

ACT OF BUILDING - ACT I

PROTOTYPING VIENNA

PLASTER & SOUND PANELS

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PREFACE

Vienna's expanding metro network excavates thousands of tonnes of loamy soil daily. Known as Wiener Tegel, this clay-rich material is typically discarded, despite its suitability for high-performance interior building applications. At the same time, the construction sector is under growing pressure to reduce emissions, cut waste and adopt more circular practices. Developing architectural materials that respond to these challenges while making use of local resources is both an urgent necessity and a strategic opportunity.

Our work focuses on the development of loam plasters and sound-absorbing panels made from Wiener Tegel. These materials offer an ecological alternative to conventional building products. By rethinking excavated soil not as waste but as a valuable material stream, we develop solutions that are low in embodied energy, reversible, and healthy for interiors. This approach addresses both material scarcity and the need for more sustainable, circular building systems.

To improve performance, we combine Wiener Tegel with local additives—such as Japanese knotweed, straw, vine shoots, textile offcuts, and animal fur. These blends enhance acoustic, mechanical, and aesthetic properties, forming the basis of a new resource logic rooted in urban metabolism.

Our work is situated in the underused interior spaces of Vienna's historic building stock, especially attic levels in Gründerzeit buildings. These areas are often inaccessible due to preservation laws or technical constraints, yet they offer untapped spatial potential for communal and residential use. With growing housing demand and limited available land, these upper levels represent a valuable resource for inner-city densification—if they can be activated appropriately.

This transformation requires materials that respect the character of existing structures, improve indoor comfort, and meet ecological performance standards. Loam plaster meets these needs through its ability to regulate humidity, buffer temperature, absorb pollutants, and reduce the risk of mould. It supports a healthier indoor climate and aligns with circular construction practices due to its reusability and low-impact lifecycle. In thicker applications, it also offers promising fire-resistant properties under further research.

Sound-absorbing panels made from loam and fibrous additives respond to another often neglected aspect of spatial quality: acoustics. These panels are easy to retrofit, improve sound comfort and air quality, and visually reinforce the identity of local materials. In converting attics and other overlooked spaces, they support a more humane, sustainable, and context-aware form of architecture.



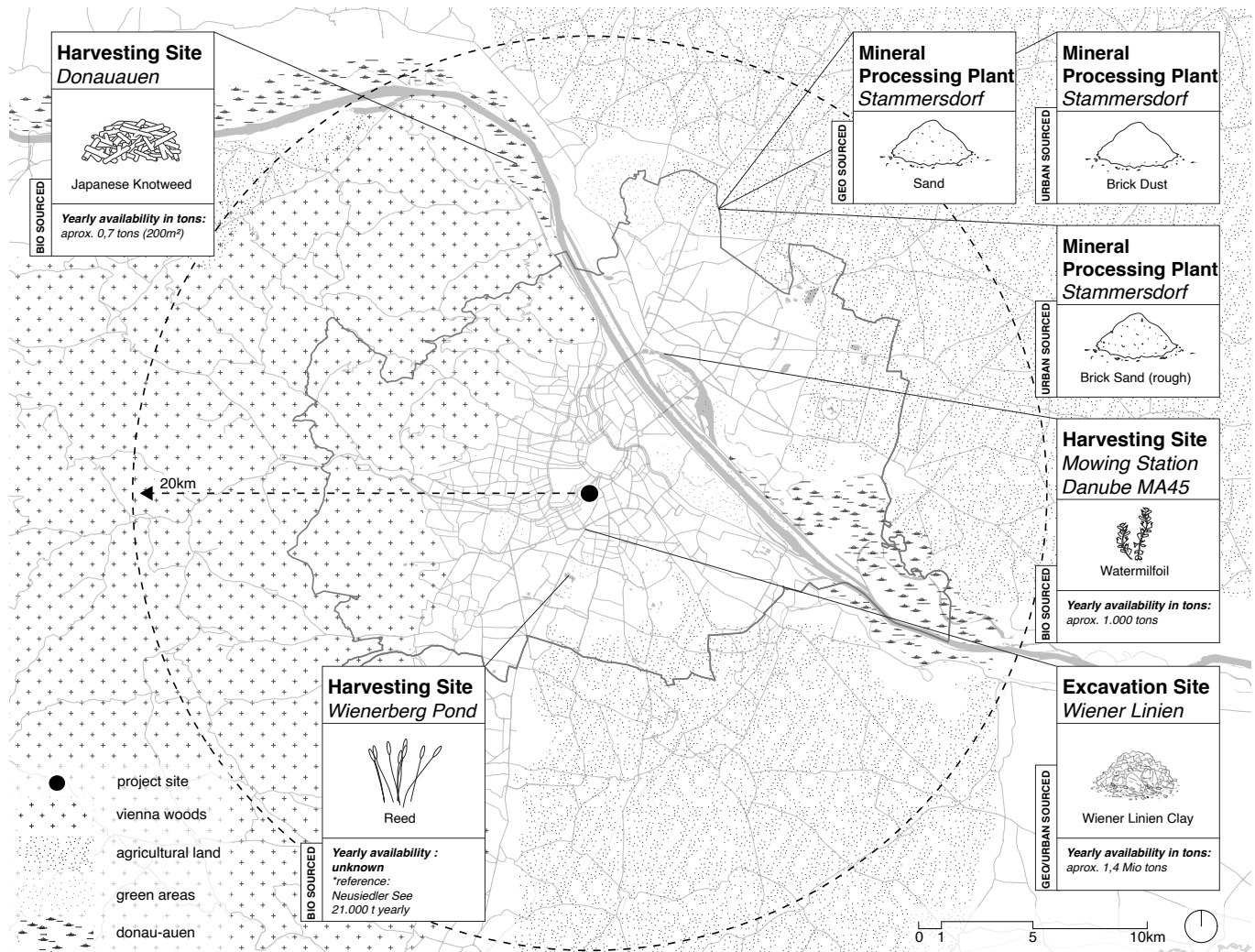
Exemplary Gründerzeit Roof Truss

Vienna's metro expansion brings 4000 tonnes of Wiener Tegel to the surface each day. Though rich in clay and ideal for interior construction, this material is usually treated as waste and sent to landfills. Meanwhile, the city and its surroundings produce a wide range of by-products with untapped potential for building use.

Our loam plasters are based on a core mix of Wiener Tegel and sand, enhanced by regionally sourced additives from agriculture, industry and ecological management. Brick dust from faulty bricks improves porosity and texture. Japanese knotweed, an invasive species along the Danube, is processed into reinforcing fibre that reduces cracking and enhances surface structure. Reed from Vienna's lakes and wetlands serves a similar role. Eurasian watermilfoil (*Myriophyllum spicatum*), an invasive aquatic plant removed by the city's water bureau (MA 45), is harvested in large volumes, around 4,000 tonnes per year, and can also be dried and repurposed as a building fibre.

By using local excess and rethinking waste as resource, we reduce emissions, avoid long transport routes, and create construction materials that respond to the specific ecological conditions of Vienna.

SOURCING



Bioregional Map of Vienna



Japanese Knotweed (Donauauen)



Crushed Bricks (Mineral Processing Plant, Stammersdorf)



- 1.Wiener Tegel
- 2.Japanese Knotweed
- 3.Sand
- 4.Crushed Brick



- 1.Eurasian Watermilfoil
- 2.Reed

PLASTER WALL A

Base Plaster (Plaster 6)



Finishing Plaster A (Plaster 13)



Underplaster A2 (Plaster 4.2)



Underplaster A (Plaster 4)



Composition

Base Plaster (3,3 kg)

2,17 kg Sand
0,75 kg Brick Dust
0,35 kg Wiener Linien Clay

Finishing Plaster (7,2 kg)

0,70 kg Wiener Linien Clay
6,50 kg Sand

Underplaster A2 (34,2 kg)

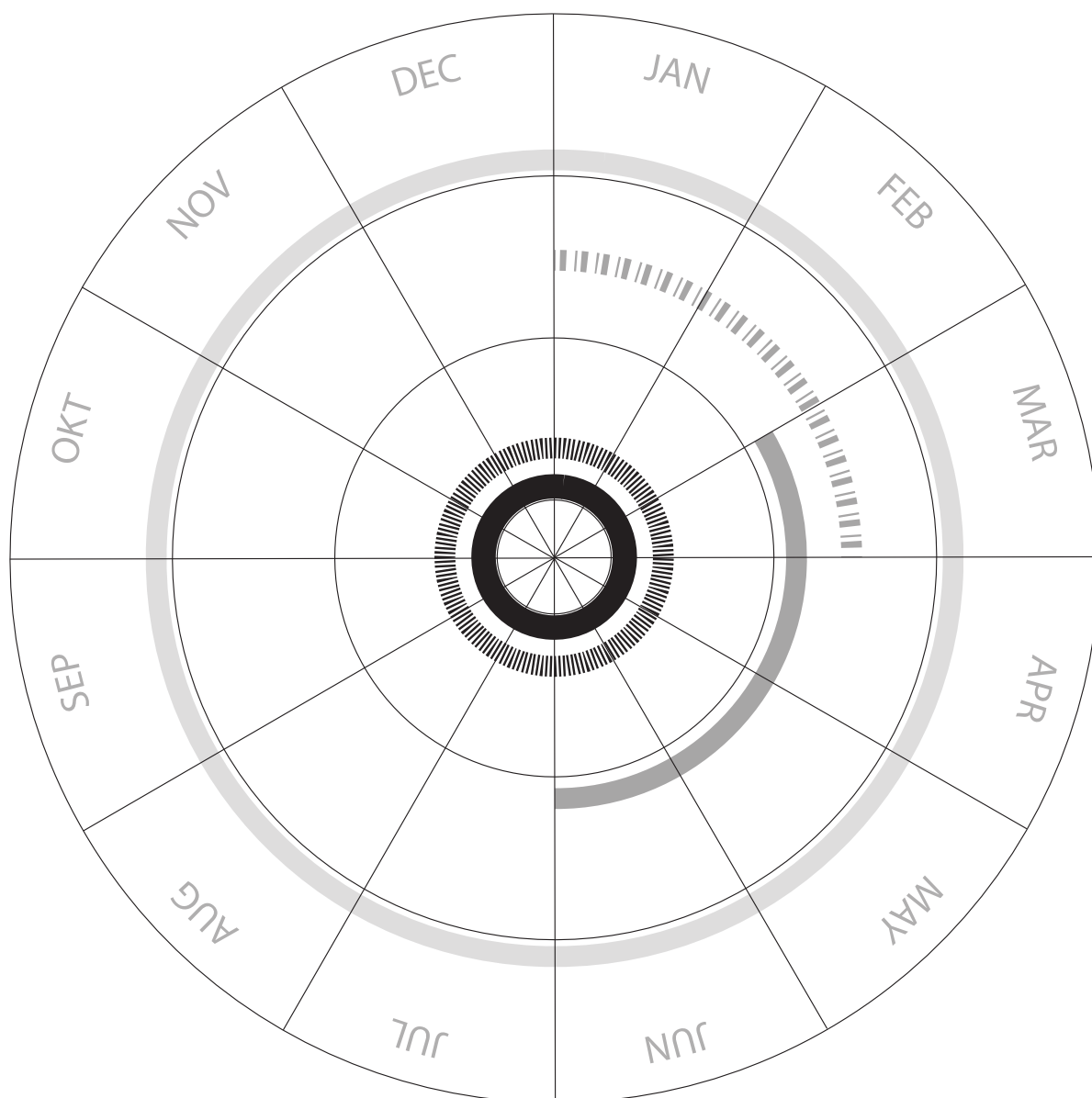
10,0 kg Wiener Linien Clay
21,8 kg Sand
2,40 kg Japanese Knotweed Dust

Underplaster A (38,6 kg)

11,2 kg Wiener Linien Clay
26,2 kg Sand
1,20 kg Reed

Description

The underplasters A and A2 are each applied at a thickness of 2 cm to achieve fire-resistant properties. Once these layers have dried, a finishing plaster is applied and sponged to create a smooth surface. The final layer is the base plaster, which, with its higher abrasion resistance, protects the plaster layers beneath.



Geo Sources



Wiener Linien Clay



Sand

Bio Sources



Japanese Knotweed



Reed

Urban Sources



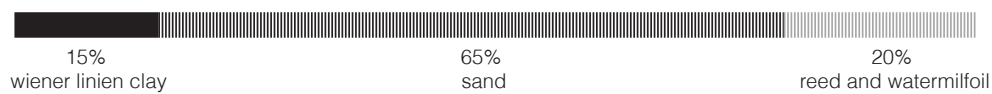
Brick Dust

PLASTER WALL B

Finishing Plaster B (Plaster 5)



Underplaster B (Plaster 4.1)



Composition

Finishing Plaster B (17,3 kg)

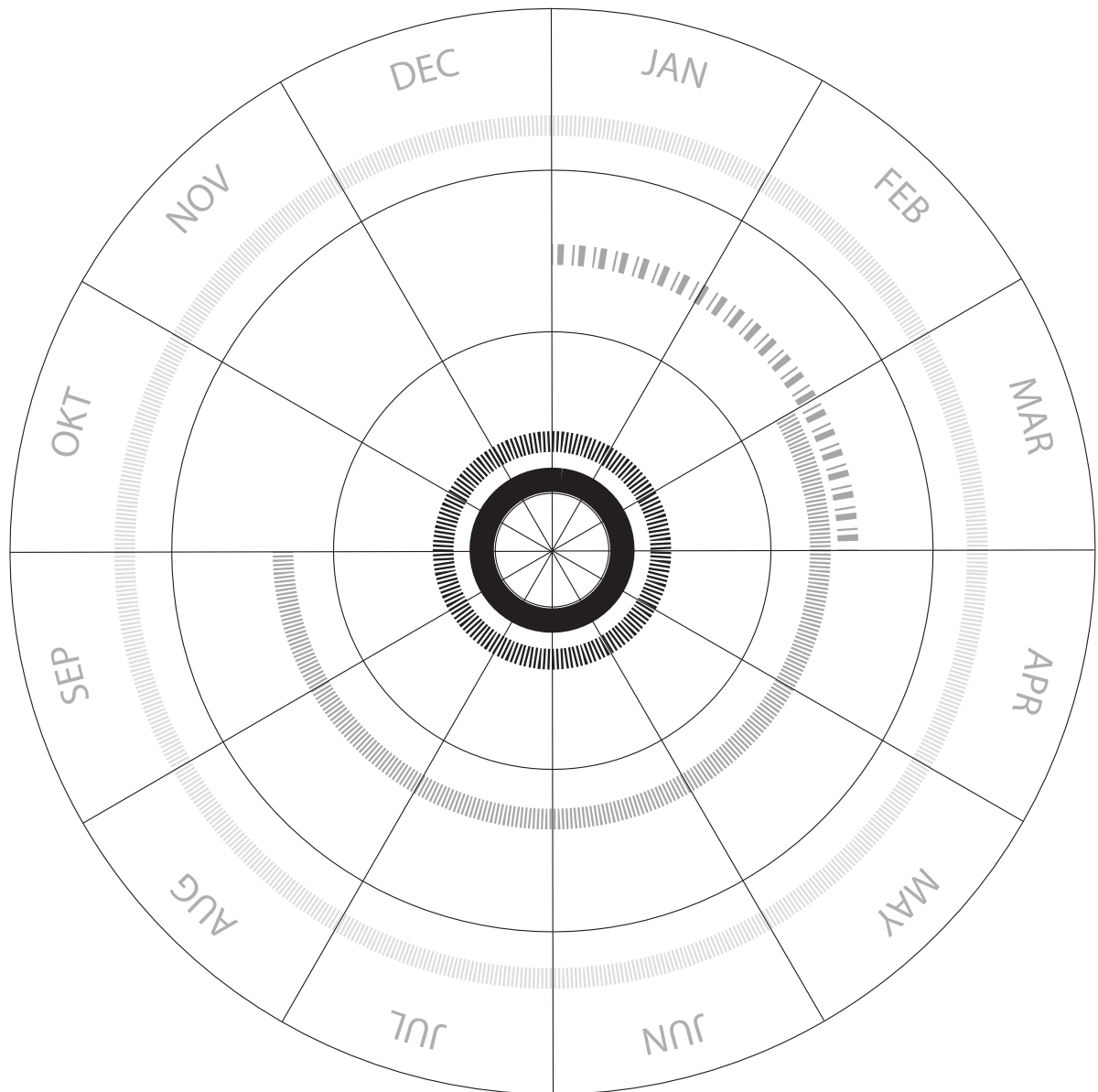
4,30 kg Wiener Linien Clay
13,0 kg Brick Dust (rough)

Underplaster (33,8 kg)

9,00 kg Wiener Tegel
21,8 kg Sand
3,00 kg Reed and Eurasian Watermilfoil

Description

The underplaster was applied in a thicker layer, approximately 2.5 cm. During the drying process, cracks developed naturally, improving the mechanical bond for the finishing plaster B applied on top. This layer consists of 85% brick dust, giving it a distinctive rough texture and reddish colour.



Geo Sources

- Wiener Linien Clay
- Sand

Bio Sources

- Watermilfoil
- Reed

Urban Sources

- Brick Sand (rough)

PANEL

Panel



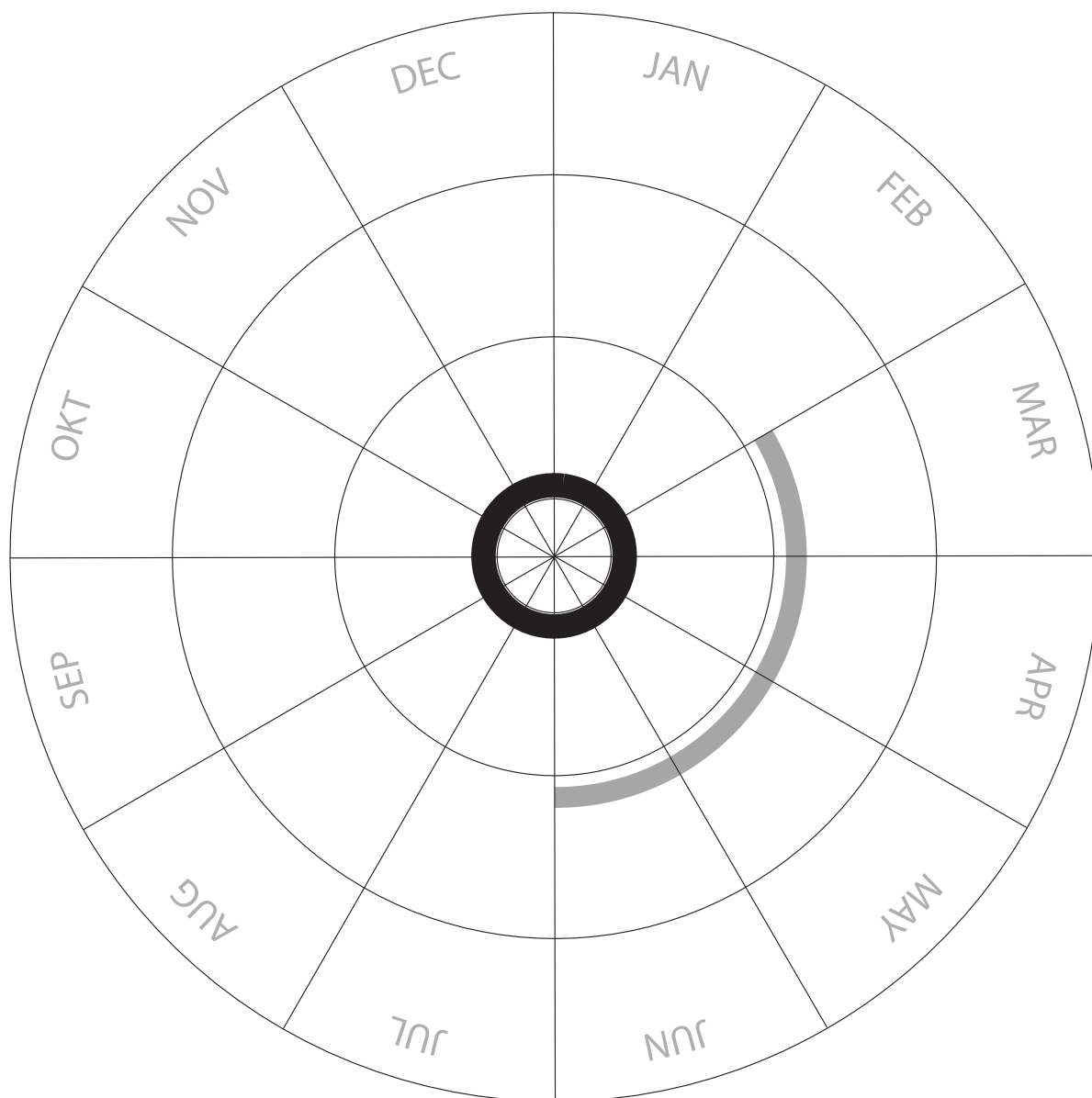
Composition

0,4 kg Wiener Linien Clay

1,7 kg Japanese Knotweed (2cm pieces and dust)

Description

The sound panel is made of two layers combining Wiener Linien Clay and Japanese Knotweed. The lower layer (1 cm) uses a denser mixture with finely chopped knotweed, while the upper layer (3 cm) contains larger knotweed pieces, which enhance the panel's acoustic properties.



Geo sources



Wiener Linien Clay

Bio Sources



Japanese Knotweed

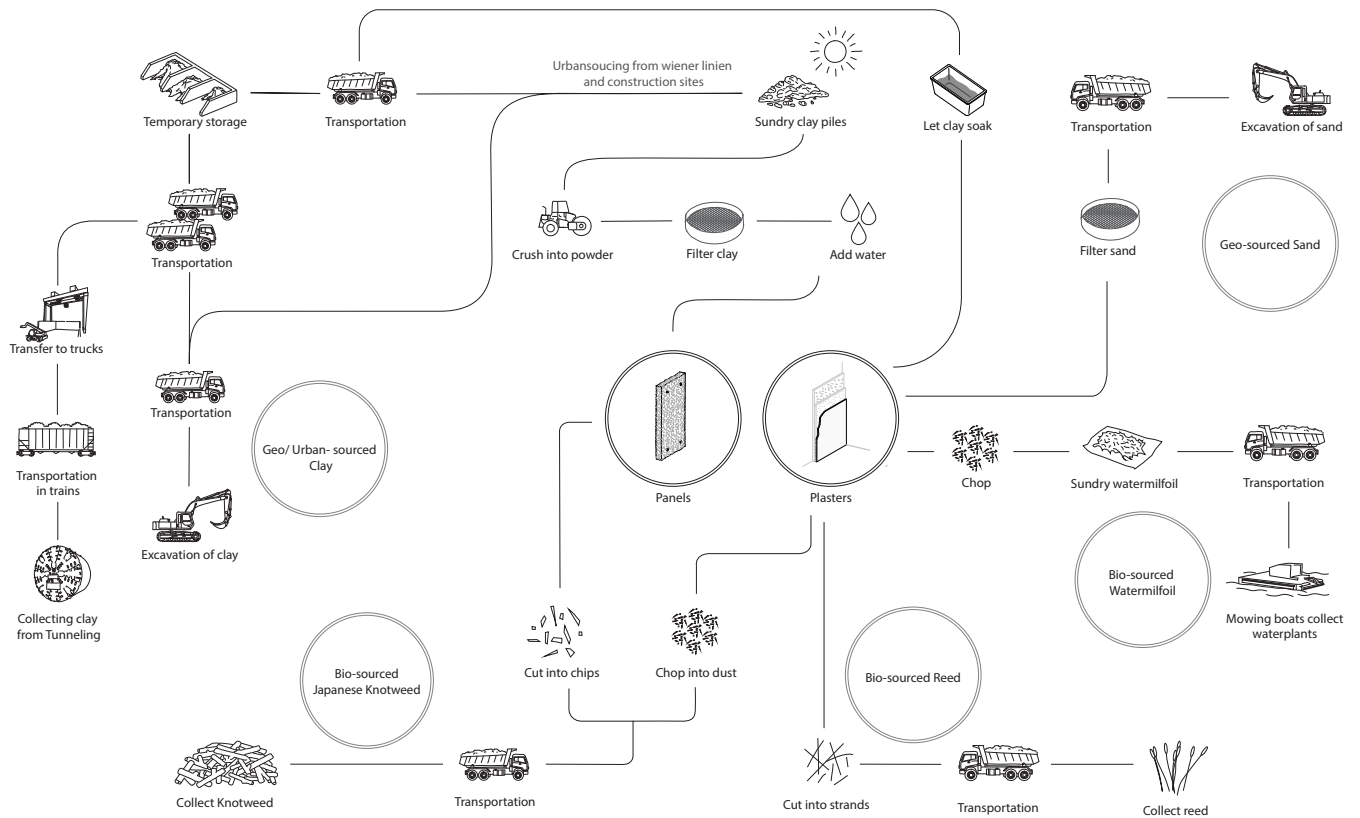
Urban Sources

Since Wiener Tegel and sand are both heavy and bulky, trains and trucks are required to transport them efficiently in large quantities.

Bio-sourced materials present different challenges. Japanese knotweed and reed are low in density but high in volume, and often grow in wetlands or along riverbanks, making access difficult. To optimise transport, they should be chopped or compressed at the collection site.

Eurasian watermilfoil is harvested from the Danube using mowing boats. Being waterlogged at the time of collection, it is unusually heavy and difficult to handle. While drying prior to transport would reduce weight, this is not always feasible. Each material requires adapted logistics to enable efficient sourcing and integration into the construction process.

TRANSPORTING



Flowchart

To understand the behaviour and potential of our loam-based materials, we began with extensive testing. Over 20 different plaster recipes were developed and applied to test boards, allowing us to observe their behaviour during application and after drying. Variations in mixing ratios and additives gave insight into their influence on workability, surface finish, and durability.

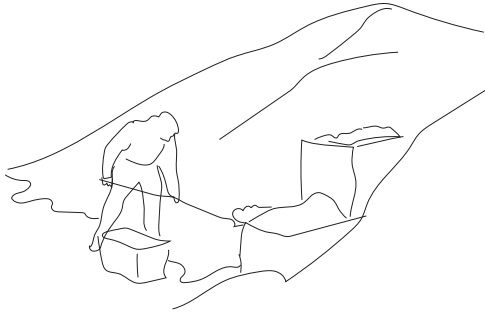
Higher clay content improved the application process but often led to shrinkage cracks during drying. This was counteracted through fibrous additives such as chopped reed or knotweed, which helped reduce cracking and improved cohesion. We also experimented with urban sourced geological additives like crushed bricks, which also add a nice colour and texture to the finished plaster. The preparation method of the loam also had a significant impact: whether used wet, dried, crushed or finely sieved, each variant altered surface texture, abrasion resistance, and colour tone.

For our sound-absorbing panels, a similar experimental process was followed. The panels consist of two loam-based layers with differing compositions. The denser base layer, placed against the wall, combines loam with finely chopped Japanese knotweed fibres (1,5 – 4 cm). The upper layer uses coarser knotweed pieces (4 – 8 cm), making it lighter and more effective in absorbing sound. The result is a robust, installable panel that improves both acoustics and indoor climate.

MANUFACTURING

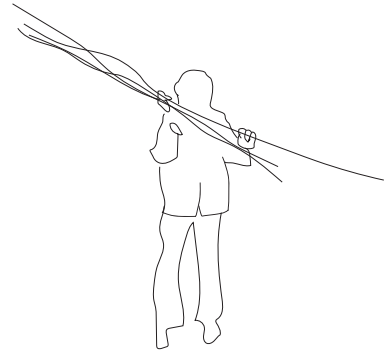


Acoustic Panel in the Making



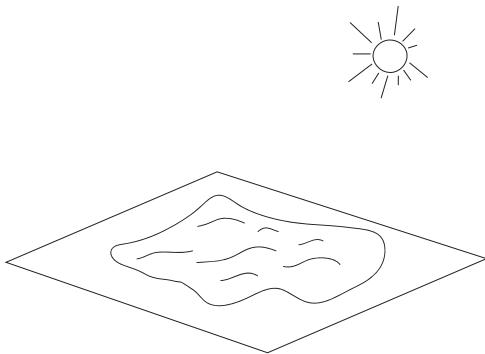
1. Mineral Sourcing

Wiener Tegel is sourced directly from metro construction sites. Sand, crushed bricks, and other mineral materials are primarily obtained from landfills, where they are collected using shovels and buckets for transport.



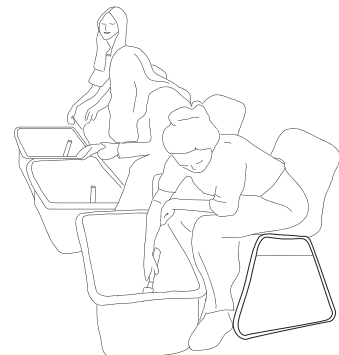
2. Fibre Sourcing

Natural fibres such as Japanese knotweed and reed are harvested near the Danube. Eurasian watermilfoil is mowed directly from the river and transported in bags as well.



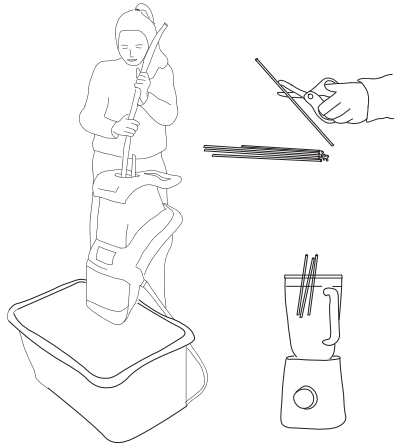
3. Drying

Clay and watermilfoil are spread out on tarps and left to dry in the sun. If drying indoors, ensure proper ventilation to prevent mould growth.



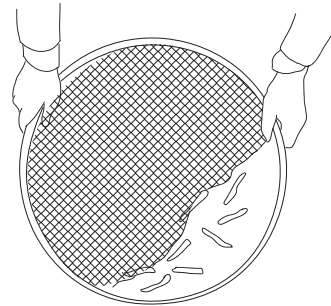
4. Crushing

Once the Wiener Tegel has dried, it can be broken into smaller pieces using hammers. For larger-scale production, mechanical crushing tools or machines may be used.



5. Shredding

Dried knotweed and reed fibres are shredded either manually or with a shredder or kitchen mixer, depending on the desired texture.



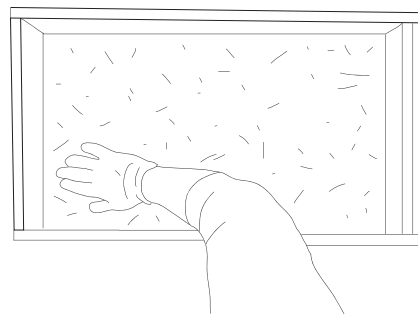
6. Sieving

After crushing and shredding, materials are sieved to separate finer loam dust and small fibre particles from larger fragments.



7. Mixing

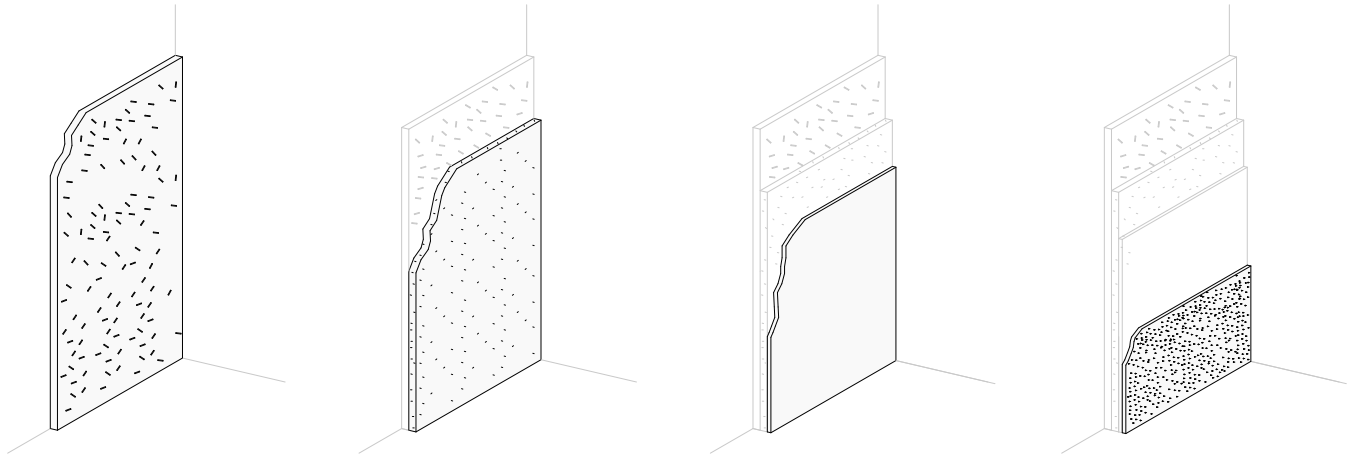
All prepared ingredients for the plasters and panels are combined in buckets according to the required recipe. Using a powered mixer ensures uniform blending of the components.



8. Formwork

The mixture is pressed into the formwork without compressing the added fibres. When sizing the form, account for drying shrinkage of the material.

WALL A | LAYERS OF PLASTER



Characteristics

Loam-Sand-Mixture

Other

Japanese Knotweed, Brick Dust (sieved), Reed

Description

The most effective method for mixing the plasters was to combine the dry components first, then add water. Producing the fibres was very labour-intensive, as the Japanese Knotweed had to be shredded, a process that was also extremely loud. The underlayers required a high fibre content to ensure they were strong enough to support both the finishing and base plasters.

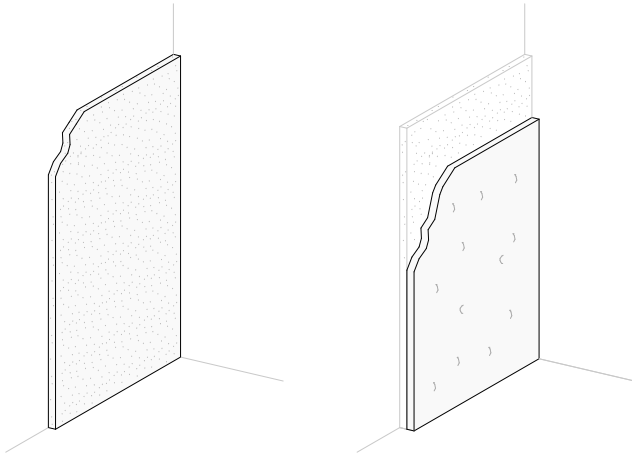
Thickness

0,5 -2,5 cm / layer

Weight (dried)

depends on surface, thickness and amount of fibres

WALL B | LAYERS OF PLASTER



Characteristics

Loam-Sand-Mixture

Other

Japanese Knotweed, Eurasian Watermilfoil, Brick Dust (sieved), Reed

Description

The underplaster was produced using watermilfoil, which first had to be dried, a process that took some time. To achieve the right fibre size, various tests were carried out. For the finishing layer, crushed brick dust was used instead of sand.

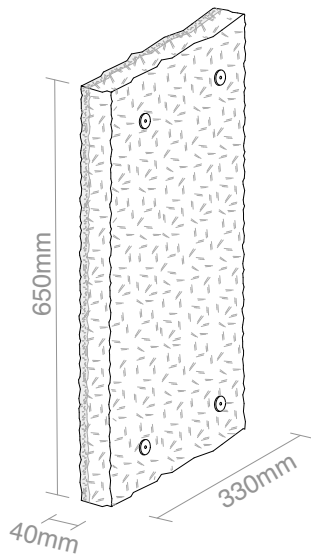
Thickness

1 - 2,5 cm / layer

Weight (dried)

depends on surface, thickness and amount of fibres

ACOUSTIC PANEL



Characteristics

Japanese Knotweed and Loam Panel

Description

The sound panel is made of two layers combining Wiener Tegel and Japanese Knotweed. The lower layer uses a denser mixture with finely chopped knotweed, while the upper layer contains larger knotweed pieces, which enhance the panel's acoustic properties.

Dimensions

65 x 33 x 4 cm

Weight (dried)

3,7 kg

Density

431 kg/m³



Different Layers of Plaster



Acoustic Panel with Wooden Mounting Plates

After developing and testing our plaster mixtures and sound panels at a smaller scale, we applied them to a 1:1 mock-up of a typical Gründerzeit attic interior. The focus was on interior wall and ceiling surfaces, using construction techniques suited to adaptive reuse in historic buildings.

Since loam plaster bonds purely through mechanical grip, a base layer of reed was mounted to the walls before application. The first plaster layer was applied directly onto the reed. Each layer had to dry completely before the next was added, to avoid shrinkage cracks. Finer, more abrasion-resistant mixtures were used for the top layers to improve surface quality and durability.

All plasters were applied by hand and finished with trowels and sponges to refine texture. Cracks appearing after drying were corrected with water and a sponge, resulting in a smooth finish.

The sound-absorbing panels were mounted using loam-painted wooden retaining plates, screwed directly into the roof structure. The system is modular, dry-assembled, and reversible.

Both the panels and the plasters contribute to improved acoustic conditions and enhance indoor air quality within the space.

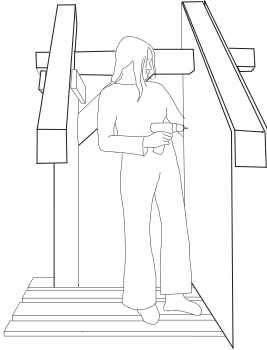
APPLYING



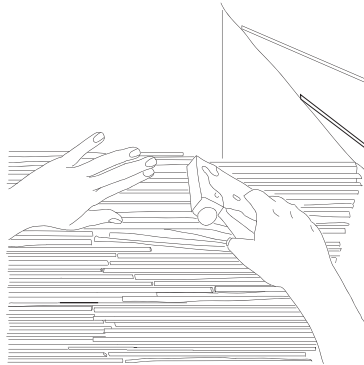
Final Prototype



Building Process of the Prototype



Construction of modell



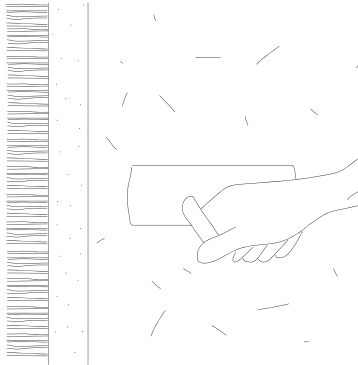
Tacking reed on as a carrier



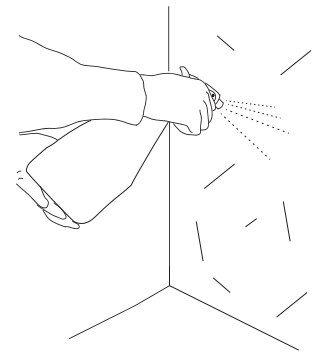
Applying protection for flooring



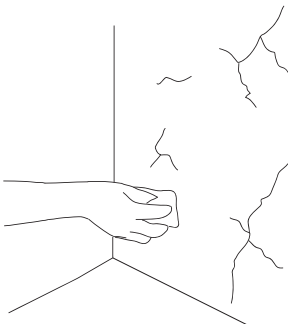
Applying layers of plaster



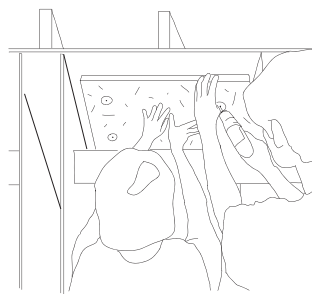
Distribute plaster evenly by using a spatula



Moistening the top layer of plaster

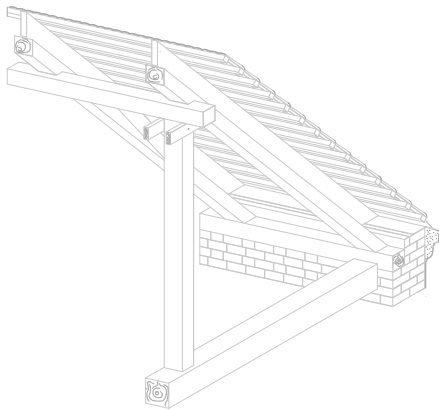


Sponging to remove small cracks



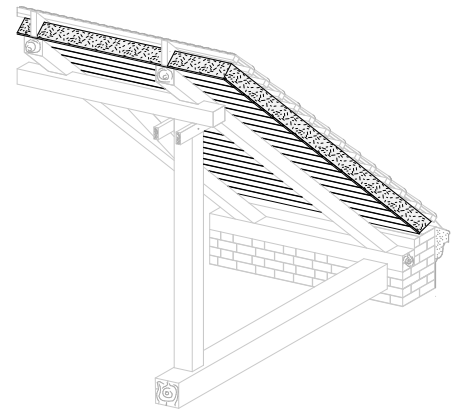
Mounting panels with wooden mounting plates and screws

Wall Construction and Panel Mounting



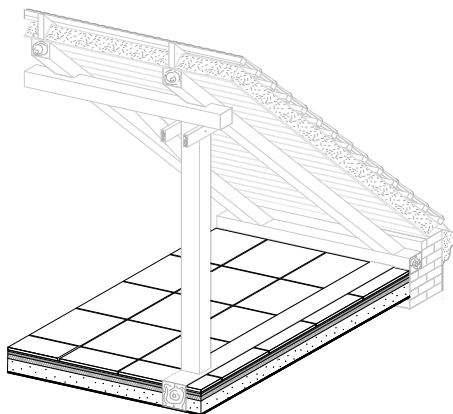
0. Roof Truss

The existing structure consists of a wooden beam roof truss, which is not insulated.



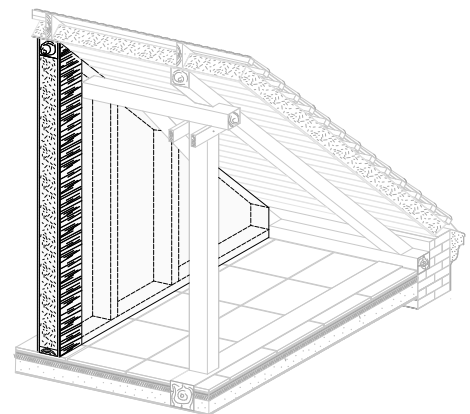
1. Roof Insulation

The space is made habitable by installing roof insulation, in our case we used sustainable wood wool.



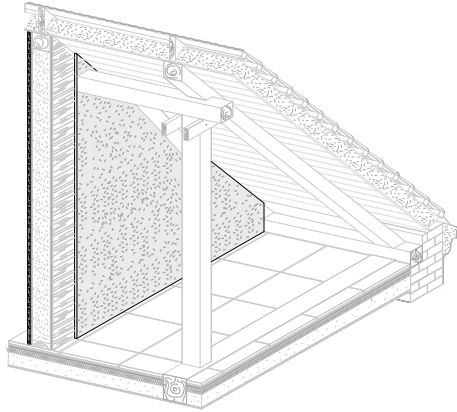
2. Flooring

By installing a floor structure, we create a uniform level in which the crossbeams no longer float but the top edge is on the same level as the terrazzo tiles.



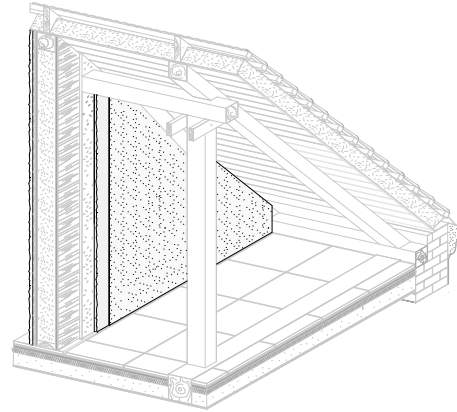
3. Drywall

A drywall is built with OSB boards, these OSB surface is covered with reed as a substructure for the following clay based plasters.



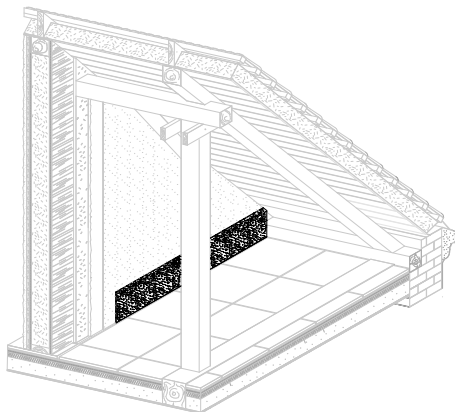
4. Underplaster

The two different underplasters are applied to both sides of the wall to a thickness of approximately 2 cm



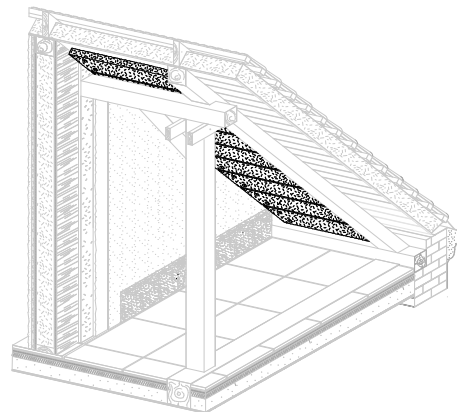
5. Plaster

The red finishing plaster on wall B and two greenish plasters on wall A are applied to achieve the required thickness of about 5 cm for fire resistance.



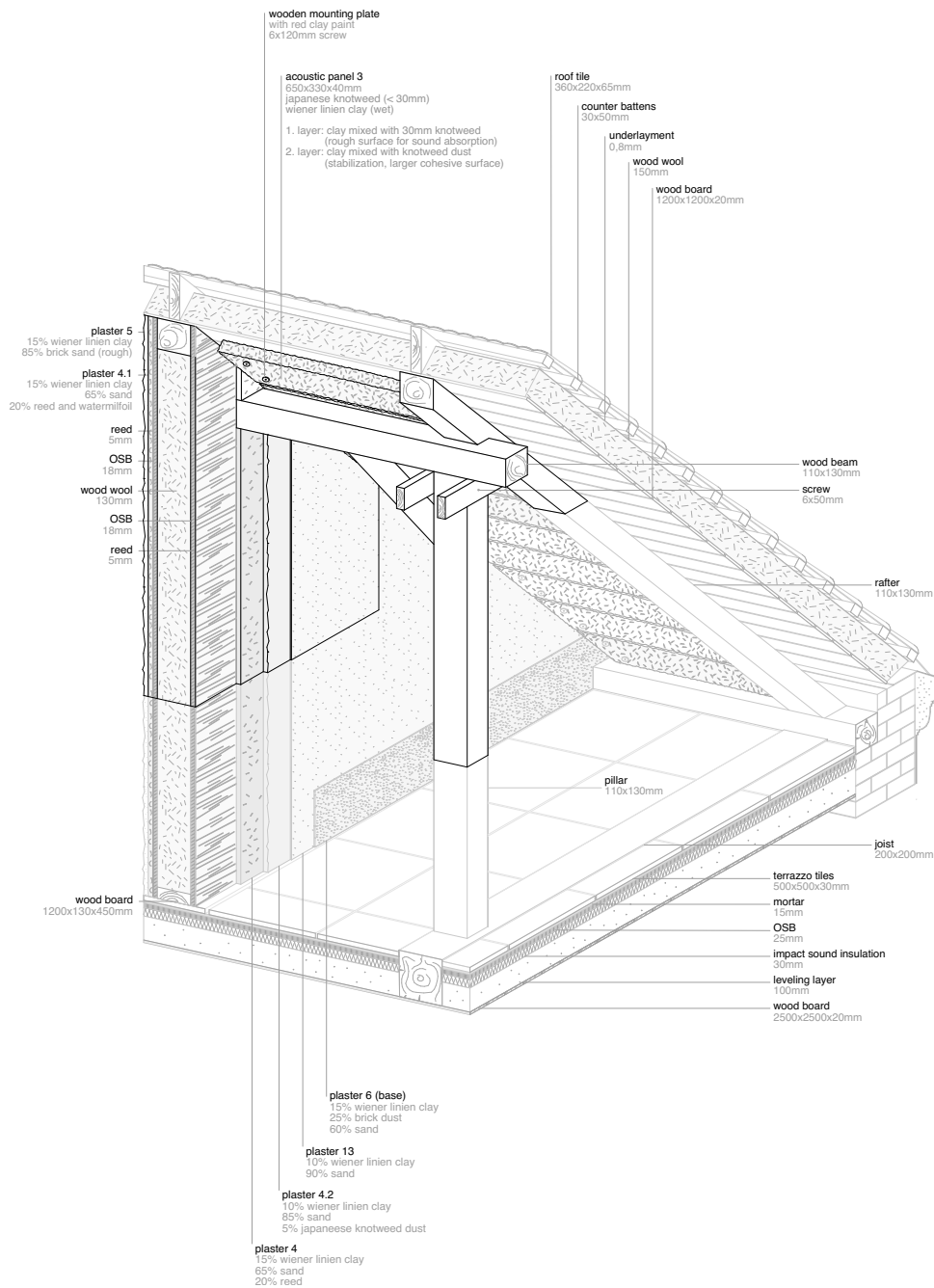
6. Base Plaster

To further protect the wall and because of the aesthetics, the red base plaster is applied to wall A.



7. Acoustic Panels

The acoustic panels are attached using self-made wooden mounting plates with red clay paint and 6x120mm screws.



8. Habitable

Thanks to the improvements, the room is now habitable and the clay plaster improves fire resistance and creates a wonderful indoor climate.

Although Vienna continues to grow and the demand for housing increases, the attic spaces of many Gründerzeit buildings remain unused. While the city has long been a pioneer in affordable housing, most notably through the Gemeindebauten of “Red Vienna”, new developments often require the sealing of additional land.

So why not activate what already exists? And why not do so using sustainable, resource-efficient materials?

With the ongoing metro expansion, large quantities of Wiener Tegel clay are excavated daily. This material can be repurposed for interior applications, such as clay plasters used in the conversion of attic spaces. Unlike cement-based alternatives, these plasters are more sustainable and enriched with fibre additives sourced from invasive plants and other renewable materials.

Loam plaster offers excellent performance: it regulates humidity, contributes to the energy efficiency of buildings, and, if applied thick enough, may even provide fire resistance, though further testing is needed. In our 1:1 mock-up, clay plasters were applied to interior walls, and acoustics were improved using sound-absorbing panels made from Wiener Tegel and Japanese knotweed.

The result is more than just functional. The plasters and panels not only support sustainable retrofitting but also offer a distinct aesthetic quality, enriching the character of interior spaces.

Compared to lime-cement plasters, loam plaster is slightly more sensitive but also significantly easier to maintain and repair. Small imperfections, such as holes left by nails or minor dents, can be corrected by lightly misting the area with water and smoothing the surface with a sponge.

For larger repairs, the process is similar. If new plaster needs to be applied, the existing surface should be slightly moistened to ensure good adhesion. Scratching the substrate can further improve the mechanical bond between layers.

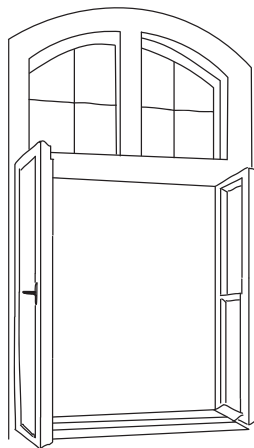
The acoustic panels are designed to be maintenance-free. If damaged, they can be easily removed and replaced.

Old panels can be crushed and reused as additives in the production of new ones, supporting a circular use of materials.

MAINTAINING

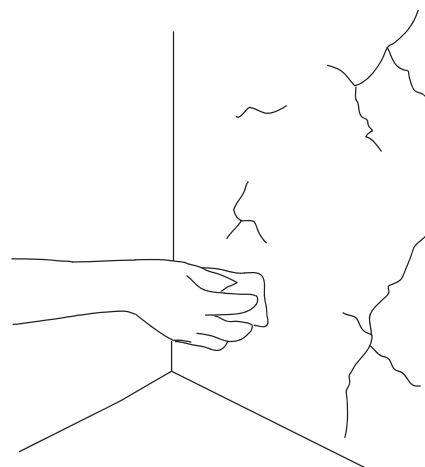


Cracked Plaster



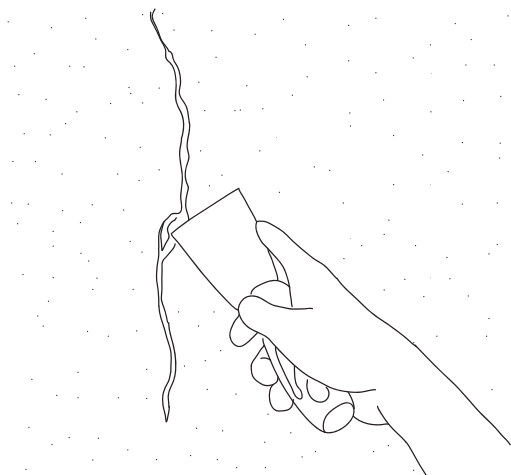
1. Airing the Room

Regularly ventilating the space helps improve indoor air quality and prevents moisture build-up. While not specific to loam, it is essential for maintaining a healthy interior environment.



2. Sponging

Small cracks or dents can be easily repaired by lightly misting the affected area with water and smoothing it with a sponge. This restores the surface without leaving visible marks.



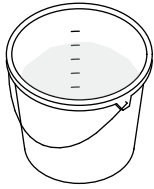
3. Repairing Cracks

Larger cracks require moistening the crack and surrounding area before filling it with fresh plaster. The surface can then be sponged to blend the repair seamlessly into the wall.

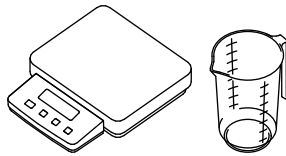


4. Replacing Panels

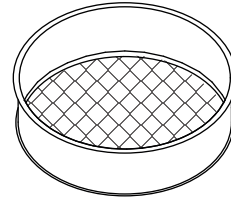
Damaged acoustic panels can be unscrewed and replaced. Old panels are not waste—they can be crushed and reused as material for new panels.



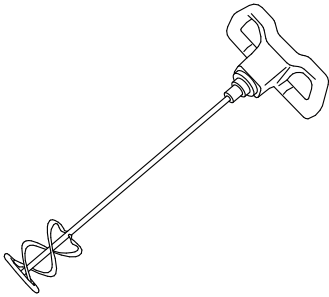
Bucket



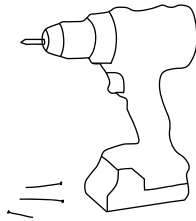
Measuring Tools



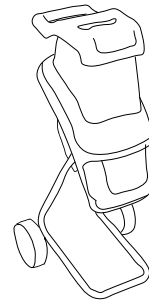
Sieve



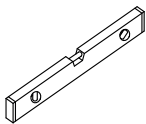
Mixer



Drill



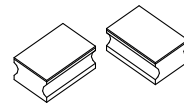
Shredder



Level



Spray Bottle



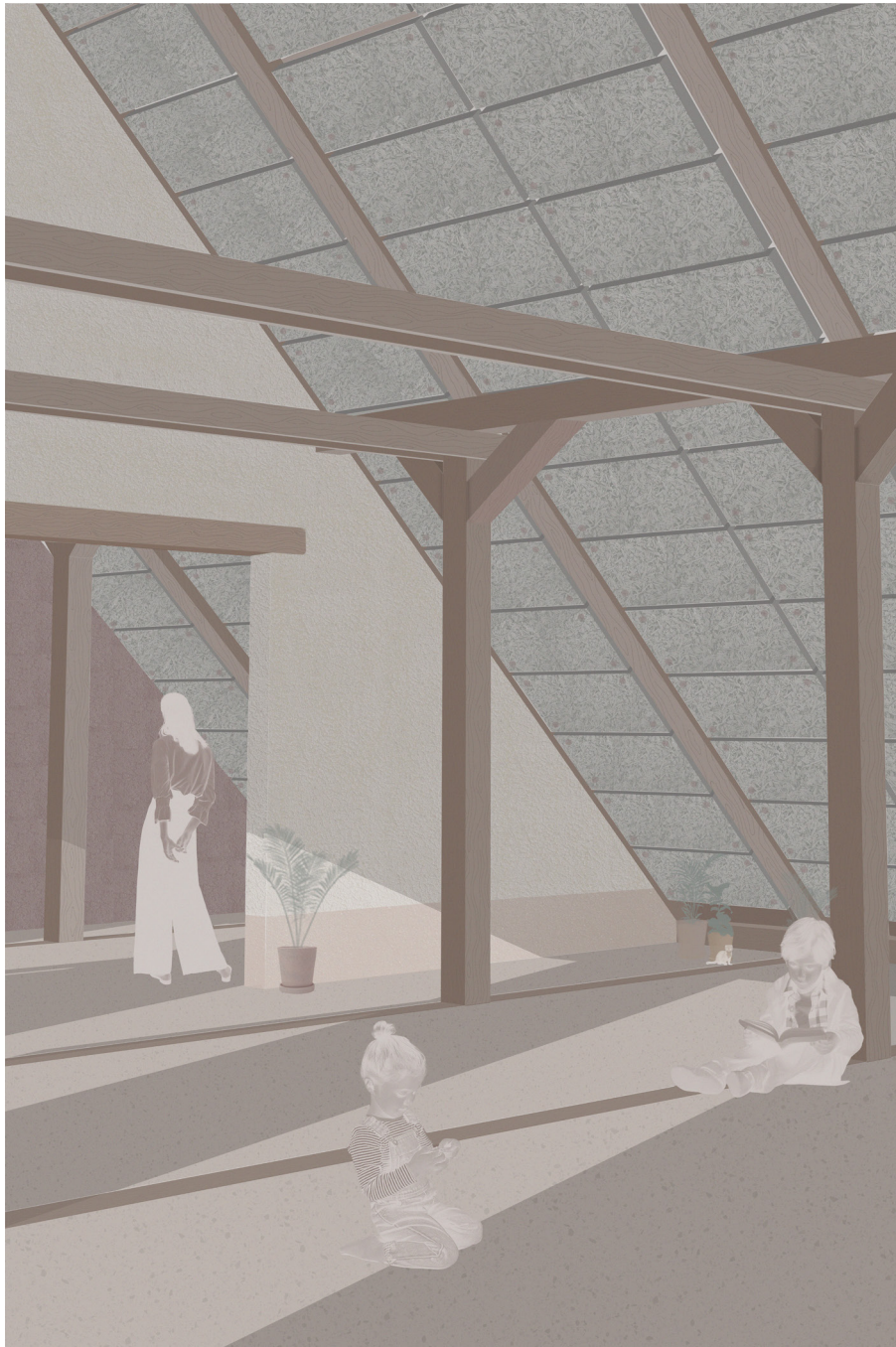
Sponge

The realisation that natural resources from our immediate surroundings, often dismissed as waste, can be used in construction was a valuable insight. It also invites a broader rethink of standardised building materials, many of which are far from sustainable. Wiener Tegel, for example, is not only ideal for brick production but also well-suited for plasters, sound panels, and many other applications.

Loam-based plaster holds great potential in Vienna, especially as the demand for sustainable and environmentally friendly construction continues to grow. As a natural, non-toxic, and biodegradable material, it fits perfectly within ecological building practices. It also offers strong thermal insulation and moisture regulation, improving both indoor air quality and living comfort.

In our project, we used this plaster to renovate attic spaces in Gründerzeit buildings, showing how local materials can enable resource-efficient and respectful upgrades of existing structures. The large quantities of Wiener Tegel clay excavated during metro construction offer a clear opportunity for reuse, supporting circular strategies while reinforcing Vienna's architectural identity.

REFLECTIONS



in partnership with

