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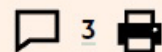
Israel's first hemp house is 'like nature herself', according to the architect Maoz Alon of Tav Group © Tav Group



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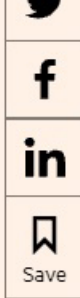


Paul Miles AUGUST 24 2017



Architects speak a lot about form, often unintelligibly. But architecture is not just about design, nor “vertical and oblique circulation elements”, in the words of the late Zaha Hadid. We still want those, whatever they are. We want buildings that make statements and turn heads. Yet materials matter as much as draughtsmanship. They affect the look of a building as well as comfort and carbon footprint. One skill of the architect — and the client — is to choose the best materials with which to build: glass, steel, brick or concrete? Or something else? Something that can breathe and regulate humidity, something non-toxic — something that is truly green.

The most sustainable building materials tend to be derived from plants. Timber is an obvious example, as is bamboo. But there is another fast-growing crop that makes an excellent building material. This plant’s woody fibres can be mixed with a lime binder to make a natural concrete that is lightweight yet has good thermal mass; it is highly insulating, resistant to pests and mould, has good acoustics and moderates humidity. The plant thrives in temperate climates. It can grow from seed to harvest in just four months. Its cultivation

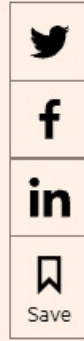


needs little or no herbicide or pesticide.

The drawback is that cultivating this greenest of building materials could land you in jail. The plant is hemp; scientific name *Cannabis sativa*. Varieties with extremely low levels (about 0.3 per cent) of the narcotic compound THC are known as industrial hemp. Although it is nigh impossible to get stoned on a joint made of industrial hemp — unless it were unfeasibly huge — the plant’s cultivation is highly controlled in most countries and requires a licence.

In the US, the first hemp house was built in 2010 in North Carolina using crop imported from the UK. Its architect, Anthony Brenner, estimates “about 50” hemp homes have been built in the US since. Today, hemp homes can be homegrown in the US. Legislation passed in 2014 makes the farming of industrial hemp possible. About 30 US states have legalised the crop, which has other uses in cosmetics, fabrics and food. Cultivation of industrial hemp in the US is still in its infancy. In 2016, just 4,000 hectares were planted. Still, if the entire crop were used for construction, that could build 5,000 small family homes.

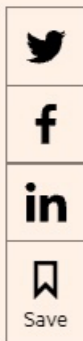
Meanwhile, Canada grows 10 times as much hemp as the US, while in Yunnan,



south-west China, 10,000 farmers grow industrial hemp. Much of the global hemp production is to make biocomposites for car interiors. In Europe, 33,000 hectares of industrial hemp were grown in 2016, mostly in France. (One of the earliest known examples of hemp architecture is a bridge in France built circa 500AD.)



The Acre on Cumnor Hill, Oxford © John Pardey Architects



Architects are experimenting. Some 1,000 hemp bales (30 tonnes) were exported from France to build Israel's first hemp house, completed last year. Tav Group Architects, the Israeli firm, designed a 250 sq metre home in the artists' colony of Ein Hod. About half the home is made of hempcrete, a lightweight alternative to concrete made from woody hemp fibres. The rest is local stone, rammed earth and wood. The house is "like nature herself", says architect Maoz Alon. "It gives you the rejuvenating feeling of the forest, or a vast fresh meadow."

Almost any house that can be built with brick and block could equally be built with hempcrete (and a structural frame). Last year, one of the first hemp homes in New Zealand was featured on the New Zealand version of TV programme *Grand Designs*. The 320 sq metre house, costing NZ\$1m (£500,000) to build, used 500 bales of hemp imported from the Netherlands. Despite media dubbing it "the ultimate stoner pad", this house in Taranaki feels more like a French farmhouse.

Hempcrete — which is weaker than concrete and non-structural — is made by mixing the woody hemp fibres, called shiv, with lime binder and water to form a porridge-like consistency. This is poured into wooden shuttering over a timber frame and tamped down by hand. Yet this method can be problematic.

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Hempcrete takes several weeks to cure and wet weather hampers construction. Greencore Construction, in association with the University of Bath, has developed a more efficient way to build with hemp. A faster-drying formulation of hemp/lime is combined with wood fibre in prefabricated panels, 300mm thick, with an airtight but vapour-permeable membrane. Unlike hempcrete, these panels are structural (up to three storeys) and easy to assemble.

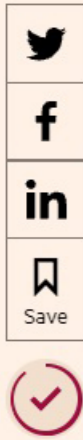
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Last year, HAB Housing, the firm founded by Kevin McCloud of *Grand Designs*, completed five homes in Oxford, all built of these panels. John Pardey Architects designed the houses. Nothing about them shouts worthy eco-house. Full-height picture windows set within deep reveals

look on to trees. “Laugier’s Primitive Hut for the 21st century?” suggests Carl Gulland, a director of John Pardey Architects.

Greencore Construction is now franchising its technology to small housing developers. The first franchisee is a Spanish company, Ekoetxe, which has used the system to build a striking hemp house in the Basque region.



Other plants are also being tested. Researchers at the University of Bath have discovered that rape straw has similar properties to hemp in terms of thermal mass, insulation and buffering humidity. “This is exciting. It’s only something we’ve understood in the last few months,” says Dr Mike Lawrence of the Building Research Establishment’s Centre for Innovative Construction Materials. Presently, most rape straw is either ploughed back into the land or burnt for biomass. Supported by a €5.5m EU grant, Lawrence has developed a “100 per cent bio-based” panellised construction system that uses plant aggregate, including hemp, rape and corn cob. The plant material is coated with nano-particles of silica to make it resistant to decay and fire. These are held together with a plant-based binder, avoiding the need for a lime binder (and the energy-intensive process of heating limestone.) These panels will be on the market in 2019.

The field of green construction is growing ever greener.

Photographs: Tav Group; John Pardey Architects