A pilot project for newly developed earth blocks in a renovation context

The following project marks one of the first pilot applications of BC materials' compressed earth blocks in Belgium. It provided an opportunity to assess the material in real-world conditions, with early observations on handling, storage, and sequencing on-site.

Set in a renovation context, the project carefully considered the connection between the blocks and the existing structure, as well as the acoustic performance required between residential units. These first experiences revealed practical challenges and generated lessons that informed subsequent projects.

Co-housing 50&c.O.
BOB361 architects

This co-housing project in Ostend, named 50&c.O., transforms a former youth centre into ten residential units. The transformation unfolds across two distinct yet connected parts of the site. At the street side, a nineteenth-century manor house has been carefully renovated to contain six apartments, preserving its architectural presence while reconfiguring the interiors. Behind it, the structure of a disused warehouse has been adapted to support a new rear volume containing four patio dwellings. The architectural approach works with the qualities of the existing buildings, introducing generous shared spaces such as green communal areas, and rooftop gardens to enhance both spatial experience and social connection.

From the start, the design was guided by an ambition to preserve and pair the existing structure with materials that express both ecological responsibility and architectural quality. Central to this approach is the extensive use of stabilised compressed earth blocks, applied exclusively as infill masonry within the renovated manor house and the adapted warehouse structure. Their consistent use across the project makes them a defining feature, demonstrating their potential for extensive application in renovation projects, particularly where existing structures are adapted for multi-unit housing and where the distinctive properties of the earth blocks add value.

During its development, the project served as an active case study within the living lab, involving regular site visits and conversations with architects Goedele Desmet and Hendrik Verlinden. These exchanges provided valuable insights into the design decisions, construction challenges, and technical adaptations that are required to integrate earth blocks within a complex renovation context.

location: Ostend, Belgium
earth blocks: BC materials - stabilised compressed earth blocks, unstabilised earth mortar
client: private
contractor: Verstraete.team
year of completion: 2025

View of the exterior during construction, showing the existing structure and some of the new additions

View of the building site

About the building: A pilot project for newly developed earth blocks

When BC Materials was searching for a pilot project to apply their newly developed compressed earth blocks, 50&c.O. offered the right combination of opportunity and ambition. The design's ecological focus, combined with a substantial number of non-load-bearing interior and separating walls, provided an ideal low-risk setting to test the material under real construction conditions.

For the architects, the choice aligned with their broader approach of using sustainable materials in ways that feel integral to the design rather than added on. It also provided an opportunity to actively contribute to the material's early implementation by serving as a pilot project, helping to bring the product to the market. Although extensive research had already been carried out in neighbouring countries, that knowledge needed to be translated into a Belgian context, bringing together architect, contractor, and producer in a process of exploration and shared learning.

The blocks are used in two ways. First, earth block masonry is inserted and carefully integrated within the retained structures of the manor house and the former warehouse frame, establishing a clear strategy for connecting with pre-existing building elements. Second, they are applied between individual dwellings, where acoustic performance was a critical concern. Although the blocks had not yet been certified in Belgium at the time, their use in this context was made possible through close consultation with an external advisor, who confirmed that the proposed wall assemblies would comply with the required acoustic standards.

The project was also the first construction site visited by the living lab team, providing early observations on the practicalities of building with earth blocks, from handling and storage to sequencing on site. These experiences revealed implementation challenges and generated lessons that informed subsequent projects.

Execution of the earth block masonry

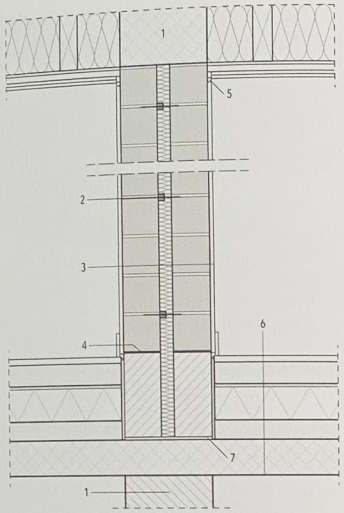
Valuable lessons learned in this pilot project with compressed earth blocks

The compressed earth blocks were laid using unstabilised earth mortar, a material well suited to the non-load-bearing interior and separating walls in this project. This choice aligned with the project's ecological goals and contributed to a fully circular construction approach, allowing dismantling, block recovery, and reuse at the end of life. However, the use of earth mortar also introduced specific challenges. Even when hardened, the joints remain more fragile than those made with conventional mortars, especially when the masonry is left exposed during the construction process. In practical terms, the longer setting time of the mortar affected the construction pace; fresh masonry could only be built to a height of around one metre before pausing for at least seven days to allow for adequate drying. While this extended timeline required careful planning and more deliberate sequencing, it helped to ensure structural stability throughout the process and reduced the risk of deformation or joint damage as construction progressed.

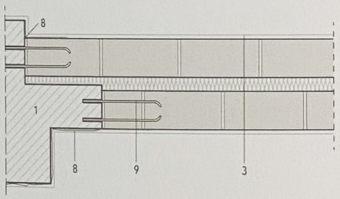
The vulnerabilities of the exposed joints became particularly evident due to unexpected delays in the project's timeline. The earth masonry was completed well before the building envelope was made airtight and watertight, leaving the walls exposed for nearly a year. To prevent the mortar from being washed out during this period, the walls were carefully covered, yet over the prolonged duration, some water inevitably seeped in, washing out the joints in several areas and making repairs necessary. A second weakness of the earth mortar became apparent when the electrician began cutting channels for wiring and the crumbly texture of the mortar caused it to break away easily. While this fragility does not necessarily indicate a lack of structural strength, it does present practical challenges. The architect acknowledges this limitation but notes that such mortars remain well suited to applications where no cutting, chasing, or drilling is required after completion.

The project also revealed some logistical challenges. At the time, earth block production in Belgium was still at an early stage, where the demand for blocks was relatively low, and production occurred only at specific times. Since construction schedules often change, predicting the exact timing for on-site block delivery is challenging, creating storage issues for producers and construction sites, especially in densely built areas. However, these challenges are mainly related to introducing a new material to the market, where production, supply chain, and application still require scaling up rather than being inherent to earth blocks themselves.

The use of earth mortar also presented a learning curve for the bricklayers, for whom this was a first-time experience. The mortar behaved differently from conventional masonry mortars, with a stickier consistency that initially slowed their progress. To improve workability, the masons instinctively added soap, a technique sometimes used with other mortars, but this significantly weakened the adhesion between the mortar and the earth blocks. After consulting with the material producer, they strictly followed the recommended technical specifications, which improved the outcome. Despite these challenges, the overall masonry process, including laying the blocks, cleaning, transporting, cutting, and finishing, was comparable in method and effort to conventional masonry once the team became familiar with the material's behaviour. However, the overall construction timeline remained longer due to the required drying periods. The experience nevertheless showed that integrating earth block masonry into mainstream practice is achievable with appropriate training and planning.



detail 1/20 - vertical section through an interior wall between two residential units



detail 1/20 - horizontal section through an interior wall between two residential units

1 existing structure

2 acoustic cavity tie for decoupling two cavity leaves

3 wall build-up:
earth plaster (15 mm)
compressed earth block masonry (140 mm)
acoustic insulation (50 mm)
compressed earth block masonry (140 mm)
earth plaster (15 mm)

4 moisture resistant membrane

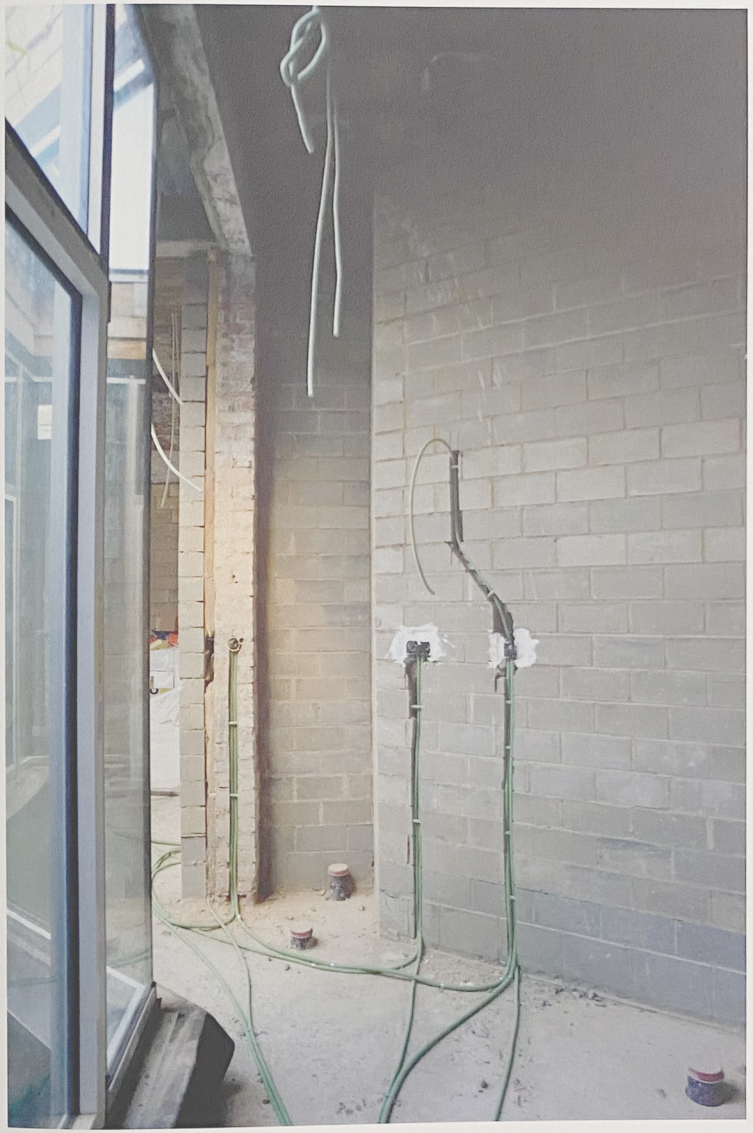
5 sealant joint

6 floor build-up:
parquet (22 mm)
screed with underfloor heating (80 mm)
vapor barrier
acoustic insulation(10 mm)
gutex thermosafe WD (120 mm)
protection layer
screed with embedded pipe channels (70 mm)
existing struture (130 mm)

7 pressure-resistant acoustic strip

8 reinforcement mesh made from flax fibers

9 masonry anchor fixed in the load-bearing structure



The earth block masonry during construction

Detailing

At the base of the wall, the connection to the concrete plinth and the waterproofing layer is made using earth mortar, ensuring a continuous and compatible junction between materials. The top connection to the ceiling or structural beams is also made with earth mortar, but only after the masonry has had time to settle. This delayed application allows the mortar to stabilise and accommodate minor shrinkage during drying, reducing the risk of cracking before the final finishes are applied.

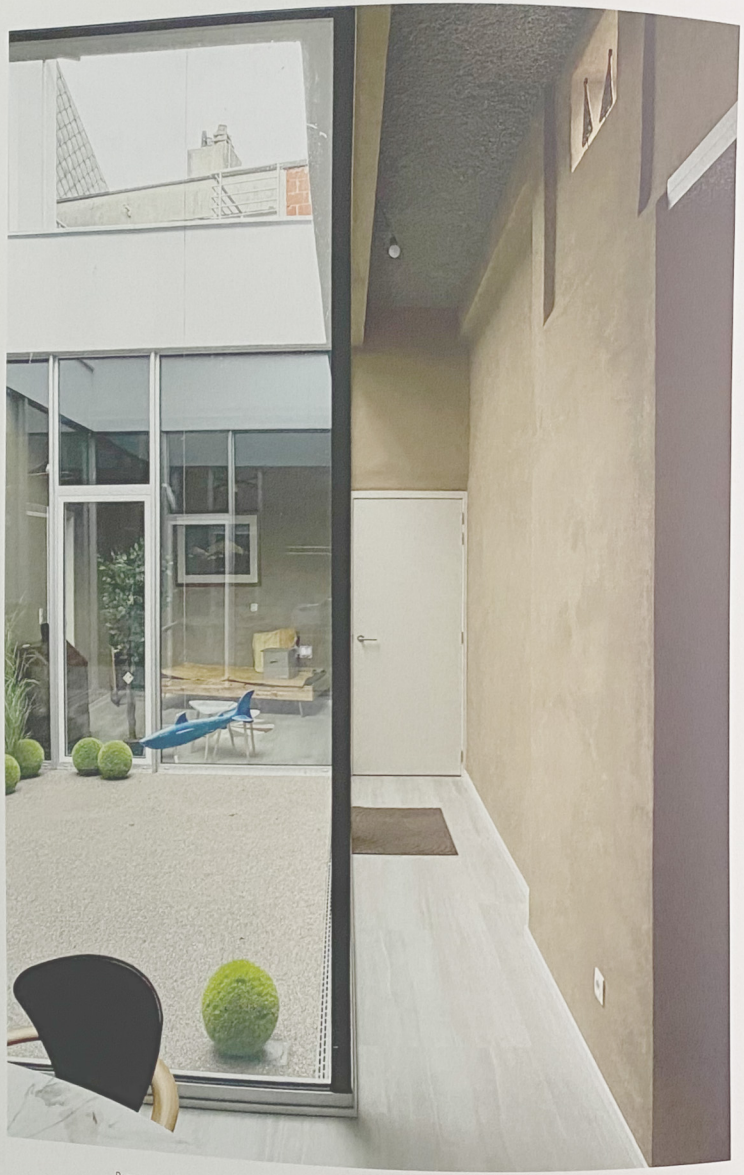
Between the residential units, acoustic cavity ties are integrated to decouple the double walls and improve sound insulation. They are embedded directly into the mortar joints, with U-shaped elements fixed into the joints to maintain stability without creating rigid sound bridges. Where earth blocks connect directly to existing masonry, a special L-type acoustic cavity tie is applied to ensure structural stability and sound insulation.

L-shaped metal bars or custom connection clips that the contractor selected are used for lateral anchoring to the existing building structure. These are inserted every three rows and secured with earth mortar to provide a consistent attachment between the earth block walls and the original framework.

An earth plaster is applied over most wall surfaces, ensuring airtightness of the earth block masonry by sealing joints and corners. The plaster also prevents acoustic leakage through the mortar joints by covering any small gaps. In certain areas of the project, however, the masonry remains unplastered. In these zones, the quality of the execution is especially critical; the mortar joints must be completed with care and precision to avoid gaps that could compromise the acoustic performance of the wall.

As the building approached completion, the question of load fixings became a point of attention. The kitchens were not fixed to the masonry because the team could not yet confirm the suitability of the walls for this type of attachment. This situation made clear that future projects would benefit from explicit guidance on the possibilities and limitations of load fixings on earth block walls.

View of the interior and lime plastering



Perspective of one of the interiors with the earth plastering by Jos Maene from 'Bouwen met Leem'

Finishing of the earth block masonry

In this project, the earth blocks were primarily applied with the intention of being plastered afterwards. The masonry interfaces with various materials, ranging from existing brickwork to concrete lintels, making earth plaster a logical and often necessary choice to ensure continuity and coherence across the surfaces.
Rather than emphasising the blocks as a visible element, the approach explores how compressed earth blocks can function as a sustainable and ecological alternative to conventional building blocks. However, using earth plaster still contributes to the spatial quality of the interior. It adds a tactile and sensorial dimension that enriches the atmosphere while maintaining a more conventional and calm visual appearance.

Application in wet rooms

In several residential units, earth blocks are also used in the bathrooms. This requires specific attention to detailing and finishing. The blocks can not be exposed in areas subject to frequent water contact, such as showers or around washbasins, but are protected locally by water-resistant layers. At the same time, breathable wall finishes are prioritised wherever possible to maintain the material's natural qualities.

To ensure that any internal moisture can migrate outward and evaporate, at least 20 percent of the total surface area of the earth block masonry remains free of vapour-tight finishes. Crucially, earth block walls are never sealed on the drier interior side, allowing vapour to escape and supporting the material's performance and the overall indoor climate.

Application in the living areas

A traditional layered earth- or lime plaster system is used in the main living spaces. The first step involves placing a reinforcement mesh across irregular surfaces, especially at junctions between materials such as concrete lintels, utility boxes, or pipe chases. This ensures that the plaster behaves consistently across the surface and it prevents cracking.

A base coat of earth plaster is then applied to level the surface. Depending on the substrate's condition, the base coat's thickness ranges from 6 to 15 millimetres. Once thoroughly dried, a top coat is applied. This final layer, typically 3 to 6 millimetres thick, provides a unified visual appearance and defines the final texture and tone of the walls.

Project reflections

In many ways, 50&c.O. is as much about a process of discovery as it is about the transformation of a building. As BC materials' first pilot for their newly developed stabilised earth blocks, it provided a unique opportunity to test a material still finding its place in the Belgian construction market. The project became a meeting ground for architectural and ecological ambitions, as well as material innovation and practical experience, each influencing the other throughout the construction process. What emerged is not only a functioning co-housing complex, but a tangible demonstration of what earth blocks can offer in the layered reality of urban renovation.

The work on site provided lessons that became an early reference within the living lab, shaping the approach taken in subsequent projects. The use of unstabilised earth mortar offered ecological and circular benefits, resulting from its lower embodied carbon and its capacity to allow future reuse. Still, it demanded a slower and more deliberate building rhythm, careful protection during periods of exposure, and clear communication with all trades. The project also exposed the logistical realities of early market introduction, from timing deliveries to ensuring adequate dry storage in a dense urban setting. While these challenges were specific to the material's early production stage, they highlighted the value of aligning design intentions with practical execution strategies.

Throughout the construction process, the architects' view of the material remained consistently positive, and working with it on site only deepened their appreciation for the blocks. This hands-on experience gave them a clearer understanding of the material's behaviour and has strengthened their confidence in proposing it for future projects. At the same time, they note that such a choice is most effective from the very start of the design process. While it is always possible to change from earth blocks to a more conventional alternative like concrete blocks, making the reverse change becomes far more difficult once other decisions have been made. In their view, integrating the material early ensures it can be used to its fullest potential and incorporated in a way that feels integral to the architecture.

For both the contractor and the residents, questions about the behaviour of the masonry arose already during construction and continued after the building was occupied. On-site, the weaker joints of the earth mortar required additional protection and careful handling. These concerns resurfaced once residents began to personalise their interiors. They were often unsure whether shelves or other elements could be safely attached without compromising the wall's structural integrity. A further point of attention was that earth block masonry cannot receive all conventional finishes, which resulted in an additional cost for the earth plaster. These experiences highlight the value of addressing such aspects early in the design phase or verifying them through dedicated testing by the material producer so that both contractor and residents understand how the walls can be used and where alternative solutions are necessary.

Together, these experiences move the material from theory into everyday practice. The project demonstrates that earth blocks can be integrated successfully in renovation projects when sequencing, protection, and detailing are carefully managed. Just as important, it shows that when the architect, contractor, producer, and residents work together, a new material can be tested, improved, and eventually trusted. In this way, 50&c.O. is more than a completed building; it is a step forward in establishing earth blocks as a trusted and practical option within everyday construction.

Sources: On-site visits with architects Goedele Desmet and Hendrik Verlinden from BOB361 architects, and with contractor Bjorn De Cuyper from Verstraete team, as well as an online interview with architect Hendrik Verlinden.

View of the interior and lime plastering