Web seminar series „Building Materials of the Future“
Seminar 2: Bricks - A traditional player shaping the future?

Friday, 30 April 2021, 10:00 – 13:00 CEST
Language: English
natureplus association

Who we are

natureplus – International Association for Sustainable Building & Living

→ Non-profit environmental association
→ Member-based network
→ Mission-driven commitment

“The natureplus association is committed to the transformation of the building sector towards climate-protecting, resource-saving and healthy building and living – this is only possible with sustainable building materials and construction methods.”
natureplus association

Who we are

European network
strong partners, available throughout Europe

members & partners
Over 80 member organisations (a selection)
natureplus association

What we do

Information & Services

- Database with over 600 awarded products
- Consulting assistance, e.g. bfub insulation case natural building materials
- Web seminars & training courses
- natureplus eco-label
- Online services & building material consulting
- Information & lobbying
natureplus association

How to get involved

→ Become a member – evolve your network
→ Subscribe to the newsletter – receive latest information monthly and free of charge
→ Become a sponsor – support natureplus, e.g. at Web seminars, conferences, etc.
→ Set standards – participating in building materials working groups of the Criteria Commission
→ Foster dialog – register for natureplus events

→ Do you have concrete projects, ideas or suggestions?

Contact us info@natureplus.org, + 49 (0) 6223 866017 0.
The official cooperation partners for this specialist event are A4F:

The specialist series "Building Materials of the Future" is generously supported by our premium sponsors Lignotrend & Wienerberger Austria:

and our theme sponsors:
Web seminar series „Building Materials of the Future“
Seminar 2: Bricks - A traditional player shaping the future?

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AGENDA Seminar 2: Bricks – A traditional player shaping the future?

**Welcoming**
- Tilmann Kramolisch  
  Managing Director, natureplus e.V.

**Welcoming**
- Judith Ottich  
  Architects for Future

**Moderation**
- Katharina Brenner  
  Freelance editor, Commha Consulting  
  Heidelberg

**“Bricks – tradition and future“**
- Gerhard Koch  
  Association „Verband Österreichischer Ziegelwerke“,  
  Hennersdorf
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<th>Session</th>
<th>Speaker</th>
<th>Company/Institution</th>
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<td>“The Brick”</td>
<td>Doris Wirth</td>
<td>BLUESAVE Consulting GmbH</td>
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<td>“Office building Flemish Environment Agency (VVM)”</td>
<td>Paul Vermeulen</td>
<td>De Smet Vermeulen architecten</td>
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<td>“The Ceramic Genius loci from La Bisbal”</td>
<td>Benjamin Iborra Wicksteed</td>
<td>MESURA</td>
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<td>“Bricks and natureplus – from the past into the future”</td>
<td>Mario Kubista</td>
<td>Wienerberger Austria</td>
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<tr>
<td>Discussion with speakers and participants</td>
<td>“A building material that &quot;goes through fire&quot; - How can the building material bricks still score in the sustainability rating?”</td>
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</table>
• HISTORY OF CLAY PRODUCTS
• PRODUCTION PROCESS
• PRODUCT TYPES
• SUSTAINABILITY
• HISTORY OF CLAY PRODUCTS
Squelching in the earth or shaping figures out of clay: Almost everyone remembers such childhood experiences - and the feeling of intimate connection with the earth. This special relationship has existed from time immemorial. As early as 3.000 B.C., people knew how to combine the elements and form an incredibly durable building material from earth, water, air and fire.
Bricks made of fired clay are among the **oldest building materials in the world and many of them survived for centuries**:

- approx. 4,000 BC: Mesopotamia - Temple buildings in URUK
- approx. 2,000 B.C.: Tower of Babel - blocks still partly in use today
- King Nebuchadnezzar: Processional road from the Ishtar Gate to the city of Bab-ili
- approx. 500 BC: Persian King Darius I: Palace in Susa
- approx. 250 BC: Roman Empire - development of vault construction and expansion of bricks as a building material throughout Europe
- 4th century AD: Basilica of Constantine in Trier
- 537 AD: Hagia Sophia in Istanbul
- even the Great Wall of China is largely made of clay bricks
HISTORIC BRICK BUILDINGS
• PRODUCTION PROCESS
BRICK PRODUCTION PROCESS - OVERVIEW

1. Mining
2. Preparation
3. Shaping
4. Drying
5. Firing
6. Packaging
7. Shipment

Control Room
• Clay and loam are used as raw materials, the most important clay minerals being kaolinite, halloysite, illite and montmorillonite.

• The clay is extracted by means of excavators, draglines, etc. and deposited in intermediate dumps for the purpose of stockpiling for some time, mixing of different types of clay and uniform moistening of the loosened clay.

• From there, the material is removed by wheel loader or bucket chain excavator and transported via a conveyor belt to a box feeder, which serves as a buffer and as a dosing device.
PREPARATION

- From the box feeder, the clay is transported to the preparation machines (e.g. pan grinder, roller mills), which serve to crush, mix and break down the mass.

- After preparation, usually the material goes to a souring house for further development and storage.

- Pore-forming materials like e.g. sawdust can be added which leave air pores in the brick body after firing, thus improving the thermal insulation properties of the clay blocks.
SHAPING

• To give the mass the required plasticity, water or steam is added to it in circular screen feeders or twin-shaft mixers.

• Clay bricks and blocks usually get their shape by extrusion through a die. After the die the bricks/blocks are cut by a wire.

• For clay roof tiles, shaping can alternatively be done in a revolver press with moulds.
DRYING & FIRING

- The wet products are then placed on drying plates or pallets in the dryer. Usually chamber dryers (the product is not moved) or channel dryers (the product moves through the dryer) are used.
- Drying is done by means of warm air, using the excess heat from the kiln.
- After drying, the products are placed on kiln cars by a setting machine and fed into the kiln.
- There they are first preheated, then fired at temperatures between 800°C and 1200°C (for roof tiles) and finally cooled down again.
- In almost all factories today, continuously operated tunnel kilns are used in which the clay products placed on the tunnel kiln car are mechanically pushed through the tunnel-shaped firing channel.
• The fired products are lifted off the kiln cars by an unloading machine...

• ...and fed to the palletizing and packaging machine

• The pallets are then stacked in the storage yard by forklift trucks and transported by lorries to construction sites or to the building material suppliers.
OVERVIEW

• PRODUCT TYPES
OVERVIEW CLAY PRODUCT TYPES

Roofing solutions

Wall solutions

Clay Pavers

Facade solutions
**CLAY BLOCKS**

<table>
<thead>
<tr>
<th>Clay Blocks</th>
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<table>
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<th><strong>Types</strong></th>
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<tr>
<td>• Single-shell, monolithic exterior wall</td>
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<td>• Multi-layer exterior wall</td>
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<td>• External wall with thermal insulation composite system</td>
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<tr>
<td>• Single or double-shell interior wall</td>
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<table>
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<tr>
<th><strong>Characteristics and advantages</strong></th>
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<tr>
<td>• <strong>Healthy indoor climate</strong>: no emittance of harmful substances into indoor air and damping of fluctuations of temperature through high thermal mass</td>
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<td>• Clay blocks increase the <strong>energy efficiency of buildings</strong> Less heating in winter &amp; less cooling in summer</td>
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<td>• External walls made of clay blocks are usually covered with a render or with an ETICS</td>
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<td>• They can be found in family homes and flats, as well as in office buildings, hospitals, schools and nurseries</td>
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### Facing Bricks

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<th>Characteristics and advantages</th>
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<td>• They stay durable and protect the shell of building from adverse weather conditions such as acid rain or frost</td>
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<td>• Benefits for homeowners: <strong>saving on high maintenance or refurbishment costs that may arise years down the line</strong></td>
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<td>• <strong>Tradition</strong> to build facades with facing bricks is mainly located in Northern parts of Europe</td>
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<td>• To improve material efficiency <strong>brick slips</strong> become more and more popular on the market</td>
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<td>• These bricks adorn private detached and semi-detached houses as well as multi-story commercial or public buildings</td>
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### Types

• Different colours, shapes and surface structures/treatments
## Roof Tiles

### Characteristics and advantages
- Roofs made from clay roof tiles offer the **best protection for houses against weather conditions**
- They are durable, cost-efficient and their color does not fade over time
- Many **advantages of a pitched roofs**: good ventilation, fire and wind resistance, easy to maintain, acoustic insulation, ensure that minimum energy is lost through the roof and offer more living space compared to similarly-priced flat-roofed houses

### Types
- Plain and pocket tiles
- Interlocking tiles
  - Different colors, shapes and surface structures
  - Some with engobes or glazes to extend the colour range
Clay Pavers

**Types**
- Different colors, shapes and surface structures/treatments

**Characteristics and advantages**
- Pavements are **sustainable, reliable, low-maintenance and weather resistant**
- This material has a long tradition, especially in Germany, Great Britain, Belgium and the Netherlands
- From pedestrian zones in towns, to public spaces in train stations or airports, to private terraces or gardens, clay pavements set the bar high when it comes to designing open spaces
• SUSTAINABILITY
COMMITMENT TO 5 ENVIRONMENTAL CORE TOPICS

DE-CARBONIZATION OF THE PRODUCT PORTFOLIO

ENCOURAGE CIRCULAR ECONOMY

PRESERVE BIODIVERSITY

HEALTHY INDOOR AIR

REGIONAL PRODUCTION
I. DE-CARBONIZATION OF THE PRODUCT PORTFOLIO

The brick industry supports the European Green Deal. Due to their characteristics, bricks make a significant contribution to climate protection in the building sector.

- **Continuous efficiency improvement**
  Heat recovery, heat pump technology, dematerialization of products, etc.

- **Replacement of fossil fuels**
  Electrification and/or use of hydrogen or green gas (biogas/syngas) combined with innovative technology

- **Nearly zero CO₂ emission from raw materials**
  Switch to alternative raw materials & innovative production technology
BEST PRACTICE: PLANT UTTENDORF / AUSTRIA: ABSORPTION HEAT PUMP TECHNOLOGY

- Recovery of heat from brick dryer exhaust air & re-use in the process
- **30% lower specific gas consumption**
- CO₂ reduction by ~2,000 tons/year
- Rollout to further plants starting
- **Alone in Wienerberger:** potential for CO₂ reduction of 400,000 tons/year
BEST PRACTICE: DE-MATERIALIZATION OF PRODUCTS / ECO-BRICKS

- Thinner facing bricks
- 35% better resource efficiency per m² of wall
- Additional thermal insulation or more living space
- Product already certified in BE and NL, certification process ongoing in DE, FR and UK
- Alone in Wienerberger: potential for CO₂ reduction of 200,000 tons/year
II. ENCOURAGE CIRCULAR ECONOMY

• Given the inert nature of fired clay, most clay products can be reused or recycled after the end-of-life stage

• Clay products are resource efficient and long-lasting products, requiring little maintenance or replacement
  ➔ A brick house has an average life span of more than 150 years

• The transformation of clay to ceramics does not allow for a 100% closed loop recycling but rather provides a valuable input for an open loop recycling

• At the end of the life cycle of brick houses, the blocks become a valuable secondary raw material and thus fulfil all the requirements of a functioning circular economy
Clay product manufacturers have developed solutions to minimize raw material consumption, reduce waste of production processes, increase reuse and recycling of ceramic products - solutions developed include:

- Recycling of internal production residues as substitute to raw materials
- Recycling of waste from other industrial processes
BEST PRACTICES: CIRCULAR ECONOMY

- Reuse of water used in the manufacturing processes
- Optimised raw material selection
- Supply chain cooperation in the case of recycling
- Optimisation of the product design
III. PRESERVE BIODIVERSITY

• Priority for brick industry: restoration of clay pits and preservation of biodiversity

• Species protection is just as important as climate protection, which is why impacts on biodiversity must be included in the assessment of building materials and buildings on a mandatory basis
IV. HEALTHY INDOOR AIR QUALITY

- Clay masonry materials are made of minerals and free from air pollutants thus, indoor air in a building using clay masonry materials is healthy and less likely to provoke allergies, tiredness and headaches among occupants.
- Clay products do not release preservative chemicals into the ground and drinking water or soil.
- Clay products help to balance moisture inside the building and prevent condensation from accumulating.
- Due to their properties, bricks regulate the indoor climate and thus ensure warm rooms in winter and cool rooms in summer - also with regard to the global warming that takes place.
V. REGIONAL PRODUCTION

- Local production – local employer – local customized products
- Bricks are a regional building material and secure - in often structurally weak regions - jobs and added value
- Short transport routes protect the environment
Webseminar: BRICKS - A traditional player shaping the future?

Friday, 30 April 2021, 10:00 Uhr

Mag. Doris Wirth
Doris Wirth

Managing Partner at BLUESAVE Consulting GmbH

- Certified DGNB/ ÖGNI-Auditor
- Certified EU Taxonomy Advisor
- Certified Energy Auditor acc. EEffG
We do Buildings! Experience counts ...

- 450,000 sqm optimised and refurbished (residential, offices, trade)

- 420,000 sqm successfully audited according to the sustainable building standard of ÖGNI – DGNB (residential, offices, trade, tourism)

- 1,000,000 sqm Technical Due Diligence (residential)

- 5,000,000 sqm Energy Performance Certificates issued, according to EAVG (residential, offices, trade, tourism)
The Brick – Key Data

- 24,576 m² office space
- 1,350 workplaces
- 835 m² retail space
- 152 guestrooms
- 405 m² restaurant & catering
THE BRICK – The New WIENERBERGER Headquarter

BLUESAVE were contracted as sustainability auditors according to the ÖGNI/DGNB system by SORAVIA Group, the project owner and developer.

In 2018, when construction started, the building was sold to Vienna Insurance Group, with Wienerberger as the main tenant.

Wienerberger was involved from the very beginning, ordering sustainable building qualities, with a minimum requirement of ÖGNI/DGNB Gold.

Situated at the former Coca-Cola production facilities, „The Brick“ opens the door to the Biotope City, a very new urban development area near to the Wienerberg-City, on Wienerberg (=Vienna Hill), a multifunctional quarter containing 900 apartments with an ecologically sustainable construction concept and great outdoor design.
ÖGNI/DGNB Audit

- Environmental Quality
- Economic Quality
- Socio-cultural and functional Quality
- Technical Quality
- Process Quality
- Site Quality

- 61 criteria (48 active)
- Different weighting
- Documentation
Audit Results:

PLATINUM

[Image of award and logos]
The Brick in Vienna
The Brick as the door to the Biotope City
The Brick – the site
The Brick and its hidden entrance
LEVEL 2
LEVEL 6
LEVEL 7
LEVEL 9
THE BRICK – environmental & social contribution
The Brick - Highly responsive to ecological criteria

Ecological Quality

- Low-Energy-Building with green rooftop and atrium
- Sustainable klinker facade, with ranking plants and throughs for small trees
- Low life cycle costs (calculated for 50 years)
- Ecologically friendly building materials, strict management of chemicals on construction site
- High area efficiency
- Recycling of rubble of former buildings directly on the site
Prepared for Greening
Socio-cultural and functional quality - User-centered design

- Focus on health, comfort and user satisfaction
- High quality outdoor space, workplace extensions in the green, atrium at level 9
- Very high thermal comfort in winter and summer (simulations & measurements)
- Very high visual comfort (daylight and artificial)
- High acoustic comfort (low reverberation)
- Perfectly clean indoor air (no volatile organic compounds, no formaldehyde)
- 100% barrier free building, all accessible for wheel chairs
- All installations in raised floors, none in partition walls, maximum flexibility of room size
- External sun shields, transparent glare protection
- Many communication and co-working spaces, quiet zones,
- Great view to the hilly South (Schneeberg)
Flexible and innovative office space
Communication everywhere
Quiet & relax zones
Lobby
Elevators
Inner Staircases
Outdoor space, atrium, view to Schneeberg
Phone cells and privacy boxes
Highlight: Terca Clinker Bricks
Wienerberger Terca Clinker Bricks

Clinker optimize the U-value of the building shell,

Clinker have an excellent contribution to noise protection of the facade
Building shell structure

25,0 cm reinforced concrete
24,0 cm stone wool
4,0 cm rear ventilation
11,5 cm clinker brick
Clinker Brick contribution to ÖGNI Platinum:

• Lower Life Cycle Cost due to:
  • Protection of underlying stone wool which is not prone to mechanical damage
  • Low maintenance cost, no painting, no crumbling, weather resistant
  • Easy Cleaning
  • Almost no aging, and if: noble aging

• Identity forming, land marking

• Ecological footprint:
  • Average energy demand in production
  • Low pollutant emissions due to high tech processes
  • Low energy demand in transport, due to regional clay mining and production
  • Very high recycling potential due to multi shell construction of facade
Ready for your questions!
AALST Kantoorgebouw Vlaamse Milieumaatschappij (1998-2005)

Client: VMM, parking garage VMM and OCMW

Architecture: De Smet Vermeulen architecten
Project architect: Bram Seghers
Advisers: Lemco, Geotechnical Expert Office, Moens Engineering, De Haeck & Dendroconsult, Studio Linja

Artist: Patrick Van Caeckenbergh

Photographers: Frederik Vercruysse, Anja Van Eetveldt, Stijn Bollaert

Building cost: 1.030 €/m² office, 615 €/m² underground parking garage
Bruto area: 3.840 m² kantoor, 4.750 m² underground parking garage
Total budget all in: 8.285.000 €

Awards: Prijs Bouwmeester 2005, Belgian Building Award 2005
AALST Kantoorgebouw Vlaamse Milieumaatschappij (1998-2005)
ecology = economy of resources

where to build?
what to keep?
a garden for the street, a path through the block
clustering functions, smaller footprint
open structure, dimensional consistency, flexible and adaptable
sound materials on the right places
brick, a material of all ages
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ecology = economy of resources

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extonomy = economy of resources

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MESURA
Core Ideology

Purpose
“We design for the unknown”

Values
A sense of place
A contemporary way of living
A thriving community

Culture
Design Principles (5)
Human Principles (8)
Genius Loci Cerámico
Genius loci

*latin*

1. En la mitología romana un genius loci (en plural genii locorum) es el espíritu protector de un lugar.

2. En ciertas teorías de arquitectura moderna, el genius loci tiene implicancias en el diseño de espacios y se le vincula con la rama filosófica de la fenomenología. Este ámbito del discurso arquitectónico es desarrollado principalmente por el teórico Christian Norberg-Schulz en su libro, *Genius Loci: Towards a Phenomenology of Architecture*. 
Cerámica

nombre femenino

1. La cerámica es el arte de fabricar objetos de arcilla por acción del calor, es decir cocida a una temperatura superior a los 900 grados.
"según esa teoría, la cerámica surgió para cubrir las necesidades básicas de la vida doméstica"

2. Conjunto de estos objetos.
"la exposición mostrará cinco siglos de cultura griega a través de su cerámica, su escultura y su arqueología"
“La cerámica es y ha sido una de las principales actividades económicas de la población, al menos desde el siglo XVIII. Artesano, creador, artista, casi un alquimista, el ceramista de la Bisbal es muchas veces el último escalón de una familia con generaciones dedicadas al viejo trabajo de dar forma a la arcilla. Formas utilitarias, artísticas, experimentales, artesanales o industriales ..., se puede encontrar de todo en la larga historia cerámica de la Bisbal.”.
Cuatro aplicaciones Cerámicas en la casa
01. Ladrillo

nombre masculino

1. Pieza de arcilla cocida, generalmente con forma de prisma rectangular, que se usa en la construcción de muros, paredes, pilares, etc.
"surgieron palacios y viviendas urbanas en ladrillo visto o enlucido"

2. Coloquial. Cosa aburrida o pesada.
"la exposición mostrará cinco siglos de cultura griega a través de su cerámica, su escultura y su arqueología"
02. Losa (cerámica)

nombre femenino

1. La losa cerámica es un tipo de placa que separa un nivel de otro en una edificación, por ejemplo, para crear los niveles en una casa de tres pisos, será necesario colocar una estructura plana horizontal o losa para crear el piso del segundo nivel.

"La bovedilla de la losa cerámica tenía un intereje de 70cm"
03. Volta Catalana

bóveda catalana

1. La bóveda catalana, es un tipo de bóveda tabicada y una técnica de construcción tradicional catalana. Consiste en cubrir el recinto o espacio mediante una bóveda de ladrillos colocados por la parte plana, es decir, por la cara de superficie mayor que forman el largo o soga y el ancho o tizón del ladrillo, en vez de hacerlo por cualquiera de las demás caras gruesas.
04. Toba
nombre femenino

1. La toba o arcilla cocida representa una de las primeras formas de “producción en serie” de un pavimento. Este tipo de materiales son útiles para pavimentos interiores y exteriores, antiguamente era el tipo de material que se usaba para todos los pavimentos. "Toba, loseta cerámica, baldosa..."
“To Dwell means to belong to a given place”
Christian Norberg-Schulz
Thank you.
MESURA
Bricks and natureplus – from the past to the future
Mario Kubista | PM wall & facade | Wienerberger 30.4.2021
The evolution of the brick

**Small sized bricks**
- Full and perforated

**Large sized bricks**
- Faster processing
- Butt joints completely mortared

**Tongue and groove bricks**
- Mortar pocket bricks
  - In the butt joint, only cramped
  - In the mortared mortar pockets

**Mortar pocket bricks**
- In the butt joint, only cramped
- Mortar pockets are filled in

**Plane bricks**
- Plane bricks ground at the factory, processing with thin bed mortar (approx. 1 mm)

**Dryfix System**
- The plane bricks are processed with PU adhesive, processing possible down to -5 °C

**Porotherm W.i Plan**
- Plane bricks with integrated thermal insulation made of mineral wool
Development of the U-value

50 cm masonry unplastered

- 1900: Mercedes, 35 PS
- 1979: Mercedes S-Klasse
- 2013: Mercedes Hybrid
Development of the U-value
Wienerberger production plants with natureplus (2006 – 2021)
Wienerberger production plants with natureplus (2006 – 2021)

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</table>

◆ Main testing (9), repeat testing (23)
Verification of the manufacturer’s details
Sampling and product specific laboratory tests
Sampling and product specific laboratory tests

- Measurement of radio nuclides
- Heavy metal analysis
  - In the solid
  - In the eluate

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Min.</th>
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<tbody>
<tr>
<td>Arsenic</td>
<td>mg/kg</td>
<td>9.4</td>
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<tr>
<td>Antimony</td>
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<td>Bismuth</td>
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<td>Cadmium</td>
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<td>Cerium</td>
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<td>Cesium</td>
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<td>Niobium</td>
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<td>Quicksilver</td>
<td>mg/kg</td>
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*Each test is conducted according to DIN 25414-34*
<table>
<thead>
<tr>
<th>Ökologische Indikatoren</th>
<th>Kennwerte Wienerberger</th>
<th>Orientierungswerte RL102 in kg</th>
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<tbody>
<tr>
<td>Treibhauspotential der GHG-Emissionen (GWP 100 Prozess) [kg CO₂-equiv.]</td>
<td>0,196</td>
<td>0,23</td>
</tr>
<tr>
<td>Treibhauspotential aus CO₂-Speicherung (GWP 100 C-Gehalt) [kg CO₂-equiv.]</td>
<td>0</td>
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<tr>
<td>Treibhauspotential Summe aus GHG-Emissionen und CO₂-Speicherung (GWP 100 Summe) [kg CO₂-equiv.]</td>
<td>0,196</td>
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<tr>
<td>Abbaupotenzial der stratosphärischen Ozonschicht (ODP) [kg CFC 11 equiv.]</td>
<td>1,54E-08</td>
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<tr>
<td>Versauerungspotenzial von Boden und Wasser (AP) [kg SO₂-equiv.]</td>
<td>2,63E-04, 1,00E-03</td>
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<tr>
<td>Europhierungspotenzial (EP) [kg PO₄³⁻-equiv.]</td>
<td>9,81E-05, 2,00E-04</td>
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<tr>
<td>Potenzial für die Bildung von troposphärischem Ozon (POCP) [kg C₂H₄-equiv.]</td>
<td>6,76E-05, 1,50E-04</td>
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<tr>
<td>Potenzial für die Verknappung von abiotischen Ressourcen - nicht fossile Ressourcen (ADP Stoffe) [kg Sb-equiv.]</td>
<td>1,35E-08</td>
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<tr>
<td>Einsatz erneuerbarer Primärenergie ohne die als Rohstoff verwendeten erneuerbaren Primärenergie träger (PERE) [MJ, unterer Heizwert]</td>
<td>0,68</td>
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<td>Einsatz der als Rohstoff verwendeten, erneuerbaren Primärenergie träger (stoffliche Nutzung) (PERM) [MJ, unterer Heizwert]</td>
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<td>Gesamteinsatz erneuerbarer Primärenergie (Primärenergie und die als Rohstoff verwendeten erneuerbaren Primärenergie träger) (energetische und stoffliche Nutzung) (PERT) [MJ, unterer Heizwert]</td>
<td>0,68</td>
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<tr>
<td>Einsatz nicht erneuerbarer Primärenergie ohne die als Rohstoff verwendeten nicht erneuerbaren Primärenergie träger (PENRE) [MJ, unterer Heizwert]</td>
<td>2,46</td>
<td>2,8</td>
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<tr>
<td>Einsatz der als Rohstoff verwendeten nicht erneuerbaren Primärenergie träger (stoffliche Nutzung) (PENRM) [MJ, unterer Heizwert]</td>
<td>0,03</td>
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<td>Gesamteinsatz nicht erneuerbarer Primärenergie (Primärenergie und die als Rohstoff verwendeten nicht erneuerbaren Primärenergie träger) (energetische und stoffliche Nutzung) (PENRT) [MJ, unterer Heizwert]</td>
<td>2,49</td>
<td>-</td>
</tr>
<tr>
<td>Gesamteinsatz erneuerbarer und nicht erneuerbarer Primärenergie (Primärenergie ohne die als Rohstoff verwendeten Primärenergie träger (PERE + PENRE + PET) [MJ, unterer Heizwert]</td>
<td>3,14</td>
<td>3,8</td>
</tr>
</tbody>
</table>

Tabelle 5: Ergebnisse der Wirkbilanz der geprüften Produkte im Vergleich mit den natureplus-Orientierungswerten
Certificate

30.04.2021
Bricks with integrated thermal insulation

\[ \lambda_{\text{mat,design}} < 0.300 \text{ W/mK} \]
\[ \rho_{\text{n,dry}} = 1450 \text{ kg/m}^3 \]
\[ \mu = 5/10 \]
A1

\[ \lambda_D = 0.034 \text{ W/mK} \]
\[ \rho_{\text{mean}} = 50 \text{ kg/m}^3 \]
\[ \mu = 1 \]
A1
\[ \vartheta > 1000 \text{ °C} \]
Bricks with integrated thermal insulation

\[ f_b \leq 12.5 \text{ N/mm}^2 \]
\[ f_k \leq 4.8 \text{ N/mm}^2 \]
\[ f_{vk0} \leq 0.28 \text{ N/mm}^2 \]
\[ A1 \]
\[ \text{REI} \geq 90 \]
\[ R_w \leq 54 \text{ dB} \]
\[ \rho_{gr,dry} \geq 620 \text{ kg/m}^3 \]
\[ \lambda_{10,dry,unit} \geq 0.064 \text{ W/mK} \]
\[ U \leq 0.12 \text{ W/m}^2\text{K} \]
\[ \mu = 2.3/3.9 \]
4 Floors: WHA Morogasse, Klagenfurt – 2017
5 Floors: Cura Cosmetic, Innsbruck – 2015
6 Floors: Interpark FOCUS 40, Röthis – 2016
7 Floors: „Loft Living“ Sonnwendviertel – 2021
8 Floors: „Wildgarten, Wohnen am Rosenhügel“ – 2022
Bricks with integrated thermal insulation

Porotherm

50 W.i
44 W.i
36 W.i
32 W.i
26 W.i
25-38 W.i
Mineral wool offcuts in the production plant
Mineral wool offcut in the prefab plant
Mineral wool offcuts on the construction site
Mineral wool offcuts

- Decision of the district administration
  - BH Wels-Land

- Decision saying
  - Cuttings within the scope of production activities: no waste in the meaning of the AWG 2002 (waste management act)
  - Cuttings on the construction site: waste in the sense of the WG 2002
    Collection by „remabo“ - waste property ends after completion of quality assurance in the collection container of the Haiding plant
Mineral wool offcuts

- Collection container in the plant (Haiding)
  - Press container
    rented from Energie AG (2-3 t or 20 m³)
  - Transport with trailer (2 containers)
  - Return to the production plant
Deconstruction or demolition of a brick house
Separation of bricks and mineral wool

Carried out on 20.07.2012 at Schäfer (Rüssingern – D)

Zig-Zag-Windsifter (Nihot)

Prallreaktor (Schäfer)

50 kg/m³

1500 kg/m³
Alternative filling materials

Wood fibre

Hemp fibre

Hull grain

Sheep’s wool

Coconut fibre

Straw
PrlMa >>> BIM

- Masonry mortar
- Plaster mortar
- ETICS
- etc.
We would like to thank our speakers and partners for their support of this event!
We look forward to seeing you & our speakers in the following web seminars

**21 May 2021**
Lehm –
10:00 Uhr
Kann der älteste Baustoff die moderne Architektur verändern? *(in German!)*

**04 June 2021**
Bamboo –
10:00 Uhr
A building material suitable for the masses? *(in English!)*

**18 June 2021**
Sekundäre Baustoffe –
10:00 Uhr
Die Zukunft des Bauens? Mehr Upcycling in der Bauindustrie! *(in German!)*

**08 July 2021**
Who would have thought this? -
16:00 Uhr
Surprising building materials. *(in English!)*
natureplus association

Contact

natureplus – International Association for Sustainable Building & Living

Hauptstr. 24
69151 Neckargemünd
Germany
[E] info@natureplus.org
[T] +49 (0)6223 – 8660170
[F] +49 (0)6223 – 8660179
www.natureplus.org

www.natureplus.org

www.natureplus-juice.org

www.natureplus-institute.eu