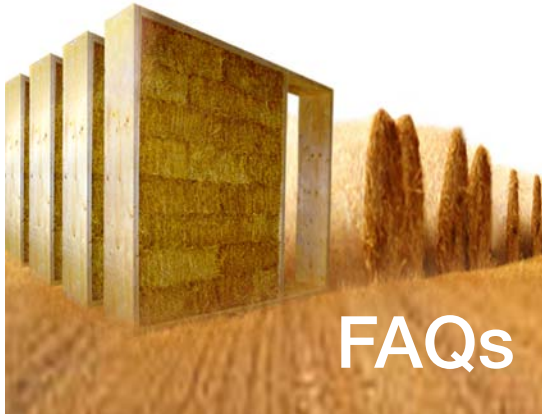
modcell®

**ModCell is a sustainable, prefabricated straw bale and hemp cladding panel designed for use in offices, schools, housing, and commercial buildings.**




## ModCell® FAQs

**What about fire?** ModCell® Straw bales are tightly packed and covered with lime render. Fire needs a ready supply of oxygen to burn and, without it, no combustion will occur. The panels provide a near airless environment, so fire resistance is very good. Recent tests show a fire rating of 2 hours for ModCell® Straw and over 2 hours for ModCell Hemp™ at least double the current UK Building Regulations requirement.

**What about infestation?** Straw contains very little nutritional value and will not, in itself, support a pest population. The density of straw discourages rodent activity. Infestation can only occur when a panel has been damaged and straw is open to the outer atmosphere. ModCell® Hemp™ is a monolithic structure not dissimilar to lightweight aerated concrete and, as such, prevents infestation occurring. Lime render is aseptic, further reducing the possibility of infestation.

**Won't the straw decompose?** ModCell® panels are designed to be breathable and prevent the build up of humidity levels. It is high humidity levels that cause decomposition to take place. It has been established independently that straw has the potential to decompose when the moisture content exceeds 25% for an extended period of time. To ensure a high level of confidence, it is generally accepted that straw moisture content should not exceed 20%. As a result of the breathable nature of ModCell® panels, moisture levels inside the ModCell® panel rise and fall in synergy with the surrounding environment, preventing the risk of decomposition. Our own research at the University of Bath Research has shown that the moisture content in ModCell® panels is below 15%, which is well within acceptable limits to prevent decomposition.

**What about damp?** ModCell® is delivered to site as closed panels with all but the finishing surface skim coat of lime render applied. Relative humidity (RH) and moisture levels are measured at the factory gate. Research has shown that damp is kept at bay naturally as part of the breathable properties of the materials used

**What about mould?** Lime is highly alkaline. The pH, moisture content and air change levels are not conducive to microbial and higher order animals.

**What sizes do ModCell® panels come in?** There are no standard sizes but the most common sizes are nominally 1m x 3m, 2m x 3m and 3m x 3.2m.

**Can I get different sized panels than the standard?** Yes, we can manufacture panels outside our standard sizes. If you require these please contact ModCell® to discuss your specific requirements.

**How thick are the panels?** ModCell® Straw panels are 490 mm thick. We also supply a ModCell® Lite System which is 390 mm thick.

**Why are they so thick?** this thickness accommodate standard size UK straw bales. To meet the same u-Value using brick, block and mineral wool insulation, the wall would need to be 533 mm thick, 43 mm thicker than a ModCell® panel.

**Does ModCell® help towards the thermal mass of the building?** ModCell® has an optimum combination of mass and super insulation. ModCell® Hemp has higher thermal mass than ModCell® Straw. The mass of both types of panel delivers a thermal lag of 12 hours, which is optimal for most uses.

**What are the u-Values?** This is dependent on the panel type:

| | |
|---|---|
| 490 mm ModCell® Straw | = 0.13 |
| 490 mm ModCell® Hemp | = 0.14 |
| 390mm ModCell® Lite | = 0.14 |
| ModCell® solid timber frame | = 0.13 |

Insulation values are nearly 3 times higher than current regulations require.

ModCell® panels can deliver an airtight construction to PassivHaus specifications. As a result, buildings using ModCell® can help deliver zero heat requirements, saving money and $CO_2$ emissions. BaleHaus® has an air tightness of 0.86$m^3/h/m^2$ at 50Pa , over 10 times better than current regulations require.

**What about Carbon?** ModCell® panels are carbon negative. Embodied carbon - A 3 x 3.2m ModCell® panel has equivalent of 1400kg of atmospheric $CO_2$ locked up in its fabric. A typical two storey BaleHaus® of 94m2 banks almost 34 tonnes of atmospheric equivalent $CO_2$.

**How are ModCell® panels made?** The structural timber frame is 'infilled' with locally-sourced straw bales, which are stacked to form a wall, compressed and pinned together for stability. The wall is then either plastered using a protective lime render, or clad with timber.

**What are ModCell® panels made of?** Straw bale or Hemcrete, timber, lime render or wood cladding and small quantities of steel fixings. ModCell® is made of by-product wood, infilled with straw or hemp. They are precision-engineered using modern methods of construction (MMC).

**Are ModCell® panels sustainable?** Yes, ModCell® panels are made from almost 100% renewable materials. ModCell® Panel frames are constructed

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using certified legal and sustainable timber using the CPET standard and include PEFC or FSC certification as standard. All straw, which is an annual 3m tonne by-product of the agricultural industry, is untreated and locally sourced. . ModCell® Hemp uses hemp grown as a field crop in the UK. A field of hemp has a different biodiversity profile to that of straw, but we know of no adverse impact. AT end of life the panels can be disassembled and all elements either re-used, recycled, used as biomass or safely composted.

**Is there waste from the manufacturing process?** Straw bales are cut to size in the Flying Factory and trimmings and rejected material are composted, used as bedding for farm animals or recovered as biomass. The frame is made using offcuts from the timber industry. Cut materials from the frame manufacturing process are used in the factory's biomass boiler. Cut waste is minimal as each panel is CNC cut from larger sheets. Lime render is spray applied
with almost no residual waste. Offcuts of stainless steel for the fixings are minimised by design but are collected and recycled via the scrap industry.

**Do ModCell® panels cut noise levels?**
Yes they produce an reduction of up to 60 db.

**How heavy are ModCell® panels?** Weight varies by panel size. A fully rendered 3m x 3.2m weighs approximately 1.7t

**Are there different finishes available?** Yes, Uncoloured Lime render, Pigmented Lime render, Lime wash colour finishes and timber cladding. Customers who require alternative finishes should contact us to discuss their requirements.

**How do you incorporate essential services like plumbing and electricity?** The frames of ModCell® can have pre-routed conduilt at 150 mm centres when requested. The face of the panel can have this fitted in the factory upon request. Electrical conduit can be installed behind the lime render face.

**Are ModCell® panels structurally load bearing?** Yes, with some considerations. On commercial buildings ModCell® is structural up to 2 stories high, for 3 stories and above they are normally secured to a building frame.
For domestic construction ModCell® can be used for structural load bearing and stabilisation and are structural up to 3 stories high. Above this height we would advise the use of ModCell® panels as a panelling system fixed to a frame.

**How high can you build with ModCell® panels?**
Structurally up to three stories high for residential buildings.
Structurally up to two stories for commercial buildings.
Above these heights we would recommend using them as part of fixed frame system.

**Can I build with a frame?** Yes, ModCell® can be used with timber, steel and concrete frames.

**Do you build ModCell® panels onsite?** No, ModCell® is an offsite prefabricated panel system - (see below)

**Where are ModCell® panels made?** In order to minimise the embodied energy in ModCell® Panels we fabricate them in Flying Factories. Instead of using a central fabrication plant and transporting ModCell® Panels great distances, we work with local farmers to identify a source of straw and a suitable location to assemble ModCell® panels, normally within 3 - 25 miles of the construction site. By using local straw, skills and labour, we are able to keep more of the project's value within the local economy.

**What quality controls do you have?** ModCell® panels are entirely manufactured and assembled under controlled conditions in flying factories. The quality of each panel is uniform and signed off at various stages during manufacture. ModCell® is delivered to site as closed panels with a two-layer base coat of lime render. RH and moisture levels are measured at the factory gate.

**What is the lead time?** 16 weeks from confirmed order.

**How long do ModCell® panels take to install?** ModCell® is delivered to site in nominal 3m x 3.2m panels. To offload from low loader and secure on to building is typically a 30 min operation giving an install rate of 20sqm per hour. Complexity/ simplicity of project will impact on this rate. Final finish coat of render is done at a later date and each panel takes half an hour. This can be achieved off of a cherry picker, or more usually from a scaffold.

**What equipment is needed to install them?** On construction site – Crane or telescopic lifting device. Scaffolding or cherry picker.

**Can I buy them in kit form?** No. Currently manufacturing quality controls prevent the manufacture outside of factory environments. Although we are happy to engage with community groups and individuals who want to assemble panels. This would be after appropriate training and supervision.

**Do you supply to self builders?** This is dependent on the size of the development and will reviewed on a case by case basis. Additional traveling distances from flying factories may have an effect on cost per unit and an increase in $CO_2$ emissions.

**Can you help me with my design?** Yes ModCell® are able to offer a number of additional services to the developer. These include:
Supply, Supply & Fit, Design & Supply, Design, Supply & fit, Consultancy and CPD training

**How long do they last?** Life cycle is a minimum of 75 years. At end of life they can be easily reused or disassembled. Lime can be re-used. Straw, hemp and wood are biodegradable and can be used as biomass. Hemcrete can be crushed and mixed into soils. All metal fixings can be recovered and recycled. There are a number of straw bale buildings throughout the world, some of which are over 120 years old.

**How much do they cost?** Costs are dependent on panel type and panel design. Prices vary from between £220 and £290 per square metre.

**Where can I get my building insured?** There are a number of insurance brokers who offer insurance, an example is M & DH Insurance Services Ltd (www.mdh-insurance.co.uk).

**Do you supply complete building packages?** ModCell® are able to offer a number of different packages. These vary from supply only, supply and fit, supply design and fit. ModCell® can supply the package that best meets your needs, just ask. BaleHaus® is our whole house solution.

**Where can I see one?** There are a number of sites around England and Wales. These include:
BaleHaus at Bath, University of Bath, Bath, England
York EcoDepot, York, England.
Knowle West Media Centre, Knowle West, Bristol, England.
Torfaen EcoBuilding, Cwmbran Wales.
Merrow Park & Ride Guildford
Faculty of the built Environment, University of West England, Bristol, England.