

Editor's Note

DOI
– 10.14195/1647-8681_16_8

The aim is to add a reflection on the theme of this edition, based on practical cases, that is, with publications on already-constructed works.

Projects were selected from studios operating in a Mediterranean environment, with one exception that can still be placed within the geographical limits set out in the call for articles, despite its location outside the Mediterranean basin and its harsher climate.

The selection criteria implied a focus on buildings which are unique in character; when published together, they offer a comprehensive and complementary response to the questions raised in this issue of *Joelho*, namely the urgent need for a move towards sustainable architecture. This response can be found in the architectural language of each case, arising from specific considerations at the stage of designing and building in each setting.

When searching for solutions that contribute to reducing carbon emissions, both in the construction and use of buildings, the whole and its parts are, as usual, inevitably related; the use of a certain material implies a certain system of construction, which is a decisive factor in defining its spatial and typological features.

An approach to architecture is called for that guarantees interior thermal comfort and responds to the climatic conditions of the

location, without resorting to mechanical environmental control systems. The strategies for such an approach summon the accumulated experience which has been perfected over centuries by vernacular architecture, particularly in terms of materials, construction systems and spatial solutions. There is a recognizable constructive past born from the close, ongoing relationship between people and place; this often supplies the most appropriate option for the climate crisis we are going through today.

The project '6×6 block' (Girona) by the Bosch+Capdeferro studio puts forward a flexible-use typology, the result of a construction system with self-supporting CLT walls. The structural system harks back to traditional (pre-concrete) construction and a use of space with identical dimensions between load-bearing elements. The lack of areas for circulation optimizes the useful area of the house. The centrally located service area allows users free use and appropriation of the spaces adjacent to the façade. The access gallery and the balcony provide cross ventilation for the apartment, working to regulate the internal environment in both winter and summer.

The work 'Vivendas sociales 2104' (Mallorca) by the Harquitectes studio is considered a case of 'urban mining', with its reuse of material from a pre-existing building.

A public tender promoted by the Balearic Housing Institute (Instituto Balear de Vivienda – IBAVI) has certain similarities to the previous project. The construction system features self-supporting walls, consisting of stone blocks and cyclopean concrete, carried out on site, with horizontal self-supporting CLT elements placed upon them.

The construction option can be seen in the façade of the building, employing a language which is reminiscent of traditional stone construction; the thickness of the walls progressively decreases on each floor, leaving space for the slab structure to be laid. It has a very similar typology to the '6×6 block' project, but with three modules instead of six, the service area being located in the central module and the living spaces next to the facades.

Another project carried out by IBAVI in Santa Eugenia (Mallorca), coordinated by municipal architect Carles Oliver Barceló, is an example of quality, publicly promoted architecture. Indeed in Spain, state collective housing arising from public tenders is of more interest than that which is privately promoted. Public tenders serve as a catalyst for joint reflection on current issues in architecture, particularly sustainability.

Quarrying stone for direct use in construction allows for greater monetization of the material than that normally carried out for cement production and implies significantly reduced carbon emissions. The building uses a traditional construction system with local stone (Marés) and shows improvements over the cases previously carried out by IBAVI, the aim being a low-carbon construction system that is easier, faster and more economical to build. This project is founded on thorough, rigorous and near-obsessive research in the search for sustainable solutions for the construction,

performance and use of buildings in the Balearic Islands. These could be applied to other Mediterranean islands due to the similarity of their insular condition — with limited natural geological and climatic resources.

The K118 pilot project is by Swiss studio Baubüro in Situ, located in Winterthur, and changes the current paradigm of undertaking an architectural project. Circular construction changes the way the materiality and construction system of a work is defined. Reusing materials and elements from other buildings means that the architect is restricted to the opportunities that may arise and traditional freedom of choice is lost. Therefore, the spatial development of the project does not necessarily correspond to any pre-defined materiality and construction system, as these are part of the ensuing selection process.

The implications of this paradigm change also extend to the concept of aesthetics in architecture. A work's architectural language does not result from prior thinking and design that connects the programme to the space and the material; rather, it develops from the selection of diverse materials and elements that, with the support of the factor of time, build a self-defining aesthetic.



6 × 6 Block



Girona, Spain

DOI
– 10.14195/1647-8681_16_9

Located in an urban environment of transition between the compact city and the open block ensanche characterized by an important presence of public facilities, the project proposes the design of 35 apartments based on criteria of program flexibility and reduction of the carbon footprint throughout the life cycle of the building.

The use of cross-laminated timber panels (CLT) for the construction of the volume above ground brings back the traditional structural wall typology and defines living spaces of similar dimensions between loadbearing elements.

The project draws on the local tradition of cantilevered galleries built on the ancient wall that separated the city from the Onyar River. The apartments are composed of six rooms of 12 m² each capable of containing a multiplicity of uses and designed to be connected at will, suggesting a free appropriation of each space and incorporating any possible changes in the program over time according to the wishes or needs of their inhabitant, as well as allowing for the possibility of housing community spaces (nursery, gym, workplaces, collective kitchen-dining room ...). The chaining of pieces allows, in both bays of each apartment, a complete perception of the total depth of the building and the simultaneous incidence of light from the south and from the north, even in the spaces furthest from the façade planes.

Typology

– Residential

Area

– 4,375.50 m²

Promoter

– Private

Collaborators

- Raül Elias (project leader)
- Arnau Arboix (architect)
- Xavier de Bolòs (technical architect)
- L3J arquitectura i enginyeria (facilities consultants)
- Societat Orgànica + 10 s.c.c.l., (sustainability consultants)
- Blázquez Guanter s.l.p. (structural consultants);
- SiS consultoria acústica s.l. (acoustic consultants)
- Incafust, Institut Català de la Fusta (quality control and counselling)
- Egoín technical services

Builder

- Estructuras Ultra, Egoín, Alumilux, Jaume Fusters, Placoguix, Elèctrica Riam, EIS Girona, Telecta

Completion date

– 2020

Photographer

– José Hevia

In addition to reducing the energy embedded in the construction, the project makes a significant effort to reduce the energy demand necessary to guarantee the comfort of the living spaces, combining good insulation and cross ventilation with the maximum use of solar radiation.

The location of a gallery as a habitable greenhouse on the south façade allows the passive preheating of the air intake of the ventilation system in winter, while in summer the direction of the circuit is reversed and the gallery is reconfigured as a shadehouse in contact with the environment.



fig.1 Orthophotograph.





fig.2 Site plan.





fig.3 North elevation.



fig.4 South elevation.





fig.5 Typical floor plan.

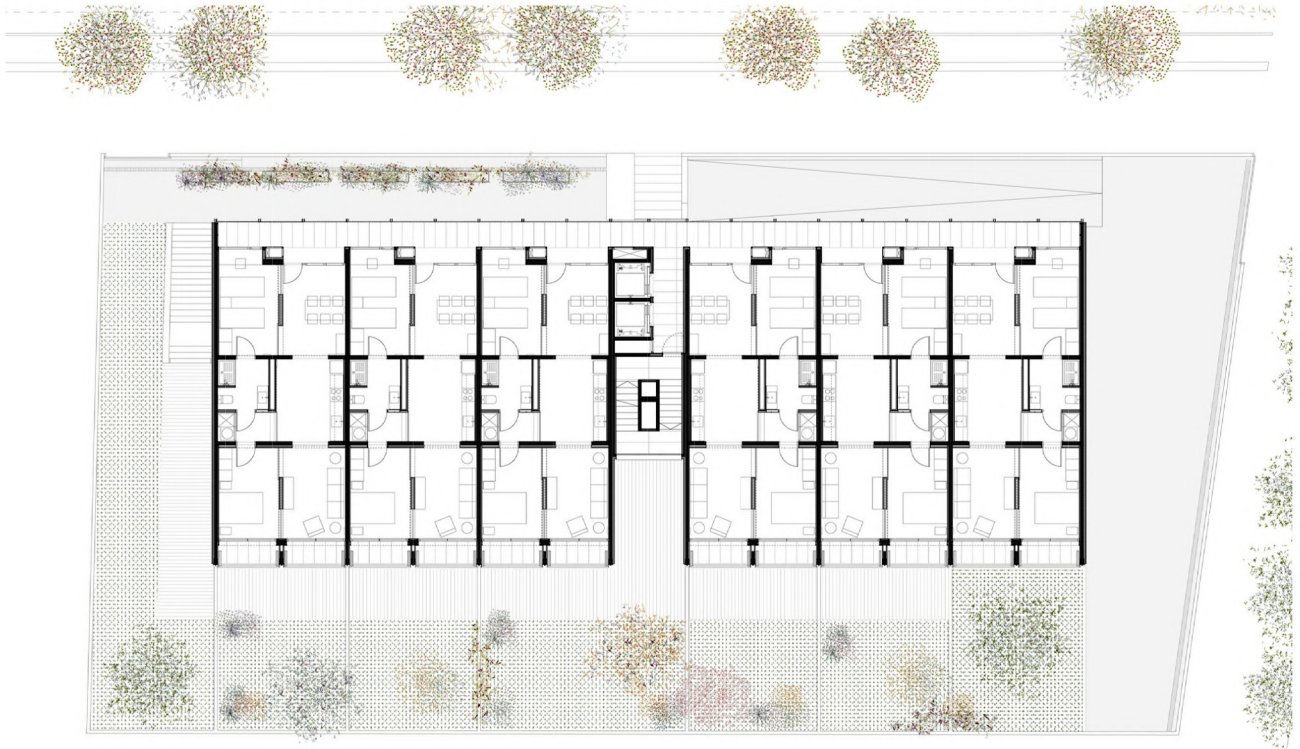






fig.6 Cross section.

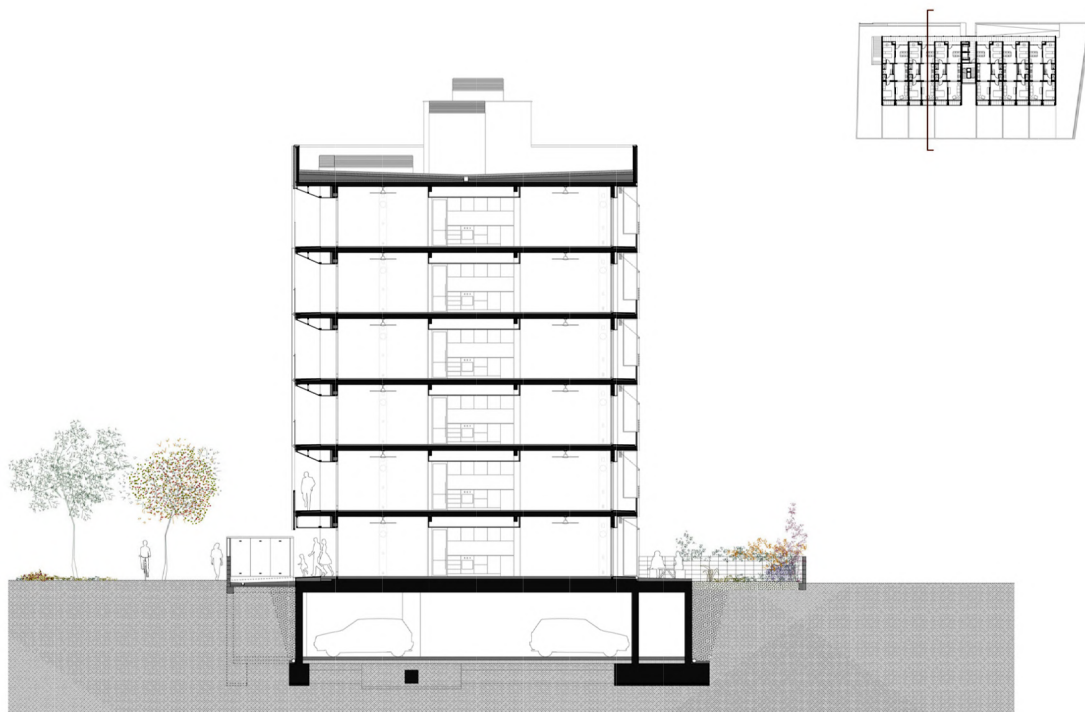
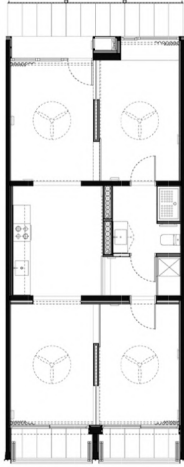
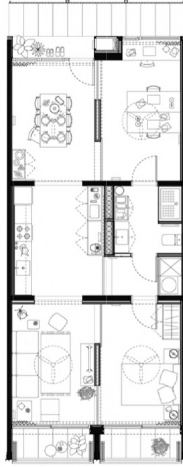


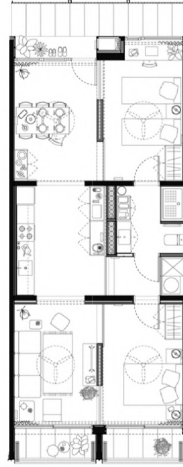
fig.7 Hosting domesticity (above) and the extraordinary hosting collectiveness (bellow)



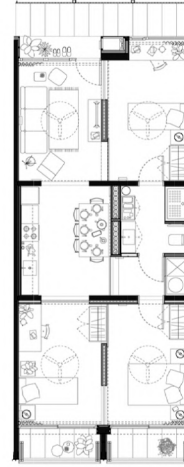
apartment unit



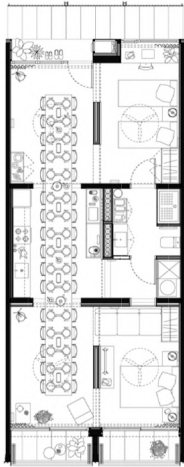
1 bedroom



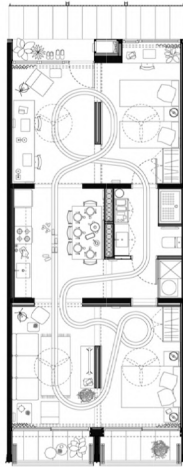
2 bedrooms



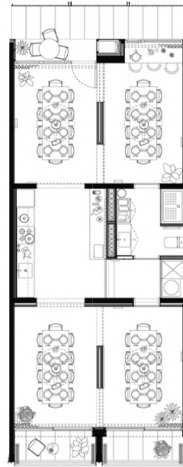
3 bedrooms



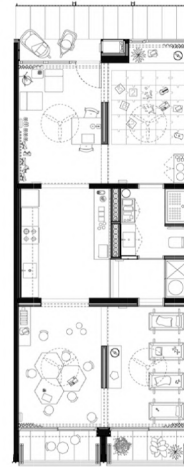
celebration dinner



slot car racing championship



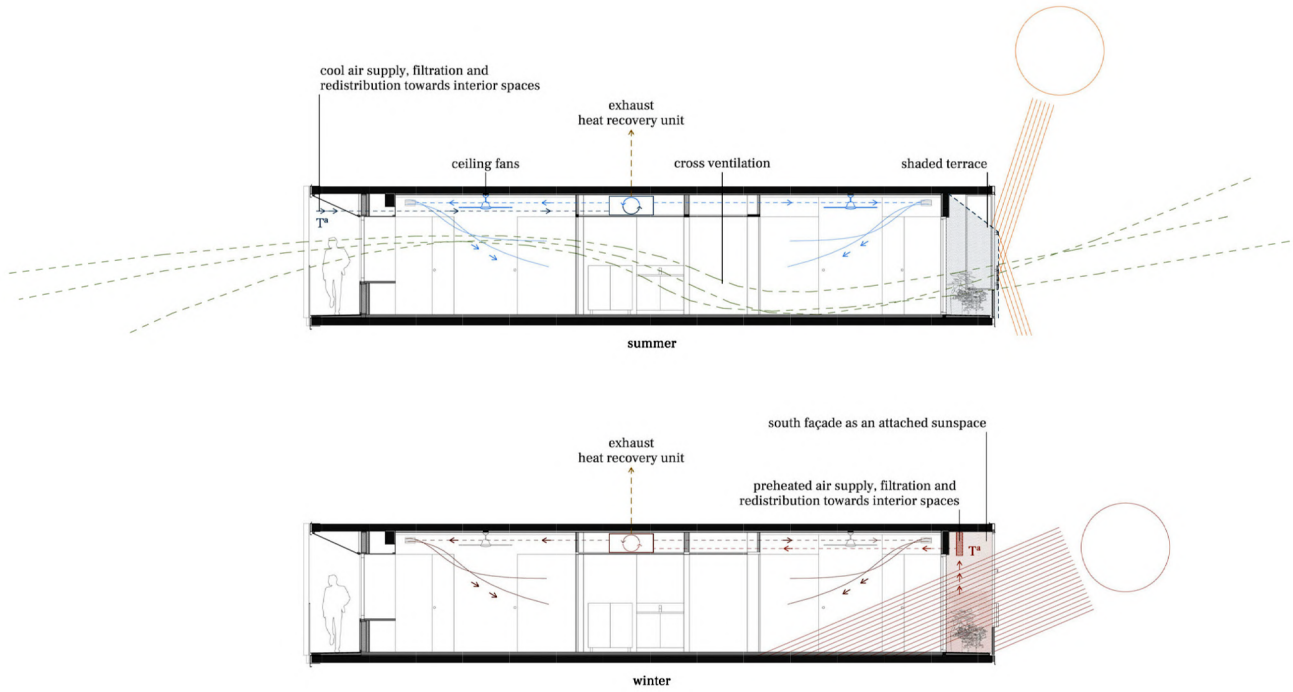
canteen



nursery



fig.8 Cross section.







25 Endowed Housing Units

Palma de Mallorca, Mallorca, Spain

DOI
– 10.14195/1647-8681_16_10

On the site where the dwellings are to be constructed is an existing unused school, the bad state of which makes it impossible to preserve. The main strategy of the project is to reuse the materials from the demolition of the old school to construct the new building, with an “urban mining” approach where the resources are mainly from the existing urban plot.

Almost all the debris from the demolition is reused, some just thrown into the shaft foundation, and the marés stone to create big blocks of cyclopean concrete. These are piled to build bearing walls perpendicular to the street, narrowing in each storey to allow the cross-laminated wood slabs to rest directly on the walls. Perpendicular to the main walls, thinner walls of the same materials fix all the structure of the building alongside the stairs and lift core.

The spatial and programmatic organization is in accordance with the structural system; the plan is organized with a stairwell core in a corner, giving access to a passageway in the inner courtyard, where the accesses to each dwelling are located, all of them double façaded except the semi-basement and the attics.

The façade clearly shows the structural system of the prefabricated blocks, thinning in each storey and supporting the wooden slabs. Each of the apartment façades highlights large wooden balcony frames with an opaque side and rolling shutters to protect from the east and west sunlight.

Typology

– Residential

Area

– 1,610 m²

Architects

– David Lorente, Josep Ricart,
Xavier Ros, Roger Tudó

Collaborators

– Anna Burgaya, Ángeles Torres,
Cynthia Rabanal, Victor Jorgensen

Team

– Xavier Suárez (quantity surveyor)
– DSM-arquitectes (structure)
– M7 enginyers (engineer)
– Societat Orgànica
(environmental consulting)
– MC acústica (acoustics engineer)

Project years

– 2021–2022

Construction years

– 2022–2024



fig.1 Site plan.

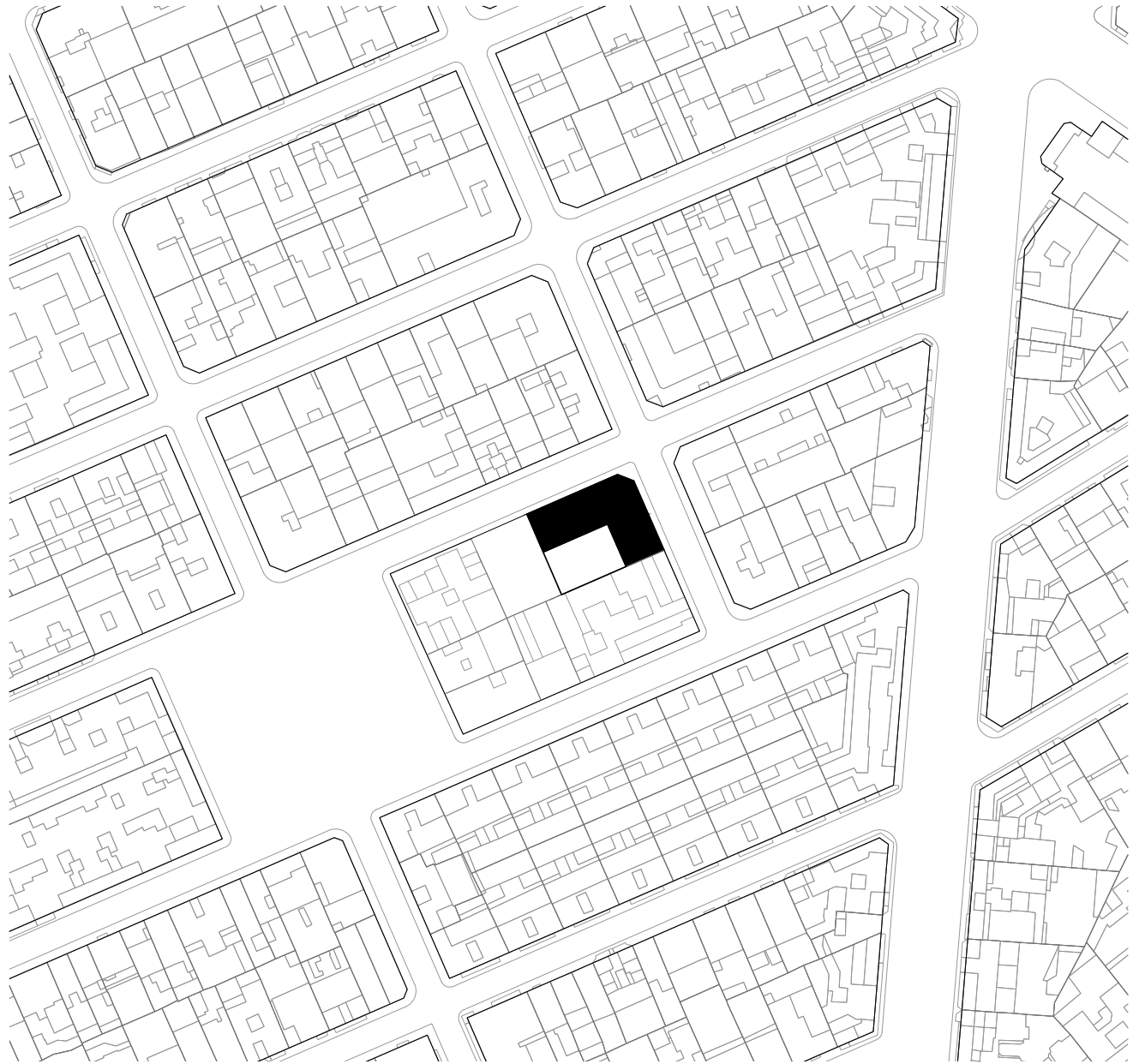
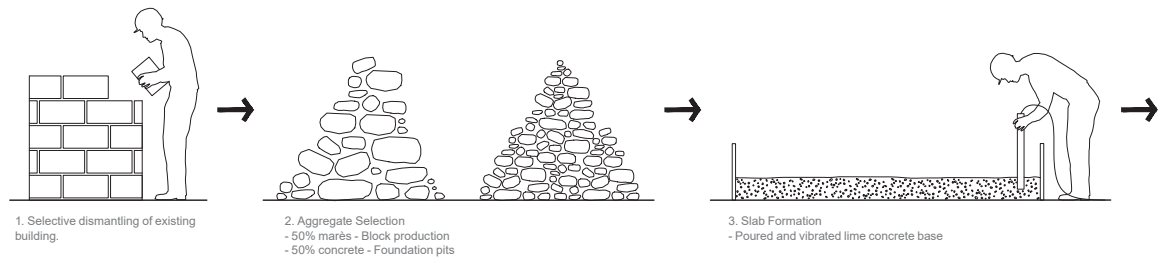
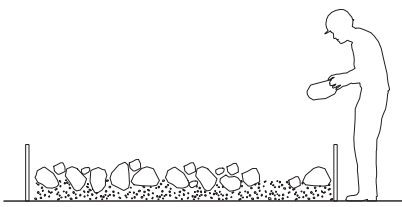
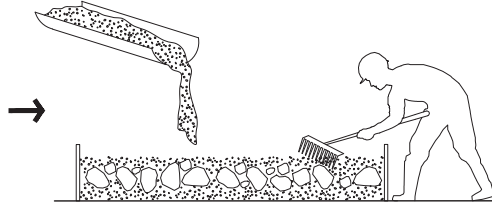


fig.2 Blocks construction process.

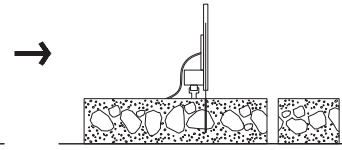




4. Slab Formation
- Laying reclaimed marès



4. Slab Formation
- Lime concrete poured, vibrated, and leveled



5. Cutting the slab to make the blocks, using a disc

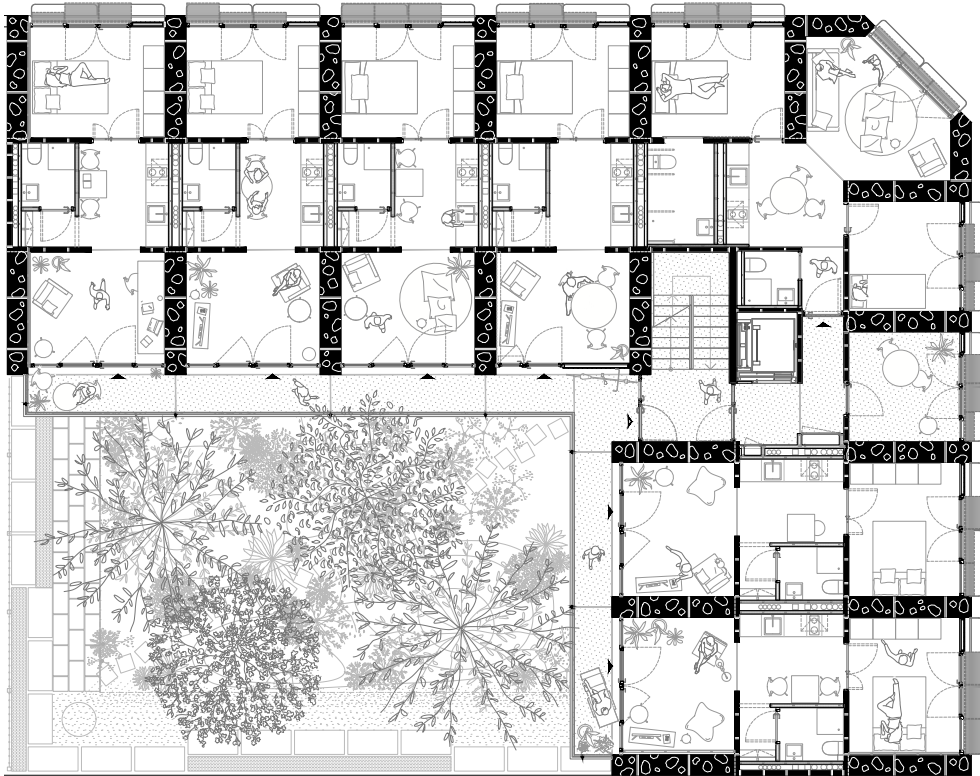








fig.3 First floor plan.



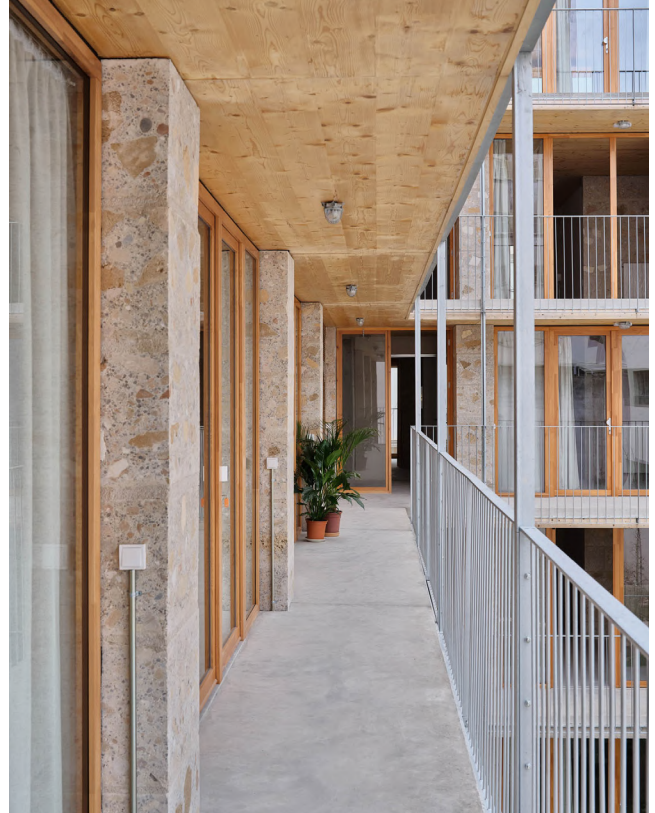


fig.4 Cross section.

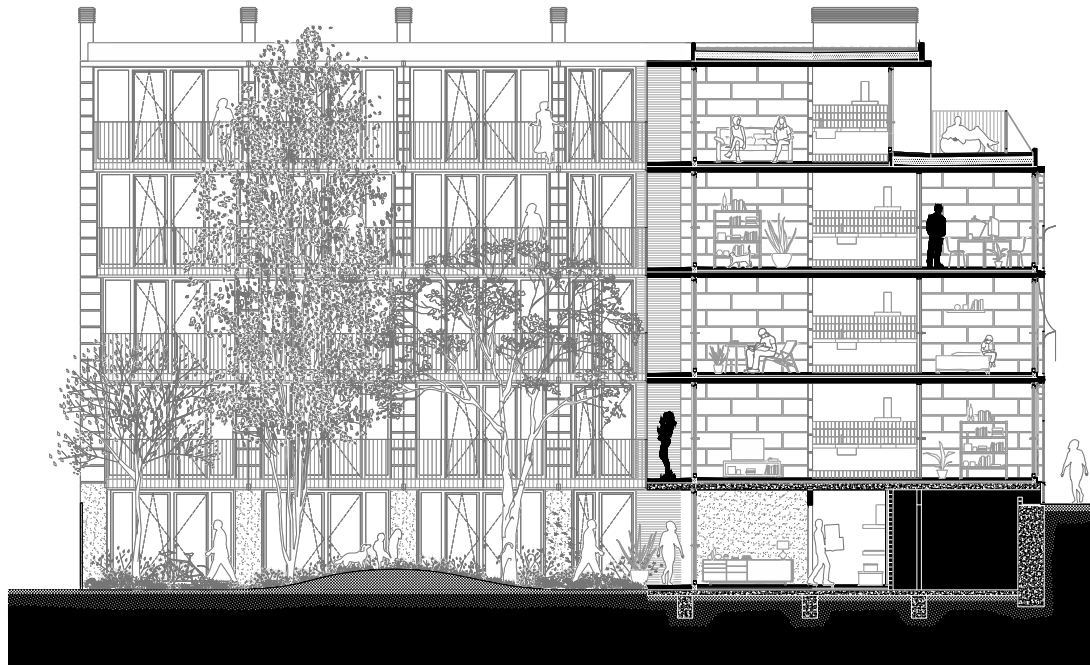


fig.5 Long section.







fig.6 Axonometry.

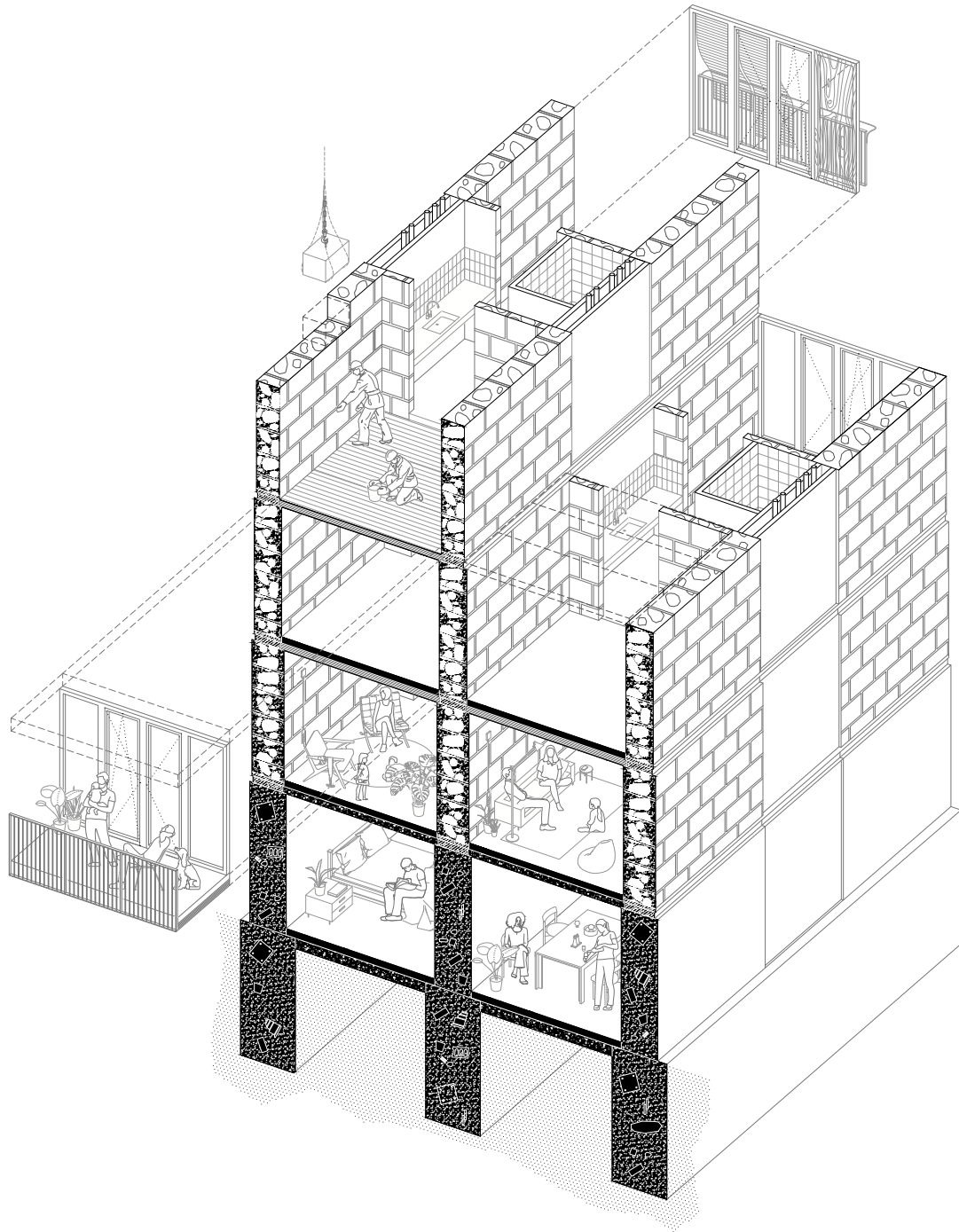
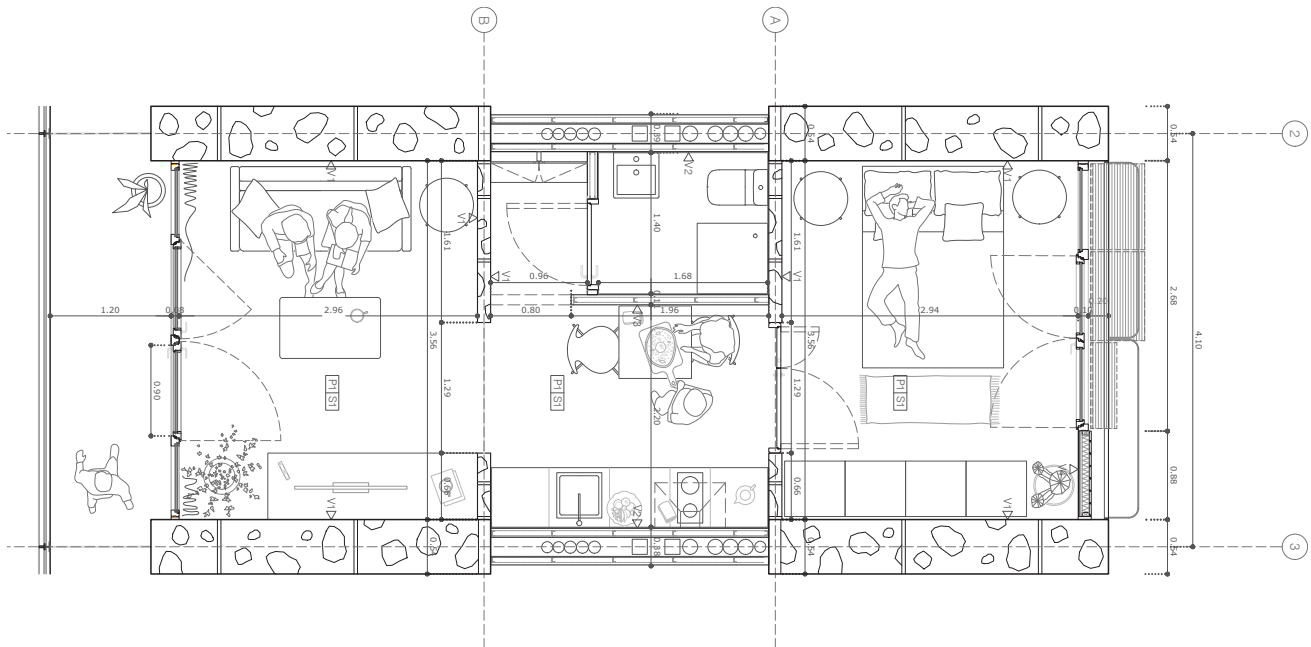


fig.7 Typology.







Six Social Housing Units

Santa Eugènia, Mallorca, Spain

DOI
– 10.14195/1647-8681_16_11

Programme

Completed in 2023, these six social housing units on a rental basis in Santa Eugènia, Mallorca, were designed by civil service architects of the Balearic Institute of Housing (IBAVI), a public agency of the regional Balearic government, responsible for providing and maintaining social housing.

There are three homes on the ground floor, and three homes on the first floor. Access to the dwellings is through the rear courtyard along the east-facing party wall, to provide a common space as green as possible for the neighbours, and to improve the sense of community. In addition, all the dwellings have a little private outdoor patio at the entry, which after COVID-19 has proved to be very necessary.

Urban Context

Santa Eugènia is a small, picturesque town with 1,800 inhabitants, twenty minutes from Palma. IBAVI has been developing social housing buildings around the four Balearic Islands, at the scale of every city and town. Since this is one of the first buildings you see when you arrive in Santa Eugènia from the Palma–Sineu Road, just below the main church of the town, landscape integration was essential to eradicate the stigma suffered by social housing. However, landscaping has not been solved with form, but with the

Typology

– Residential

Area

– 578.92 m²

Promoter

– Instituto Balear de la Vivienda (IBAVI)

Architects

– Carles Oliver Barceló, Xim Moyá

Collaborators

– Miquel Canyelles, Ernest Bordoy, Edu Yuste, Lara Fuster, Aina Pons

Structure

– Bernabeu Ingenieros S.L

Installations

– Miquel Ramon Oliver, Esteban Font Hocke (EEI ingeniería)

Quantity surveyor

– Marco Menéndez

Environmental consulting

– Societat Orgànica

Builder

– Obras y Construcciones Tomeu Rosselló S.L

Completion date

– 2023.02

use of local low carbon materials and the update of vernacular construction techniques as the most efficient way to use these resources.

When the work was finished, the neighbours said, very surprised: “they have not destroyed the town!”

Design Approach/New Productive Model

This project develops research into a new model of production and consumption for global social justice, well-being and integral sustainability started in Life Reusing Posidonia LRP (2012–2020), a climate change adaptation project funded by the EU LIFE+ programme, and is an update to eight social housing units in 39th Salvador Espriu St, in Palma (2018–2021). It aims to develop a low-carbon construction system that is faster, cheaper, easier, and more refined than previous buildings designed by IBAVI. In this sense, one of the main improvements over the previous projects is standardisation with natural materials. In this case, all the spans between pillars are the same to make the building easier to build, in order to compensate the extra cost of local low-carbon materials. The same applies to the windows, which have been arranged on vertical axes to make the walls and lintels simpler to construct.

In relation to the dwelling design, the main priority was to ensure the comfort of the user and to prevent energy poverty through passive bioclimatic solutions and locally sourced materials. The total heating and cooling energy demand is 4.80 kWh/m², which is a 65% reduction compared to LRP, and 85% compared to Passivhaus standard limits (15.00+15.00 kWh/m²). The energy demand has been also calculated for the year 2050, and it would be 6.40 kWh/m² with a theoretical scenario of +2^o C.

Environmental, Economic, and Social Sustainability: We Don’t Live in a House, but an Ecosystem

During its useful life, the building will produce emissions of 0.85 kgCO₂/m² year, according to calculations. This constitutes an 80% reduction compared to the minimum threshold for consideration as energy class A. Aerothermal heat pumps are used to heat water, and most of the energy needed for this process comes from pv panels. However, we consider the hypothesis developed by A. Valero in *The Mineral Limits of the Planet: Thanatia* (2021), which demonstrates the reasons why there may be an increase in prices and total shortages that will make the minerals that are necessary for the production of all the renewable energies that are needed worldwide by the end of 2050 inaccessible. Thus most of the energy efficiency comes from passive solutions, this is, from architecture itself:

In summer, the passive strategies are inertia (mass) and hygrometric comfort provided by the stone, cross ventilation facing the prevailing breeze from the sea (Embat), sun protection through traditional wooden shades, and thick thermal insulation of 10 cm on walls and



24 cm on the roof. The active devices are fans on the ceiling with very low energy consumption.

In winter, the passive strategies are very thick thermal insulation, highly insulated wood-framed windows with low-e double glazed glass filled with gas, and a large number of windows to collect as much sun as possible. The active device is a low-tech Trombe wall that faces south towards the neighbouring plot, which cannot be built on according to current urban development regulations. During the cold months, the outside air is tempered by convection in the Trombe wall and distributed to the six homes by mechanical ventilation through individual pipes for each dwelling, consuming less than 50 w.

Comfort in the building will be monitored with the collaboration of the University of the Balearic Islands (UIB). It therefore not only improves energy efficiency in comparison with LRP, but also provides reference values for establishing future regulations on the environmental impact of construction.

Following a mapping of resources* in Mallorca, 52% of CO₂ embodied emissions were saved during construction in comparison with an equivalent conventional building. Thanks to sustainable sourcing and reuse of construction materials, like wooden formwork boards that support the 25 cm of dry *Posidonia oceanica* sea grass for thermal insulation $\lambda = 0.044 \text{ W/mK}$, window blinds, traditional Arabic tiles, the wood for all the interior doors, or some sandstone that has been placed at the entry, 50% of waste production was also avoided during the construction phase.

The local sandstone is low-carbon, provides mass and endurance to extend the useful life of the building, and is 100 percent recyclable. The three homes on the ground floor are organized in two parallel 3.5 m stone barrel vaults supported on three axes of pilasters, also made of stone. The rooms can be marked out using movable wooden doors that are the size of walls.

The other three homes — on the upper floor, with independent access and staircases for private use — are organized in a single open space, in this case under the pitched roof supported by wooden trusses with 9.6 m spans and reused wooden boards. This layout provides a flexible plan that allows uses to change very easily over time, to reduce waste in future refurbishments.

One of the main improvements of the project to build faster is to update the mortar for the joints, which has been studied and developed so several stone blocks can be stacked on the same day with a crane, rather than having to build in courses to wait for the mortar to set, as is the case with the traditional “Mallorcan cement” grout. The mortar used in this work is of a mixed type: white cement with lime cement, and “zero” type aggregate (the smallest one, but not as thin as sand). This mortar has more substance with a strength of 20 N/mm² after seven days, and is not crushed by the weight of the blocks.

To make the vault easier to build, one-piece stone lintels have been used between pilasters from a different quarry that provides stronger stone and weigh approximately 840 kg per unit.

Thanks to many efforts by IBAVI and other architects in the island to make feasible the construction with local stone, local sandstone quarries are not anymore in danger of extinction because of people retirement age. Investments to update the facilities have been made and new young workers have been hired.

The climate in Mallorca is semi-arid and the risk of drought is expected to increase with climate change. The green area at the inner courtyard becomes a bioclimatic device and is very useful for the thermal functioning of the building; thus, it is important that this area can continue to thrive in drought and high heat without a significant increase in the building's water use. Hardy native plants with low water requirements were selected for this reason and are irrigated with stored rainwater.













fig.1 Site plan.

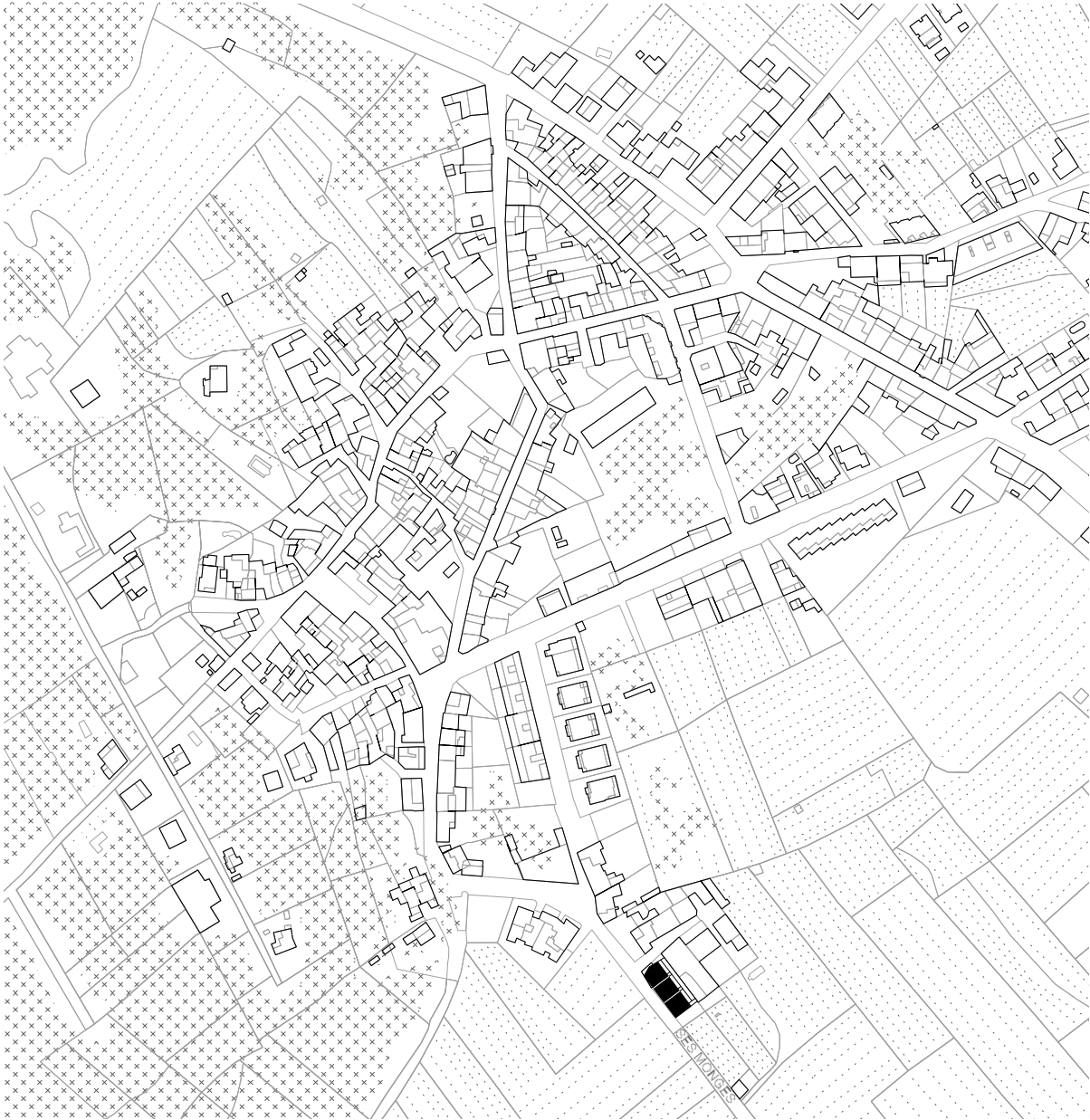








fig.2 Ground floor and first floor plans.

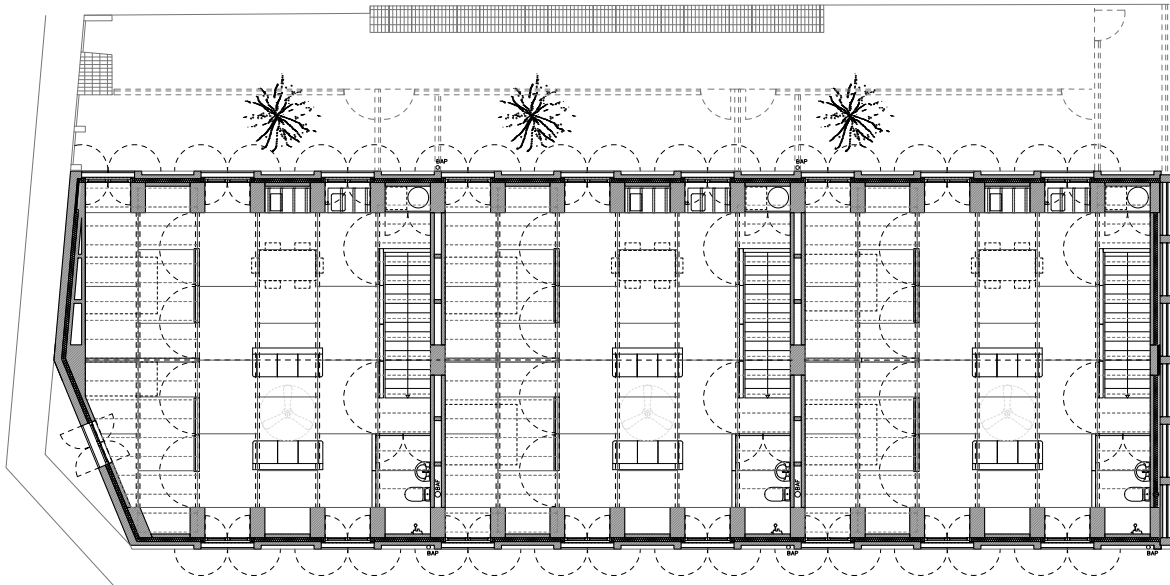
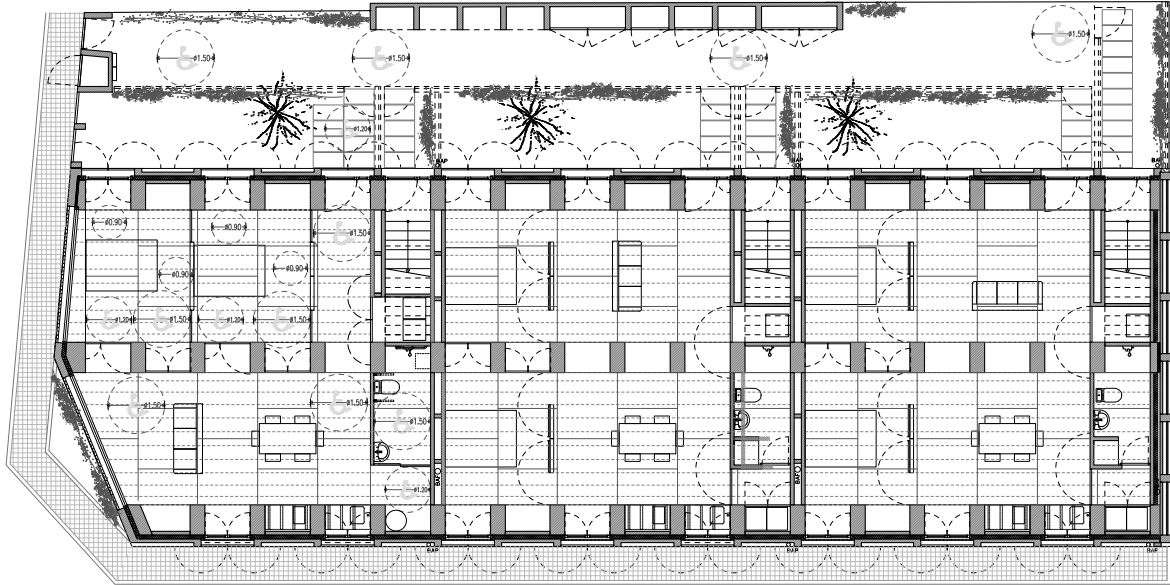






fig.3 Sections A and B.

0 1 5m

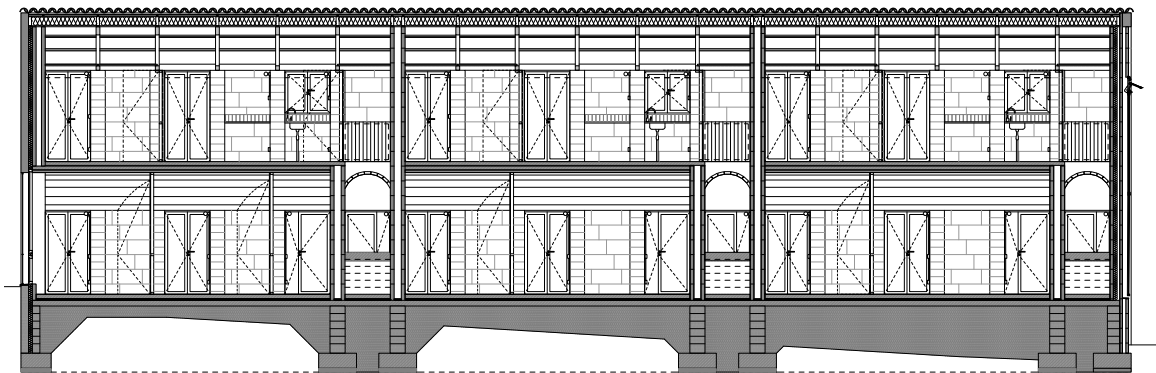
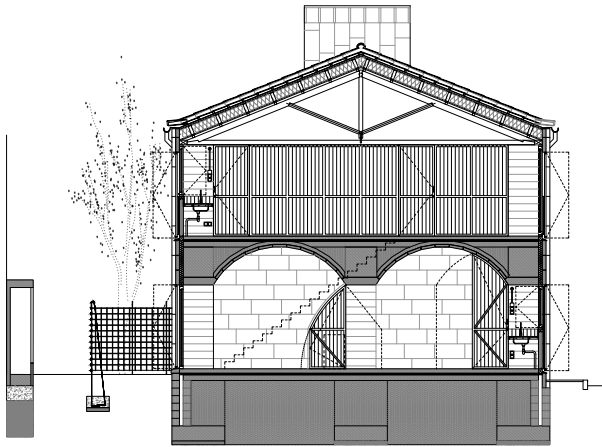


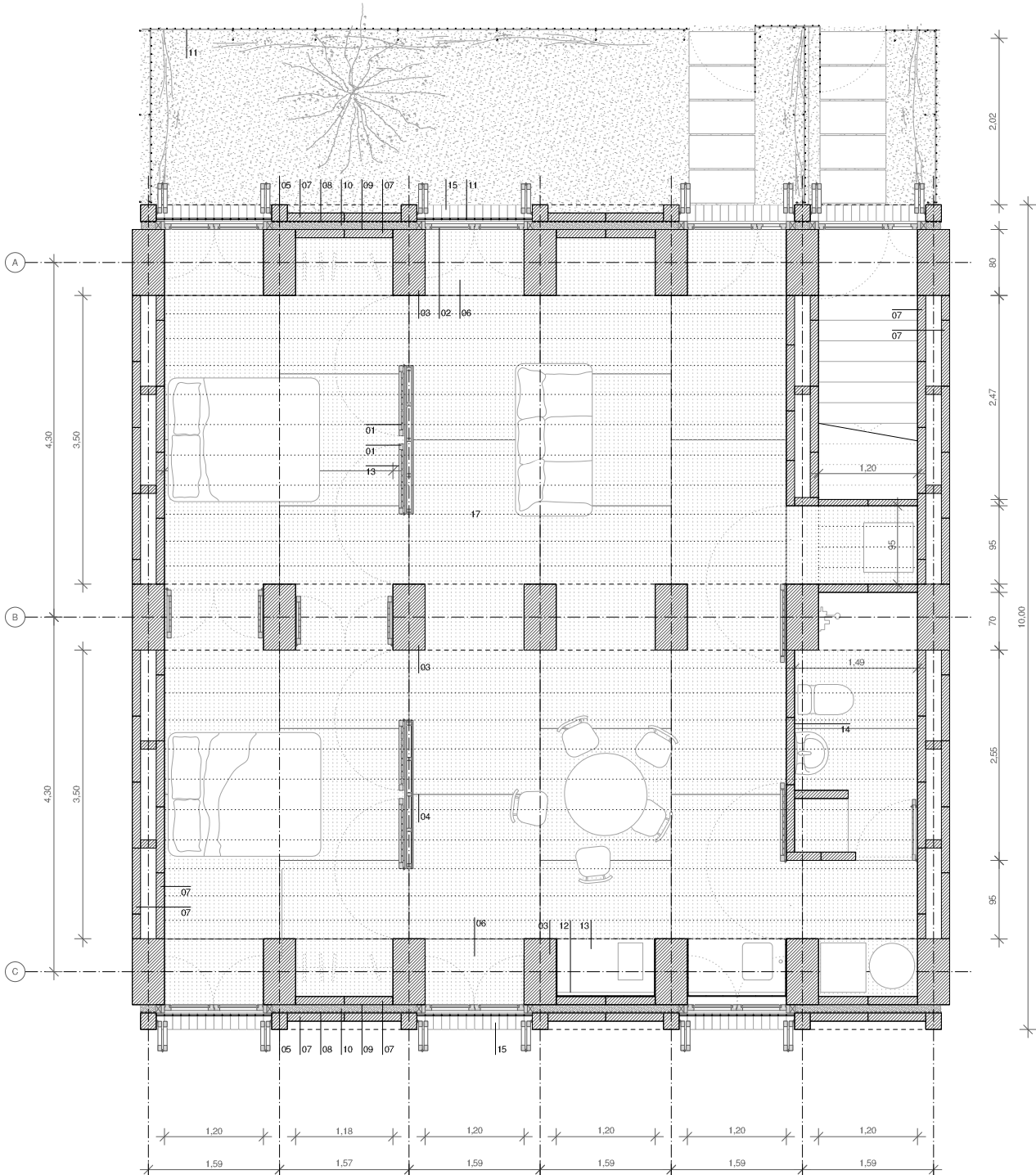


fig.4 Type 1 ground floor and first floor plans.



1. Double-leaf folding door made of reused wood
2. Wooden hinged window frames, rot-proof and low-emissivity glass U: 1.00 W/m°C.
3. Inner piles of extra high quality Marés stone from the quarry 80×40×18 cm, with 2 parts white cement, 1 part NHL 3.5 lime and 9 parts sand.

4. Expansion joint in concrete paving using 5×45 mm PP propylene profile.
5. Corrugated stainless steel bolts of 10 mm (2/m* of marés) for fastening between the outer and inner leaf, taken by epoxy resins.
6. Lintel made of 1 piece of extra quality marés weighing 840 kg.



- 7. First quality Marés masonry with 80 × 20 × 10.
- 8. Breathable waterproof film.
- 9. High-performance, mesh-reinforced vapour-regulating and air-tightness sheet.
- 10. 2 layers e: 10 mm of recycled cotton geopanel for acoustic insulation.
- 11. Grille formed by 16 mm round perimeter and 10mm round inside perimeter.

- 12. Flooring tiles 20 × 10 × 1,5 cm fired with biomass.
- 13. Binissalem stone countertop e:25mm.
- 14. Toilet equipment.
- 15. Hand-glazed, biomass-fired, 30 × 15 × 1,5 cm tile paving.
- 16. In situ white concrete slab paving e: 12 cm reinforced with 210 c/20 cm mesh.

- 17. hand polished with a trowel.
Colour according to DF.

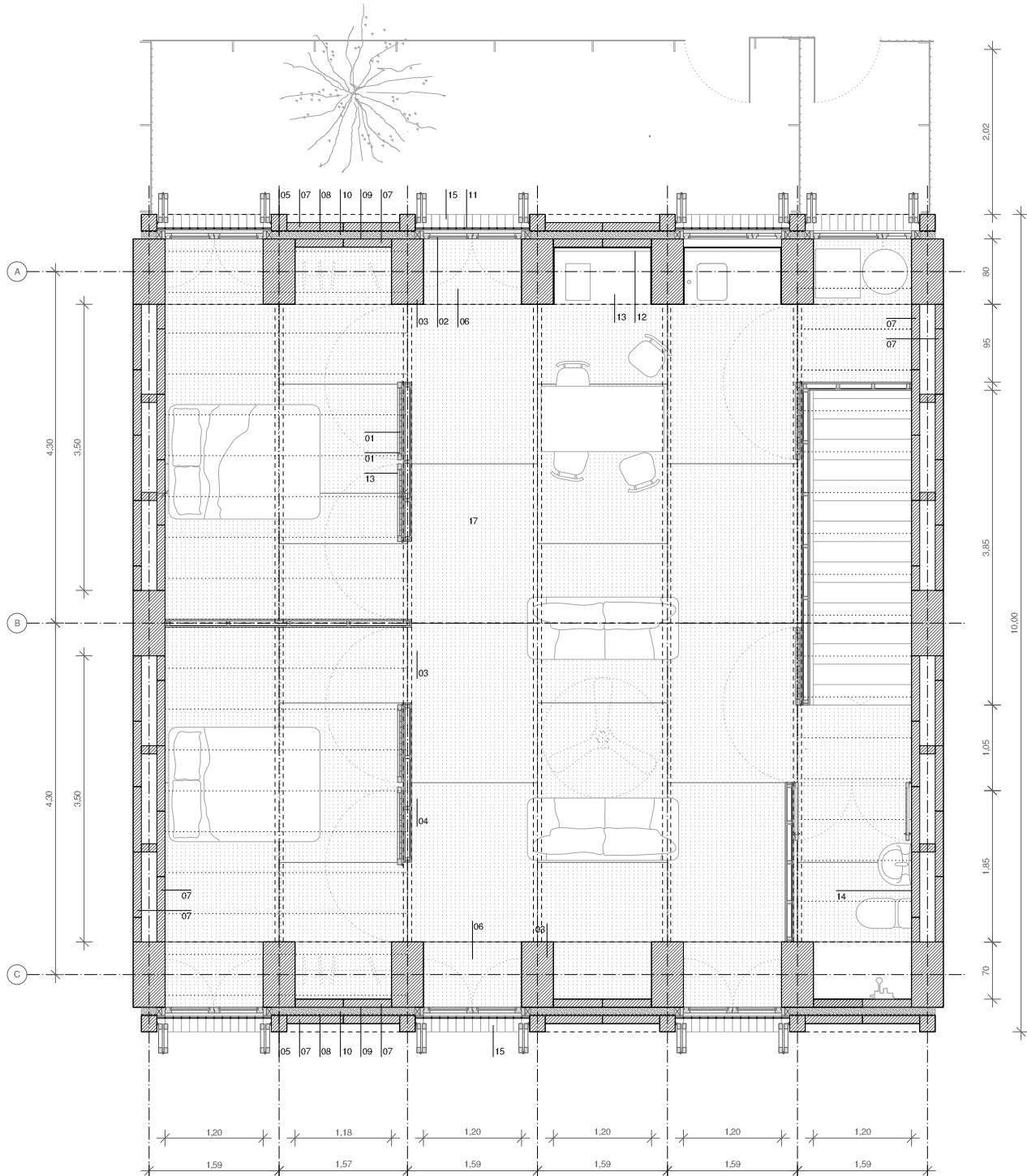
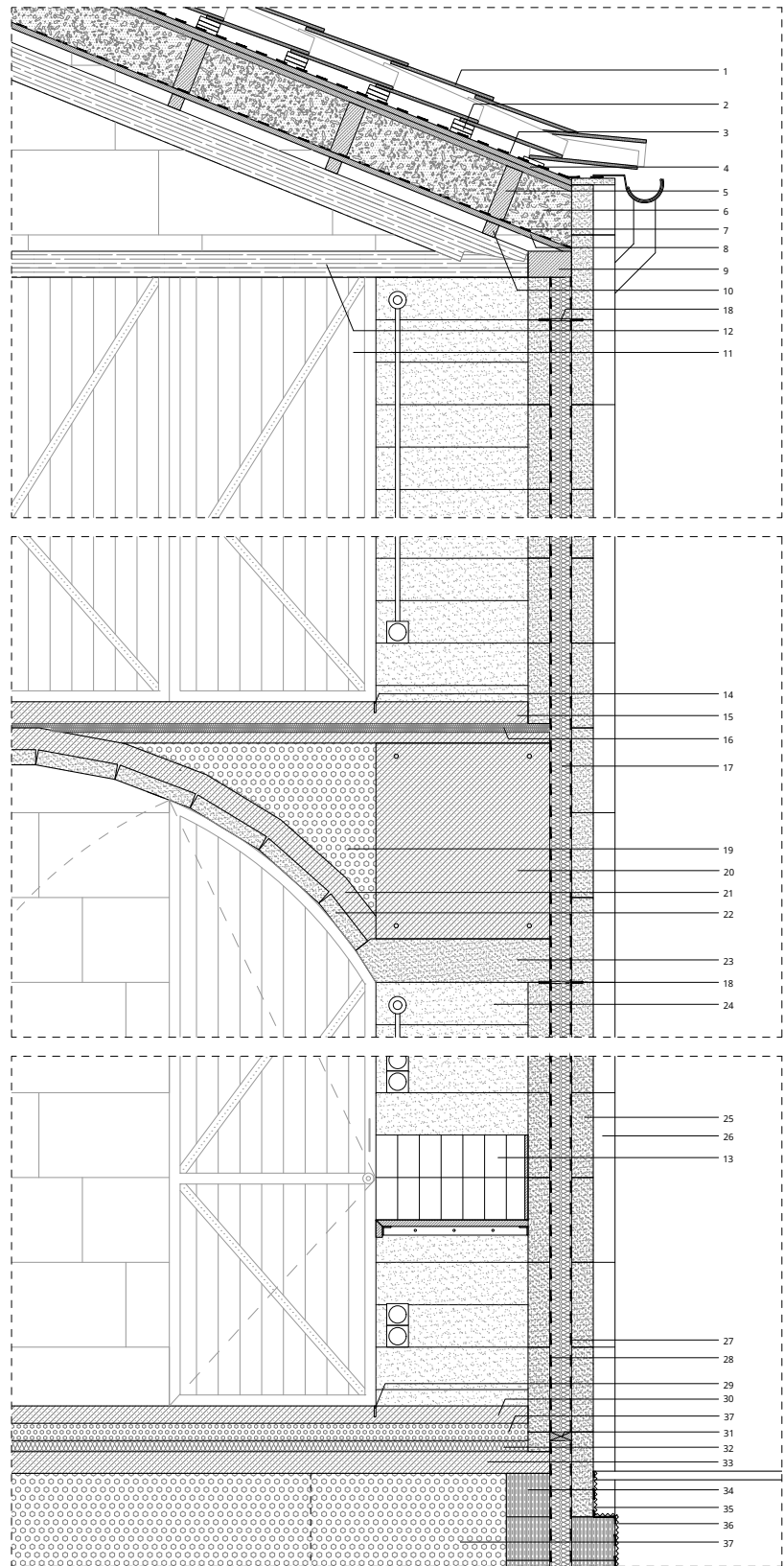


fig.5 Facade section construction.



1. Arabic ceramic roof tile fired with biomass and glued with glue mortar.
2. Tile plugs from broken pieces of tile.
3. Breathable waterproof membrane protected with a 4 cm layer of lime mortar.
4. OSB-IL wood board e: 20 mm.
5. Purlins on 24 × 8 cm Spanish sawn timber trusses.
6. Thermal insulation e: 24 cm of dry posidonia.
7. High-performance vapour-regulating and air-tightness sheet reinforced with mesh.
8. Reused wood board 70 × 120 cm e: 40 mm.
9. Edging on the perimeter edge of the roof, 10 × 20cm laminated wood.
10. Wooden rails of 60 × 60 mm.
11. Reused wooden door.
12. Spanish truss of 9.40 m in length (pairs, brace, pendulum and braces), on gable roof with 22% slope, formed by laminated wood elements.
13. Tiling with white tiles 10 × 20 cm.
14. Expansion joint of concrete paving with 5 × 45 mm PP polypropilene profile.
15. White concrete slab paving e: 8 cm.
16. 2 plates e: 10 mm each one of recycled cotton acoustic insulation.
17. 2 plates e: 50 mm each of recycled cotton acoustic insulation.
18. 10mm stainless corrugated steel bolts (2 × pilaster) for fastening between the outer leaf and the inner leaf, taken by means of epoxy resins.
19. Filling of the quarry vault kidneys with gravel e: 40 mm.
20. Poor concrete strips between the structural buttresses, 80 × 100 cm.
21. Compression layer of NHC-5 fibre-reinforced concrete marés vault.
22. 22. Extra high quality marés vault of 80 × 40 × 07 cm, taken with preocol mortar and joint 2 parts white cement, 1 part NHL 3.5 lime and 9 parts sand.
23. Stone lintel in 1 piece of extra quality marés stone 90 × 40 × 18 cm, for the formation of a flat arch between structural buttresses.
24. Interior pillars of extra high quality marés 80 × 40 × 18cm, and joint 2 parts white cement, 1 part NHC 3.5 lime and 9 parts sand.
25. Marés masonry 80 × 40 × 10cm first quality.
26. Marés pilaster 80 × 20 × 20cm first quality.
27. Breathable waterproof sheet.
28. High-performance vapour-regulating and air-tightness sheet reinforced with mesh.
29. Expansion joint of concrete paving by means of a 5 × 45 mm PP polypropilene profile.
30. In situ white concrete slab paving e: 8 cm reinforced reinforced with 010 mesh c/20 cm.
31. Pine wood block e: 10 cm.
32. Expanded polystyrene insulation e: 5cm.
33. Concrete slab e: 10 cm in situ without reinforcement.
34. German block of 20 cm.
35. EPDM waterproof sheet e: 1.5 mm.
36. Egg cup + geotextile.
37. Backfill recycled gravel from demolition.





ASVZ

sicherheits Training
← 1 km → AYP

hunziker
Technik und Gebäude

K.118

Winterthur, Switzerland

DOI
– 10.14195/1647-8681_16_12

On the former site of the Sulzer factory in Winterthur, the Swiss Pension Fund “Stiftung Abendrot” built a beacon for climate—friendly and sustainable building that shimmers red in its reused sectional metal sheeting. The extension of the head building of Hall 118 for twelve studios, think tanks and a tinkerer’s laboratory on the first floor, was made mainly from used building materials.

All things that were already there plus wood, straw and clay.

Put radically, these are the only materials that are available for climate-friendly construction methods. Because of great advances in building operation, construction is now responsible for three-quarters of the emissions in a building’s lifetime.

For the K.118, the focus was on reducing this embodied energy: 60 percent of greenhouse gas emissions and 500 tons of primary materials could be saved compared to new building components.

The pilot project quickly showed that circular building means thinking in loops. When starting from available building components, the planning process turns around: It follows opportunities as they arise and starts with finding materials.

Typology

– Commercial and residential

Area

– 1,100 m²

Promoter

– Stiftung Abendrot

Architecture

– Marc Angst, Pascal Hentschel,
Benjamin Poignon, Barbara Buser,
Eric Honegger

Structural Engineer

– Oberli Ingenieurbau AG, Urs Oberli

Timber Engineer

– Josef Kolg AG, Stefan Signer

MEP Engineer (HVAC)

– Russo Haustechnik-Planung GmbH,
Nicola Grabiele

Timber Construction

– Zehnder Holz und Bau, Andreas Frieden

Steel Construction

– Wetter AG, Marc Kreissig

Completion date

– 2021

Photographer

– Martin Zeller

Selection is followed by cataloguing. In order to reinstall components, we need information and a precise idea of the requirements and installation options.

In this way, the design is created along the usual planning phases in a constant process of evaluating, checking and deciding.

A steel skeleton that once supported a distribution centre on the Lysbüchel site in Basel forms the supporting structure.

Concrete was used only where necessary and only where it was unavoidable for static reasons or for sound and fire protection: in the floor slabs, the chamber sound supports and in the foundations. The three new floors built on top of the hall are accessed by the steel exterior staircase from the demolished Orion office building in Zurich. This stair's landings determined the floor heights. Granite façades, which have been converted into slabs in the kitchens, toilets and on the balcony arbours, and the majority of the aluminium insulated windows also originate from the Orion building. The windows and the surrounding red facade sheet metal from Winterthur protect against the weather and define the appearance of the building and the Winterthur cityscape.

Since material and projected elements are not geometrically related, necessary leeway must be created: Once elements and functions are decoupled in layers, they can overlap and follow their own rules. The scaled facade and visible support structures in K.118 illustrate this. Surrounding reused elements with adaptable materials is another way of overcoming the geometrical difficulties: In the prefabricated wooden facade elements, waste-free compartment insulation made of straw bales and interior plaster made of local excavated clay fill the space around the reused windows. Processed with minimal energy input, these natural *materiali poveri* remain compostable and provide a comfortable indoor climate. Interior walls made of wood accommodate reused doors and reused triple-layer panels from stage construction. Glued wood materials and elements should be reused, as their climate impact is far less positive than one expects from wood because of the adhesives.

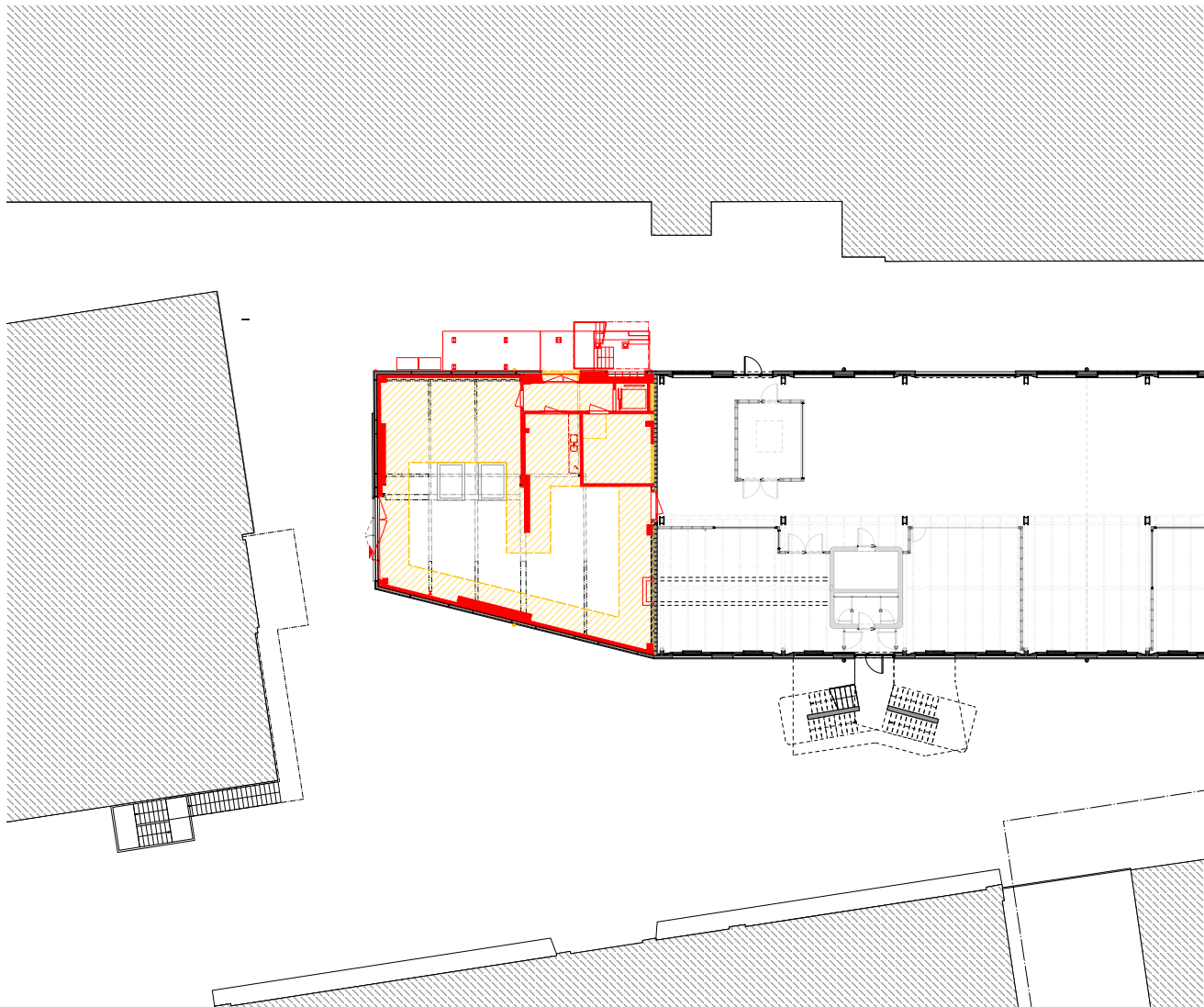
While the CO₂ emissions in construction were more than halved, the costs remained within the limits of the expected costs for a similar new building, the difference being that the vast majority of the expenses were for the labour of the craftsmen involved. The inexpensive reused material requires a certain amount of manual labour and expertise before it can be installed, thus implying sustainability also for the local economy.

fig.1 Site plan.





fig.2 Ground floor plan.



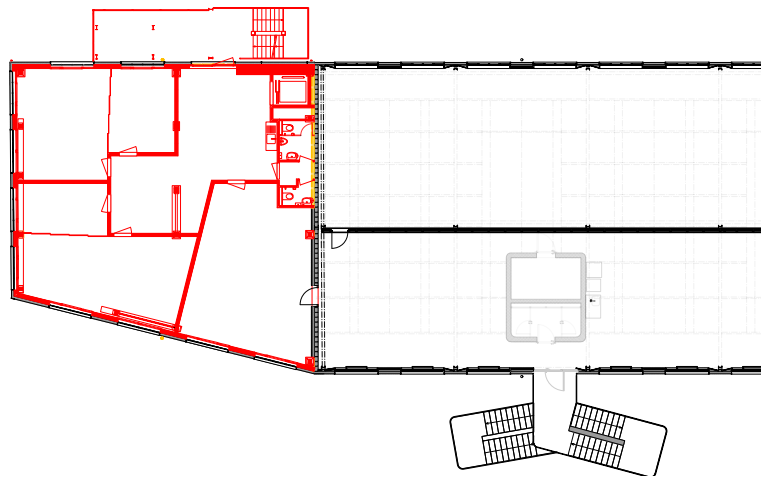
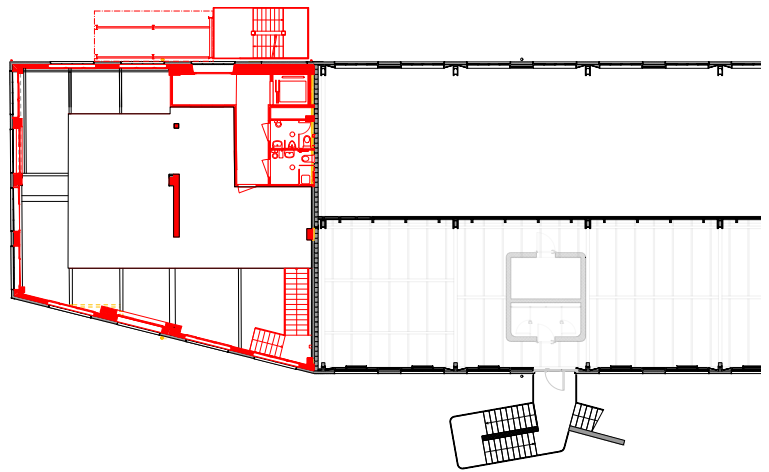
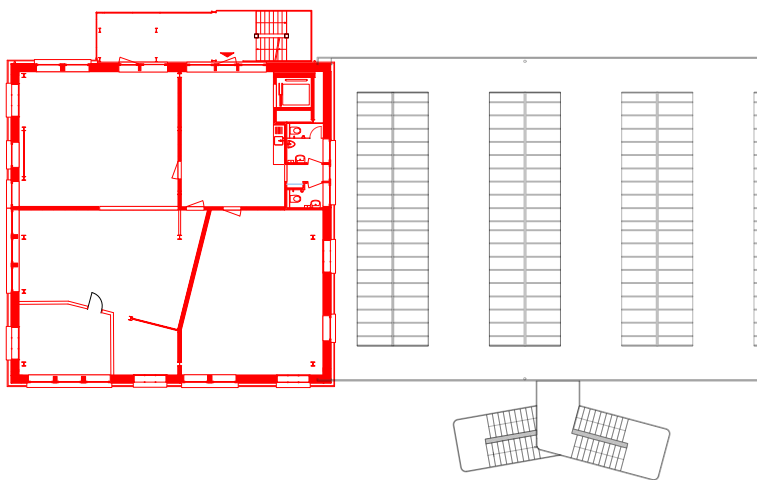
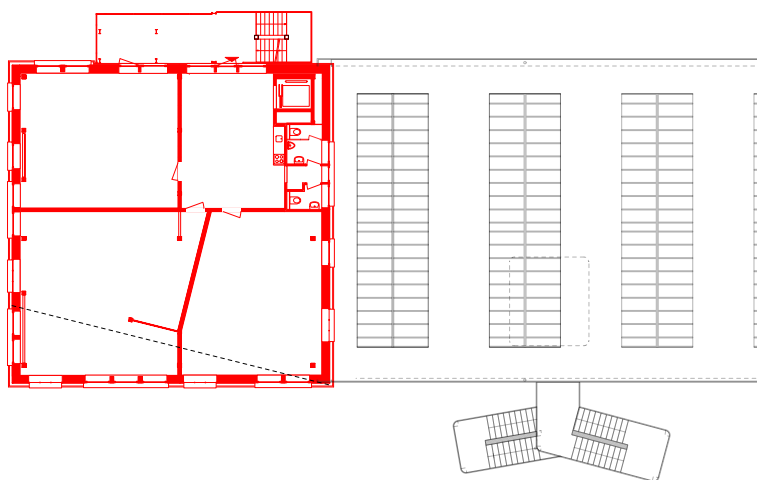
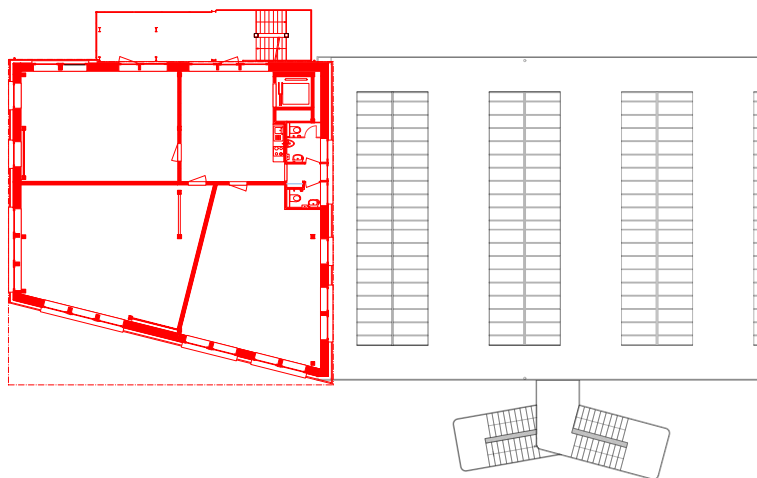


fig.3 Gallery, 1st floor, 2nd floor, 3rd floor and 4th floor plans.



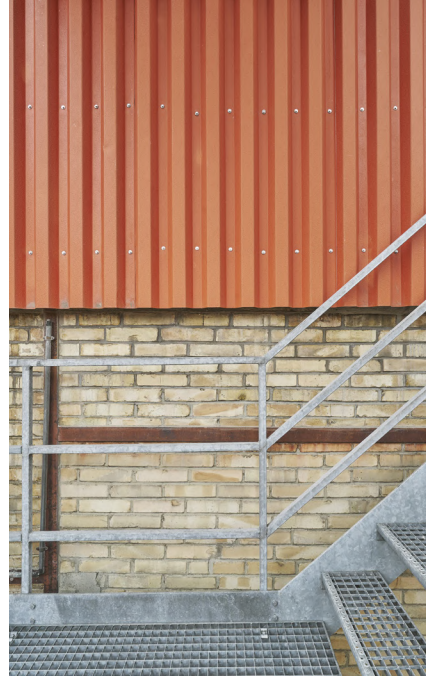
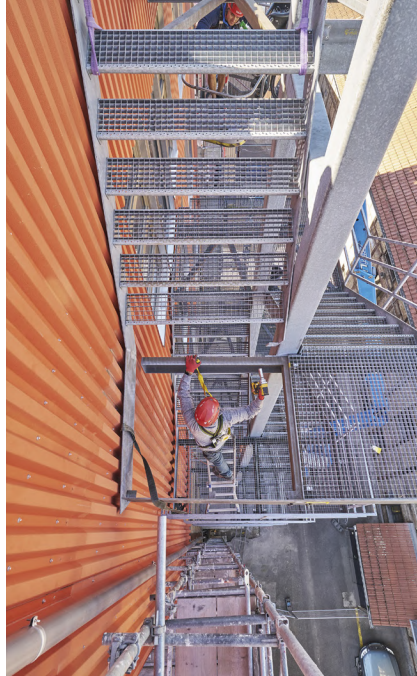






fig.4 Northwest and southwest facades.

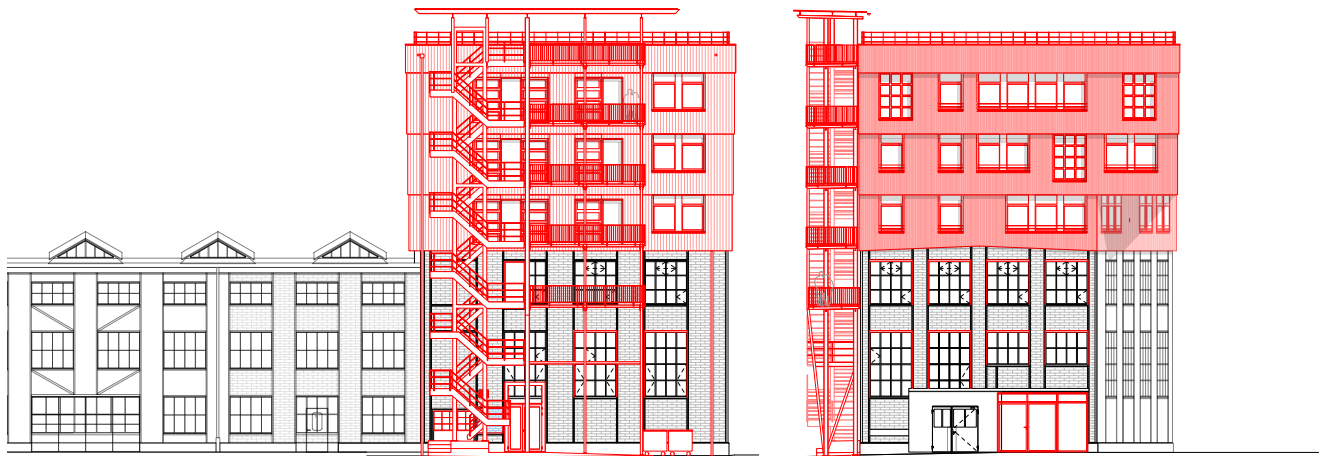




fig.5 Section A-A.

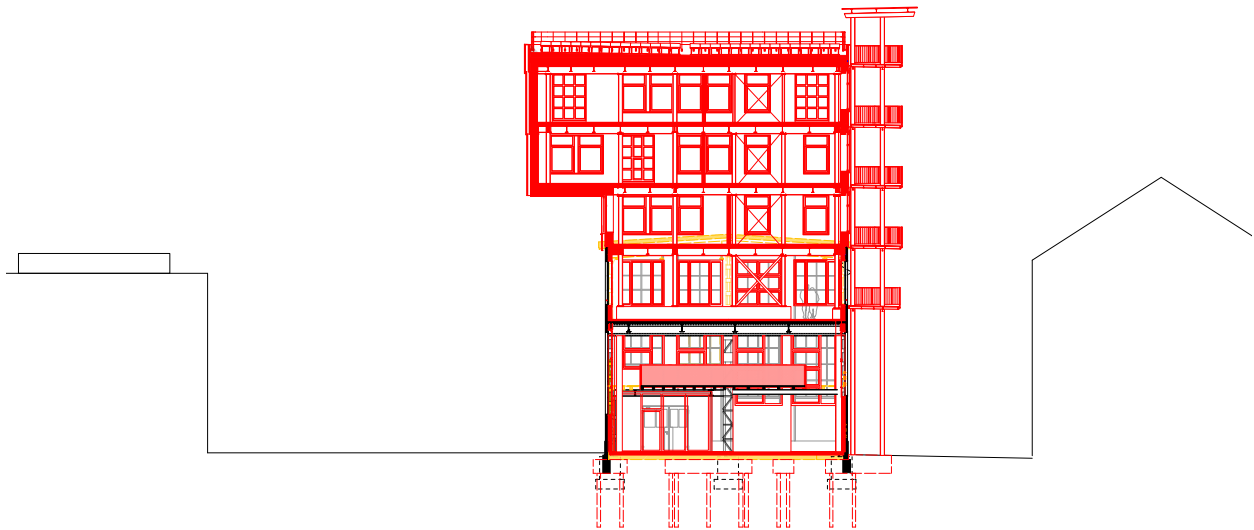
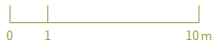


fig.6 Section F-F.



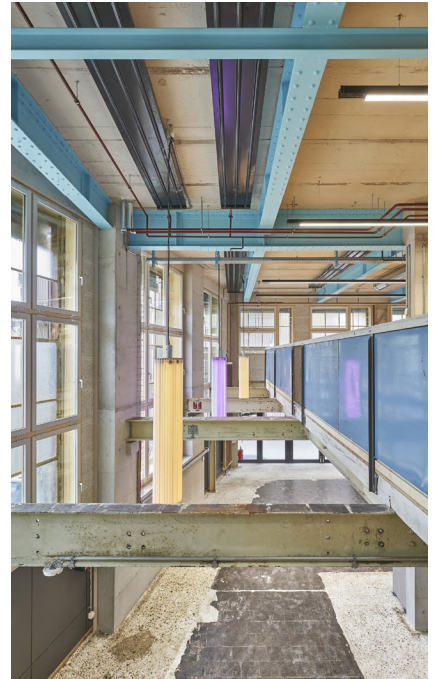




fig.7 Axonometry.

