



BUILDING WITH STRAW

AS SEEN ON DRAGON'S DEN

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Interview & Words: Heidi Moment

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Building with straw might sound crazy, but when you find out that it's healthier, hygienic, will save you a fortune on energy AND has a positive impact on climate change, it's an absolute no-brainer. We met up with Barbara Jones to find out all about it.

MEET THE EXPERT



I started as a traditional carpenter and joiner in 1980 and I've worked in construction ever since, running a women's roofing and building company, Amazon Nails. In the '90s, I took a year out to go travelling and whilst in California I discovered straw-bale building and was completely blown away by it.

I started helping people to build with straw straight away and went back to the US and Canada on a Winston Churchill travelling fellowship to learn more about it. Then in 2011 I closed Amazon Nails and started Straw Works with my co-director, Eileen. Straw Works is a design company. We are architectural designers and specialist consultants, designing everything from tiny garden buildings to huge commercial salerooms. We help people to make sure they get the details right, acting as a facilitator to help developers through their first project or designing and managing the whole process.

We also run the School of Natural Building which educates others in this process.

NO NEED FOR A DAMP PROOF COURSE

Often people don't realise that the damp-proof course in modern houses is there to protect the building from the cement foundation because cement's always wet. We never use modern damp proof courses, instead we use appropriate materials, ones that do not wick water like cement does. And we use traditional capillary breaks, so no need for any plastic.

WHY STRAW?

Most modern materials are cradle-to-grave. You make them, you use them and then you bury them and they stay buried forever.

Natural materials are cradle-to-cradle materials, which means they are still in their natural form and haven't been treated with anything. Straw is grown, fuelled by the sun, fed by water and harvested. We can make it into bread or we can make it into houses. The great thing is if in 200 years we decide we want to take the house down, **the straw can then be composted or mulched around the trees and it will go back to nature without causing any damage or toxic outflow.**



In England, each year we plough five million tonnes of straw back into the earth, because we don't know what else to do with it. We could build 650,000 homes with it!

NATURAL MATERIALS ONLY

As a company, we only ever design using natural materials. Some work best for the structure of the house and others for insulation. Materials we use include:

- Timber
- Straw
- Clay and lime plasters for the interior and exterior walls
- Breathable paints made out of clay and lime
- Sustainable board materials, such as Smartply OSB3, panelvent, fermacell. This has no added formaldehyde, or toxic glues
- Wood fibreboard
- Sheep's wool, recycled cotton and paper or hemp or wood wool batts – used for insulation if we aren't using straw.

"We **ONLY** use natural materials. No cement. No plastic."



BUILDING WITH STRAW

People have been building houses with straw since around 1850. It started in America, where they used straw bales like giant bricks, put together in the load-bearing method, or Nebraska style. And in the late '70s and early '80s, straw started to be used as insulation in timber-framed buildings.

Nowadays, we use prefabricated modular panels of straw, which are much more widely available to the mass market. The problem is not many people know about them, which is something we'd like to change.

PREFABRICATED STRAW PANELS

A 'straw panel' is effectively a box made of timber and filled with straw. Panels are made in a factory, so the boxes, the density of straw and the moisture content are all identical and the measurements are millimetre accurate.

The dimensions of the boxes vary, depending on the design. If you've got access to a crane, then the panels could be three metres high by 800 millimetres wide, or 600mm by two metres if you're manoeuvring them by hand.

These structural panels (or boxes) fit together like bricks. So, once you've got your foundations ready, you bring the structural panels to site and just fit them together. Four strong people can manoeuvre the boxes together, or you can use a crane or forklift truck to put them in place. You can get the walls of a three bedroomed house up in three or four days, and the whole structure, including roof, up within a week or 10 days.

STRAW AS INSULATION

The straw itself acts as an insulator. Packed to a density of 100 kilogrammes per cubic metre, the panels give really good insulation.

Regular types of insulation, such as expanded foam, rock wool or glass wool are either made from the petrochemical industry, or they're extruded from stone or glass somehow, all of which takes a lot of energy. Straw, on the other hand, uses no chemicals and releases no toxins into the environment and is fuelled by the sun, making it a much cheaper, safer and healthier choice.

NON-FLAMMABLE

People often wonder if they are flammable because they imagine straw to be flammable, but there isn't enough air inside the panel or bale to set it on fire. Lots of fire tests have been carried out in different European countries and they all confirm plastered straw is a better fire protector than most other modern day materials.

COSTS ARE COMING DOWN

At the moment, building in this way is slightly more expensive than conventional building methods, but that's about quantity. As people become more aware of these products and more people are building with them, prices are beginning to come down to be pretty comparable, and that will continue over the next few years.

SUPPLIERS

You can't buy these panels at B&Q, yet, but there's quite a good network of specialist suppliers all around the UK who provide all of these natural materials. Some of them are made in this country, and some of them are made in Germany or France and brought in. There are several straw panel manufacturers in Europe, including one in the UK. I work with a company called EcoCocon based in Lithuania.

Other suppliers include:

- EcoMerchant
- Ecological Solutions
- Green Building Store
- Natural Insulations
- Womersleys.co.uk
- Ty Mawr Lime (Welsh Lime Centre)
- Anglian Lime
- Black Mountain
- Thermafleece
- Steico.

THE PROBLEM WITH CEMENT

Cement is a real enemy of the environment. For every tonne of cement made, a tonne of carbon dioxide is released into the atmosphere. And because of the huge quantities that are manufactured worldwide, that makes it one of the major causes of greenhouse gas, which makes it a real contributor to climate change.



Cement comes from a raw natural material, limestone. But chemical additives are added to the burning process, which means at the end of that process it has transformed into something very unnatural that won't go back to nature.

Cement and gypsum plasters are also a major cause of mould, condensation and damp in buildings. These kinds of problems can take a long time to show on some buildings, which is why we are only just starting to realise it now 20 or 30 years on. Damp can be a real issue in houses, and it's interesting to note that English and Scottish Heritage have banned the use of cement on all heritage buildings because of this.

LIME REGULATES HUMIDITY

Instead of cement-based plasters we use traditional lime and clay plasters, which have been around for more than 12,000 years. They are totally breathable and help to maintain a healthy indoor air climate without creating draughts or compromising airtightness.

"Lime plaster is hygienic because it doesn't grow mould and bacteria on it and it mitigates against them"

In a normal house plastered with gypsum and cement plasters, humidity created by using the shower, bath, washing machine or drying clothes on radiators will result in mould and condensation. This doesn't happen in a house plastered with clay and lime plaster, as clay and lime can regulate humidity to the exact level needed for human health, by absorbing excess moisture in the air and releasing it again when the humidity level drops. Pretty impressive really.

THERMAL-EFFICIENCY AND AIRTIGHTNESS

It's extremely easy to achieve Passiv Haus standards with these buildings. Passiv Haus requires an air exchange rate of 0.6 per hour, which is very low. Building with straw makes it easy to meet the 0.6, because the panels fit very tightly together, which increases airtightness. So straw buildings far surpass the building regulations requirement, which is 10. In my opinion, building regulations should lower their requirement to 5, so that all new houses are better quality, have lower fuel bills and no draughts.



REDUCED ENERGY BILLS

When you build a house in this way, energy bills are reduced dramatically. You hardly need any heating in the house because the straw retains the heat as well as preventing heat loss. If you imagine a house built using foamed products with stone or glass wool insulation. When you heat that up and then turn the heat off and open all the doors and windows, the heat will leave. The walls don't retain any heat, so when you close the door again it will be cold.

But if you've got a straw house, and you do the same thing, it will very quickly get warm again when you close the door because the latent heat is stored in the walls.

“Straw walls store latent heat, retaining heat and reducing energy bills”

CARBON NEGATIVE

People talk about zero-carbon homes, and are trying really hard not to produce more carbon dioxide than they use in the building. But building with straw and natural materials is infinitely better than that, as we're actually creating negative carbon homes, so we're off the scale in the other direction.

Straw doesn't produce carbon dioxide. Like all plants, including timber, it absorbs it and produces oxygen. Lime plaster does produce carbon dioxide when it's made, like cement does. But the difference is once you've put it on your wall, it starts carbonating, which means it starts reabsorbing the carbon dioxide that it originally produced when it was made. And after a year or so, it will have reabsorbed it all, which is just amazing.

Also, if you knock the lime plaster off your house, it goes back to something natural, which is limestone, so you can put it on the garden, or mix it up and use it as sand to mix with more lime putty to make another plaster. Again, this is infinitely better than what happens with normal building materials, which go into landfill and create a horrible mess through leaking chemicals and sulphates into the ground for years.

“Internal walls are made from recycled car windscreens”

CASE STUDY

NORTH KESTEVEN COUNCIL HOUSING, LINCOLNSHIRE

North Kesteven are renowned for being really environmentally friendly. 10 years ago they commissioned us to design two pairs of semi-detached houses using the original load-bearing method of straw bales. This was really innovative at the time.

The design included these elements:

- **Cement-free foundations.**
- **Engineering bricks with a lime mortar from foundation level up with a 450-millimetre-high plinth wall.**
- **Behind that was a section filled with recycled foam glass chunks, which acts as a capillary break and insulator on the load-bearing part of the wall.**
- **Foam glass blocks made from recycled old car windscreens for the internal skin.**
- **A timber ladder on top of the foundations with wool underfelt from carpet to make a squashy join between the timber and the masonry.**
- **Coppiced hazel sharpened into sharp points that the straw bales are then embaled on.**
- **Build up the wall seven bales high.**
- **Ring beam at the top, then another six bales high up to the roof where there's another ring beam.**
- **The roof made of clay pantiles with sheepswool insulation is built on top.**
- **High-quality timber windows.**
- **Open plan downstairs with a door to the stairs so the heat can be contained downstairs or let upstairs to the bedrooms in the evening.**
- **Double doors into the garden.**
- **Skylight above the stairs so that we can create a good airflow in summer to keep the building cool.**

“Extremely energy efficient with a U-value of 0.17”



NO RADIATORS AND NO HEAT SOURCE

Generally, radiators or underfloor heating are just overkill in a really well-insulated house. In these houses we added a wood-burning stove because we feel that a fire is the heart of the home and makes a great focal point for any living room. A small three-kilowatt stove is sufficient to provide enough heat and if it gets a bit hot, you just open a window. As the houses are so airtight it will only be necessary to burn the stove once every other day, even in the winter. Any more and it would get too hot.

10 YEARS ON AND STILL GOING STRONG

After ten years these houses are still absolutely fine. The plaster is fine and there's no damp or mould. They haven't even been re-limewashed. The tenants have some energy bills to pay, such as electricity and gas for the cooking, but their bills are significantly reduced as they're not paying for heating.

RAISING AWARENESS

In August this year, we're running a European straw-bale conference in Todmorden, West Yorkshire. We want to raise awareness of the benefits of building with straw panels. We're trying to reach local authorities, social housing, major developers, engineers, building surveyors, architects and anyone else interested in building with natural materials.

Come along to find out more about how **YOU** can build with straw.

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European straw-bale conference in Todmorden www.esbg2019.org

YPN SAYS

Want to share your sustainable build story? If so, please get in touch. We'd love to share your story too. Please contact me at

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