structures simultaneously, but generally working on the workshop first to refine our techniques. The two buildings sit across a small courtyard from each other, so when the bales were delivered in late August, the truck parked between them and we stacked bales anywhere under a roof—the porch, the garage, the house and the workshop. Timing is everything, because it rained that very night!

On simple structures, bale stacking can be quickly handled by a large group of volunteers. We have seen whole buildings go up in a day with twenty or more people helping out—it works well even if just a few of them have experience stacking bales. However, our buildings had lots of posts and other support members, and we knew that many bales would need to be notched. We also wanted to run electrical conduit in some of the bales, another time consuming bottle neck ill matched to a volunteer bale raising party. We determined to plug away with just our own labor, and the welcome assistance of the occasional friend or neighbor who happened by. We began stacking our workshop and house walls in early September, the two of us working weekends and evenings as our day-jobs allowed, and finished about a month and a half later. For reference, we had a little over 200 linear fit of bales to stack, and either seven or eight courses high. Since our building experienced covered mostly load bearing structures at workshops, we expected a post and beam bale stack to take longer because the majority of our bales needed to be re-tied or notched.

If you've ever watched someone persuade a bale to fit into the wall, you suspect they're trying to avoid slicing those bale strings and re-tying the bale to a different size. I've seen people pound a bale with a "commander" to the point of exhaustion, the deteriorating expression on their faces covering the range from hope to exasperation: "This will fit!" "Will this fit?" "I will make this fit." "Fit dammit!" "Ahhrggggg!"

I have been that person.

Re-tying a straw bale takes some practice and a bit of luck; many folks seem to measure the "ease" of construction by how many bales need retying. In fact, the ISBCRR (International Straw Building Committee on Rules and Regulations) Code Section 12, paragraph 1, subsection 7 allows "one "whoopee" to be exclaimed when a full length bale can be inserted into the wall assembly with no customizing or re-tying." It also permits "a half whoopee"-- a "whoo"--if you have half-bales, and can place one into the wall without modification." OK. I made the ISBCRR part up.

But there were no "whoopee's or "whoos" heard during the bale stacking on our workshop, and a total of three "whoopees" and four "whoos", exuberantly exclaimed, while stacking the house.

At one extreme, the hands-down fastest way to stack bales is to work on a house with no windows, doors, or support posts, and make sure the footing dimensions are a multiple of the average bale size. With some luck, you'll never need to re-tie a bale, and you'll never get into, or out of, the house.

We found ourselves nearer the other extreme. Our house wasn't designed specifically with the bale module in mind, although we took bale height into account for window seats, and located doors and windows approximately a bale length from any corner. Like many folks, we arrived at our design through many compromises. We balanced lot line setbacks, tree preservation, solar orientation, and bale size. We reasoned that we might spend a few extra days (or extra weekends as it turned out) customizing the bales, but we expected to live in the house for a long time, and that the house would live on for many generations. What were a few extra re-tied bales? To modify our rice straw bales

we used an electric chain saw and two hay knives we'd collected from antique shops and honed razor sharp.

Preparing. Every bale that went into our walls had its "ears" trimmed off. Because we had only one chain saw, we decided to do this task with the hay knives. Using a bale "workbench" to keep from bending over too much, we each trimmed one end of the bale, our sawing movements countering the movements of the other. When one of us worked alone, the sharp knives cut easily through the straw while one hand steadied the bale. When the bales were mostly square, there were ready for notching, or resizing, and more rarely, simply setting into the wall.

Re-tying. Many bales needed to be re-tied, and we used the same bale needle and knot tying techniques we learned at CASBA and Canelo workshops. Although we managed to use most of an entire spool of brand new baling twine, we also re-used a lot of the original twine we cut from the bales, too.

Notching. Borrowing a technique from my woodworking bench, we built a miter box of plywood scraps to hold the bales on edge while we notched for posts. The box kept the bales from wobbling back and forth with the knife's sawing action, or allowed us to keep both hands on the chain saw, particularly helpful when either of us worked alone. Using a timber framers technique, we used short blocks of wood the same dimension as the posts so we could test fit the notches without lifting the bales up onto the wall.

A lot of the details we used evolved as the building progressed. For example, during the design stage we hadn't thought much about the bale-to-post connections. As we were planning to use earth plasters, we didn't have a need for stucco netting, so sewing through the walls net-to-net wasn't an option. We considered plastic netting, and rejected that, too. Then we investigated external pinning using bamboo, but as we searched out a source for small diameter 10' bamboo poles…difficult to find in our area… we came upon an elegant, expedient solution.

Sorting through back issues of *"The Last Straw"* we found a technical tip written by Paul Lascewsk. He wrote about using round wood washers embedded in the bales, and screwed to adjacent posts.

We tried this…and it didn't work. The round washers I made just didn't bite into the tight rice straw bales we had. But we adapted the technique, and borrowing yet another idea for securing electrical boxes with pointed wooden "vampire stakes," we ran some scrap ¾" plywood through a table saw and made 10" long stakes with a 10 degree point, then drilled a 3/8" hole in the wide end of each. We had a case of leftover 8" hex head screws left over from the framing. We pounded a stake into each bale that contacted a post…which in our case, was most of them… about five inches from the post. Then we drove the screw through the stake and into the post, snugging the bale to

the post. Solid!

Another contraption we devised was a bale press. We have 8'6" ceilings. I'm sure it wasn't a rational, conscious choice, and I'm sure it was made during a running conversation with our engineer and draftsman that probably went something like this:

Engineer: What do you think about ceiling height?
Me: I don't know, what do you think?
Draftsman: 8' seems kinda low. How about 9'
Engineer: 9' seems kinda high…want to split the difference?
Me: OK.

That's the way quite a few decisions got made, some of which complicated the building effort. To demonstrate how arbitrary dimensions can impact the work load, measure the distance from the top of the sill plate to the bottom of the box beam, then divided by the bale height--14.5" in our case. Our house walls were 6.7 bales high. Nice, except that bales don't come in .7' heights. We needed to make a lot of custom mini-bales about 11" high to place at the top of the walls, so borrowing from a woodworking bench's wedge clamping system, we made a bale press out of scrap plywood and some 4 x 4s. By placing approximately 15" of loose flakes in the jig, and pressing the wedge downward, we compressed the flakes to the desired 11" thickness, tied them while the wedge held them compressed, then pulled the wedge out and popped the mini-bales into place. This allowed us to efficiently make many dozens of consistently sized, reasonably dense, mini-bales.

The jig also came in handy later when we had to make mini-bales of a different size to fit under our window sills—we simply re-positioned the wedges for the bale size we needed. Someone who does a lot of bale stacking could devise a more permanent, adjustable bale press.

As each bale went in we stomped and pounded it as snug as possible to those around it. Making sure it was in plane, we screwed it to any adjacent post. By mid-October we were largely finished with bale stacking, and ready for…plaster preparation!

Owner-builders Jim Reiland and Joy Rogalla are building in Jacksonville, Oregon. They have given themselves a year—The Year of the House—to build a post and beam straw bale house and workshop. They hired sub contractors for excavation, foundation, framing, roofing, electrical, plumbing, radiant floor, and drywall work. With the help of friends and neighbors they handled bale stacking, exterior and interior plastering to date, and expect to complete all plastering, tile, and finish work in 2008.

A non-profit project of the Tides Center.

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