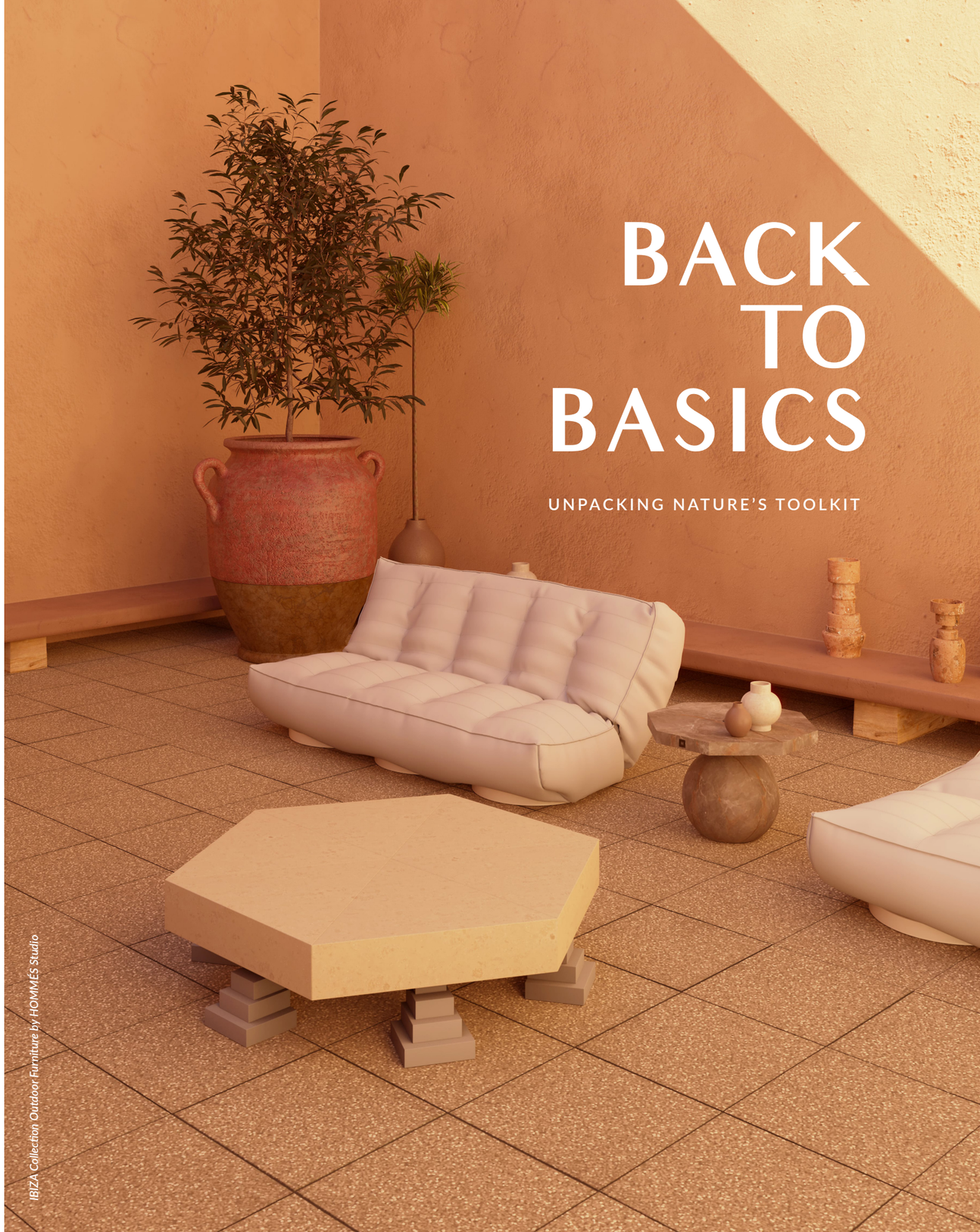
BACK TO BASICS

UNPACKING NATURE'S TOOLKIT



IBIZA Collection Outdoor Furniture by HOMMÉS Studio

NATURAL EARTH AND LIME BASED PLASTERS

Earth and lime plasters have historically been used for thousands of years in ancient China, India, Mesoamerica, Greece, and Rome. Locally, in Southern Africa, earthen plasters are still widely applied in many rural communities, and cow dung is often added to reduce cracking, add strength, and provide waterproofing.

Lime was traditionally used to plaster the early European settler buildings, when available. Otherwise, earthen plasters were simply lime-washed on a regular basis. That said, earthen plasters, while easily replenished, are less durable, and therefore prone to increased maintenance. So, depending on availability and affordability, lime plasters were used for greater durability.

Recently, lime plasters have come back into fashion after being recognised for their importance in natural building and heritage restoration work. Given their hydroscopic qualities and ability to breathe, respectively helping to regulate moisture and indoor humidity, they are highly recommended for all walls made of unfired earth or straw. For these kinds of projects, particularly heritage buildings, cement-based plasters are far too rigid and tend to crack while trapping moisture inside, causing the walls to disintegrate and the plaster to delaminate.

Raw finished lime-dung plaster (i.e. a lime, cow dung, earth, and sand mix), Pinelands, Cape Town

Lime plasters can be used to create beautiful natural finishes that age gracefully.

Instead of giving a flat even colour, lime plaster finishes are somewhat varied and lively, with an imperfect handmade quality, which can be highly aesthetically pleasing. The result is that they can handle a hand mark or scuff here and there without much notice, and therefore require less maintenance than conventional finishes, which tend to look dirty much more quickly, and, in the case of schools, can look like they need a new coat of paint the day after opening.

Strawbale wall with earthen plaster, Nieuwoudtville, Northern Cape

Lime production requires less industrial processing and energy to produce than cement. And unlike cement plaster, any wastage or leftover mix can simply be covered and used the next day, which reduces waste and mitigates the environmental impact of construction.

A setback with using lime is that, while it will continue to harden over time, it is initially much softer than cement and takes three times longer to cure. Therefore, its use requires careful site programming and provision for initial added protection. Furthermore, lime tends to be fussier to work with and tends to crack and weaken more easily with exposure to sun and wind during construction. For this reason, one often finds that various additives are included in lime plaster recipes to improve the mixture's workability and ensure proper curing.

Lime-sand plaster with fresco finish at 7 Fountains Primary School, Kokstad, KwaZulu-Natal

'Lime dung plaster' is a very specific mix that I learned from an old builder, Herbert Arense, who was taught by his grandfather (also a builder). I've since gone on to use it successfully in many projects, both for natural buildings and conventional clay fired brick walls.

The recipe originates from Mamre, the site where I worked on a heritage revitalisation project and one of the earliest settlements in South Africa. The majority of the town's original old mud brick buildings are plastered with a lime-sand mix, including a small amount of clay and fresh cow dung. Cow dung naturally contains both fine fibres as well as casein, which react with the lime and improve both its quality and workability — the reason why cow dung is considered one of the best additives to use.

STRAW

Straw is an annually renewable agricultural by-product that is often laid to waste and sometimes even burnt by grain farmers. Historically it has been used as a building material for thousands of years, typically used to make cob, moulded into bricks and baked in the sun, or added to mud plasters to increase strength and reduce cracking.

Due to its highly insulative properties, builders in colder parts of the world use mostly straw and only a little bit of earth to bind it together. Known as Light Clay Straw it is used non-structurally as an in-fill material where it is usually mixed on site, poured between shutters, and then lightly tamped around a lightweight timber frame structure. It can be used for both internal and external walls as well as for ceilings.

Since the industrial age and the advent of the baling machine, people started building with straw bales, which can be used for load bearing or as an in-fill material to make beautiful, thick, super insulated walls (R value = 6-7 K.m^2/W).

Building with straw is relatively easy to learn and lends itself to self-builders and community involvement. Straw offers extremely high levels of both thermal and acoustic insulation, even for relatively thin light clay straw walls.

Due to its exceptional insulation and compacted manner, it's highly fire resistant as it prevents the spread of heat and doesn't have enough oxygen to support combustion.

While one can build with bales as a load bearing material, this is less common and typically frowned upon by local authorities. Therefore, bales are mostly used non-structurally as an in-fill material, which typically requires the use of more timber.

Bales are fast to build with, but the light clay straw mixture panels, once cast, usually take at least two months to cure properly, and so this needs careful programming on site. Unlike conventional materials, which generate large amounts of construction and demolition waste, straw can simply be mulched for landscaping purposes.

Straw is susceptible to moisture, making it crucial to use breathable plasters and finishes so as to not trap moisture inside the walls. It also requires a good overhanging roof to provide protection from above, and a raised masonry plinth to lift the walls away from the ground, as well as meticulous detailing, particularly around openings.

Despite international building codes and countless local building council approvals, our banks still require an NHBRC building registration for any new homes or homes that are less than five years old that do not accept these highly promising building methods. This forces homeowners to go the cash build route or limits the material's use to non-residential buildings.

Working together to pre-plaster a straw bale. Barrydale, Western Cape. Photograph courtesy of Ansgar Von Oertzen

GREEN ROOFS

Historically, planted roof structures were common in the extreme climates of Scandinavia, where their thermal stability helped to provide much-needed insulation. More recently, they have become very fashionable with environmentally conscious design, and in countries like Germany it is now compulsory for all public buildings to either have solar or planted roofs.

Planted roofs are visually unobtrusive and can be highly aesthetic, helping to integrate buildings within their landscapes while providing habitat for nature that would otherwise be lost to the site with conventional roofing material. They also help reduce the carbon footprint of construction by maintaining the carbon sink of the site and its topsoil.

At the urban level, they are very effective at reducing the urban heat island effect of developments, making them ideal for hotter climates. Green roofs help to clean and cool the incoming air, thereby reducing the air conditioning load on buildings. They also reduce the pressure on storm water systems by slowly absorbing and releasing water, proving a great asset for flood control.

House Klipspringer, Two Rivers Wildlife Estate, Hoedspruit, Mpumalanga. Photograph courtesy of Abrie Visagie, JNA Roofing

Roof pitches are typically quite shallow, though they can be built steeper depending on how they are detailed. In order to build lighter, thinner roofs, we use shallow, rooted local species of bulbs and succulents, which are also extremely hardy and require minimal maintenance once established.

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Locally, planted roofs help with long-term maintenance by reducing the heat load on the roof, eliminating the temperature extremes, and preventing the continual movement that roofs are normally subjected to, whilst protecting the waterproofing layer from harmful UV rays.

Plants also absorb pollutants, cleaning and revitalising the air around buildings with beneficial negatively charged ions. And, together with the 'biophilic' effect, they help to promote healthy building environments.

Being heavier than conventional roofing material, one often sees planted roofs supported on a waterproofed concrete roof structure. However, traditionally these roofs were always built on timber roof structures, and from an ecological building perspective, it is far more sustainable to build with timber, which is how we have built all our new planted roof structures. This simply requires waterproofing, a timber boarded roof deck, and some meticulous construction detailing.

House Klipspringer, Two Rivers Wildlife Estate, Hoedspruit, Mpumalanga. Photograph courtesy of Abrie Visagie, JNA Roofing