

DUNAGRO



Prefab Hemp Construction



Discover the many advantages of building with the **prefab hemp lime construction system**

7

REASONS

TO CHOOSE LIME
HEMP PANELS:

- 1 Circular material
- 2 High insulation value
- 3 Highly fire resistant
- 4 Healthy indoor climate
- 5 Contributes to CO2 reduction
- 6 Fast construction times with prefab panels
- 7 Suitable for all home designs

From the foundations to the rooftop Dun Agro takes the sustainability of your house to a new level.

We all know that you first need solid foundations to build a sturdy house. We've taken this concept to an entirely new level. Dun Agro has developed **a prefab foundation system using foam concrete for insulation**, in order to eliminate the need for polystyrene. We are very proud of the fact that our houses are built **without Styrofoam, foils, synthetic insulation, PUR or PIR**. Our Dun Agro compressed hemp is made from three basic natural ingredients: **hemp, lime and water**.

The construction industry faces enormous challenges at the present time. We need to build **in a more environmentally-aware manner using circular materials**. CO2 emissions have to be reduced in the production of building materials. Homes have to become **'net-zero'**, which calls for excellent insulation. Furthermore, there is ever more focus on **a healthy indoor climate** and good ventilation. Finally, there is a housing shortage in the Netherlands. It is vital to be able to construct new homes as quickly as possible.

The Dun Agro Bouw prefab lime hemp panels offer **a solution for the construction challenges of today and in the future**. In this brochure you can discover what the innovative qualities of our unique building materials can mean to you.

An innovative construction system
 that uses
an ancient crop

Hemp fibre is incredibly strong. The plant has been farmed for more than 5000 years for many different uses, including textiles and strong ropes. Hemp has also been used as a building material for centuries.



Did you know that the VOC ships in the Dutch Golden Age used to contain 50 to 100 tons of hemp, for the strong ropes (on average 21 kilometres per ship) and hundreds of square metres of sail?



Conscious choices, clever construction

Circular construction

The production of lime hemp panels involves **a small fraction of the energy** required by traditional building materials. And the material is even reusable. The left-over materials can be used for a new mix and are **100% biodegradable**. This means that lime hemp is a **sustainable and environment-friendly** product.

Better for the soil

Lime hemp has a very low density. It is a lightweight building material with the attributes of heavyweight materials. In many cases, the low density allows for **lighter foundations** which means less materials and less pressure on the soil.



Quick construction with prefab panels

In the past, lime hemp panels were made by hand. This was a time-consuming process. This is why Dun Agro Bouw has developed its proprietary production line for prefab lime hemp panels. This allows for the production of façade, roof and floor panels up to 6 by 3 metres in size.

A clever construction system

Thanks to the prefab panels, a house can be built on location to be wind and waterproof **within a single week**. The innovative design ensures that no thermal bridges are present. Another advantage is that the panels can be pre-fitted with wiring and apertures for windows. **This is a great timesaver.**

The lime hemp panels are also easy to incorporate into traditional construction techniques, such as roof, floor and interior wall insulation.

Freedom of design

Our proprietary production system allows us to provide panels for any conceivable home design. Lime hemp panels are suitable for everything from bungalows to high-rise buildings, and **for small sheds to massive business premises.**



Did you know that the hemp plant grows at a rate of 3 to 4 metres in 3 months? That is more than a metre a month!



Did you know that there is a housing estate in Boekel in the Netherlands that consists entirely of hemp houses?

The best ecological basis for a comfortable home

Lime hemp has good breathability. It regulates the humidity and air quality of the home in a natural way. This creates a 100% permeable home with a naturally healthy indoor climate, entirely free from condensation and mould.



The regulated compression of the panels guarantees a constantly high and regular insulation value. This allows the home **to preserve heat in the winter** and to **remain pleasantly cool in the summer**. Another advantage is that the irregular structure of lime hemp panels makes them **good sound absorbers**.

Fire safety

Lime hemp houses also perform excellently when it comes to fire safety. A wall of 300mm thickness offers a fire resistance of **73 minutes** (WBDBO).



Dun Agro, an innovative organisation with a passion for people and for nature



Albert Dun, the founder of Dun Agro, wanted to focus all his long experience and his love for people and for nature on the cultivation of an ancient and wonderful product: industrial hemp. His first hemp seed was sown over 25 years ago. That little seed gave rise to a globally active and professionally-run company.

We started out by growing, harvesting and processing the virgin fibres. But industrial hemp offers so much more, and we soon decided to extract more products from this fabulous crop. To this end, we set up a number of companies to concentrate on the various products that can be made from this single plant. Together, these companies form the Dun Agro Hemp Group.

Circular production process

At Dun Agro, we control the entire process ourselves, from hemp seed to hemp house. Our extensive knowledge allows us to extract the maximum value from our hemp plants. Even the dust from the production process is put to good use!



Dun Agro Prefab Hemp Construction, your flexible partner for construction

In 2018 we reached a milestone: delivery was taken of the first house to be built using the prefab lime hemp panels. Since then, we have provided many prefab hemp houses for our satisfied customers.

Flexibility, made-to-measure

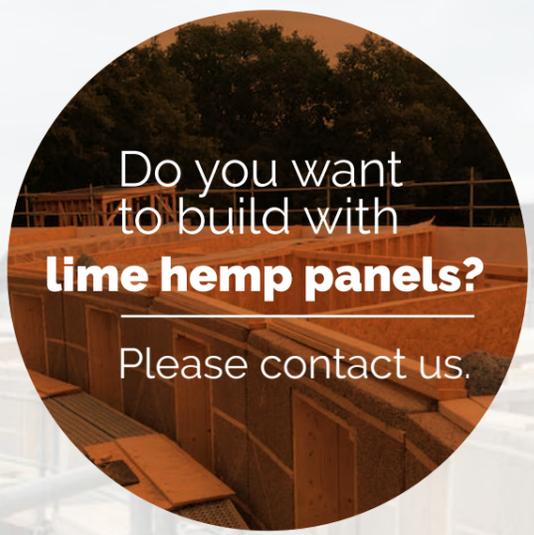
Dun Agro Bouw can oversee the entire process *from hemp seed to the completed home*. It is up to you to decide how to employ our expertise in the way that suits you best. We will tailor our advice and service to suit your specific needs. We can simply supply you with separate lime hemp panels, or we can build and deliver a house turn-key.

Building the future together

Hemp houses are the homes of the future. They conform to the ever-stricter standards that apply to building construction. Our building experts are pleased to help you to arrive at a perfect design, whether it's your own design or based on existing examples.

Did you know that Dun Agro Building is active throughout the entire Netherlands?

You can find our most recent building projects at: www.dunagrohempgroup.nl/bouwprojecten



Do you want to build with **lime hemp panels?**
Please contact us.



DUNAGRO
Prefab Hemp Construction

Our circular production process for house construction:
From tiny hemp seeds to an energy neutral house.

Healthy for people and healthy for the planet!



The main advantages of Dun Agro lime hemp panels at a glance:

CO₂ STORAGE

A hemp house measuring 120 m² stores 14 ton CO₂ of CO₂. Twice as much as a timber frame house.

INSULATION

High thermal insulation values: wall panels (RC value 5.7), roof panels (RC value 6.7).
High sound insulation values: (RW value 52 dB) at 40cm thickness.
Very low thermal effusivity (the house stays cool in the summer and warm in the winter). A cavity wall is no longer required.

HEALTHY

100% permeable, with natural regulation of humidity and air quality.
A naturally healthy indoor climate that regulates itself, with no condensation.
Natural protection from vermin and mould.
Foil and balanced ventilation systems are rendered obsolete.

BIODEGRADABLE AND REUSABLE

Almost 100% biodegradable and reusable material.
The hemp house contains no poisonous substances.

HIGH FIRE RESISTANCE

A 300 mm wall has a WBDBO of 73 minutes.

LOW DENSITY

At least 60% lighter than concrete. Allows for much lighter foundations.
This leads to less materials and less pressure on the soil.

Mechanical properties

Specific gravity: 275kg/m³
Water vapour coefficient: $\mu=1.4$
Shape retention: Permanent

Physical construction qualities

Acoustic: $V_{s\text{om}} \sim 900 \text{ m/s}$
Fire resistance: WBDBO 73 min/300 mm.
Thermal insulation: Rc 5/300 mm.
Sound insulation: Good



Did you know that the Dun Agro Hemp Group also produces 99% pure hemp for industrial use, and hemp litter for use in stables?



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