

Memory Through Architecture

By
Weiqi Chen

Thesis submitted to the faculty of the Virginia Polytechnic Institute
and State University in partial fulfilment of the requirement for the
degree of

Master of Architecture

Heinrich Schnoedt
Committee Chair

David Dugas

William Green

10/02/2020
Blacksburg, Virginia

KEYWORDS:
Memory, Tradition, Modern,
Rammed Earth

Abstract

Memories are often triggered by the presence of physical artifacts. When artifacts are replaced, the contemplation of a history attached to the artifacts tends to fade or even disappear. In an urban context, it often means that buildings and spaces which are the record of a culture are substituted with buildings and spaces that are disconnected from tradition in favor of a fast paced economy. China is the prime example of the largest and fastest urbanization over the past two decades. While it dramatically transformed most cities and suburban areas into modern urban organizations, large amounts of beautiful local architectures disappeared.

This thesis proposes that architecture - no matter at what time is built - has the potential to embody a historic dimension and memories when seeking a symbiosis of traditional materials and modern technologies. The project here is a vehicle to seek memory to be evoked by the spatial scale and familiar materials without compromising modern requirements and conveniences.

General Audience Abstract

Memories fade out when old things being replaced by new things. This is a common phenomenon that happens constantly in today's fast-paced world. Technological progress of construction increases the speed of urbanization, however, it erases good old memories in the same speed simultaneously. Take China as an example, the largest and fastest urbanization in the past two decades dramatically transformed most cities and suburban areas into modern appearances. Large amount of beautiful local architectures disappeared.

This thesis explores ways to preserve those good memories through integrating traditional materials and modern technologies. Guests' memory will be evoked by experiencing the spatial scale and old materials while still having a modern lifestyle in a hotel.

Acknowledgment

I would like to express my special thanks of gratitude to my family as well as professor Heinrich Schnoedt for their help and support.

Table of Content

Acknowledgment	ix
Table of Content	xi
Introduction	1
Memory through architecture	2
Rammed earth in recent buildings	10
- Wang Shu's Shui An Shan Ju (Tiles Hill)	11
- The Maosi Ecological Primary School	16
A proposal for an architecture of memory	21
- Place and Proximity	24
- Organization based on tradition	28
- Modern enclosure vs Tradition	40
- Modern convenience vs Tradition	48
Conclusion	56
Bibliography	58

Introduction

In the past 40 years, the vast urbanization completely changed the appearance of cities and suburban areas across China. My hometown city, Xi'an, is an example where modern structures extensively replaced traditional local dwellings in a very short time. Memories of my childhood begin to fade.

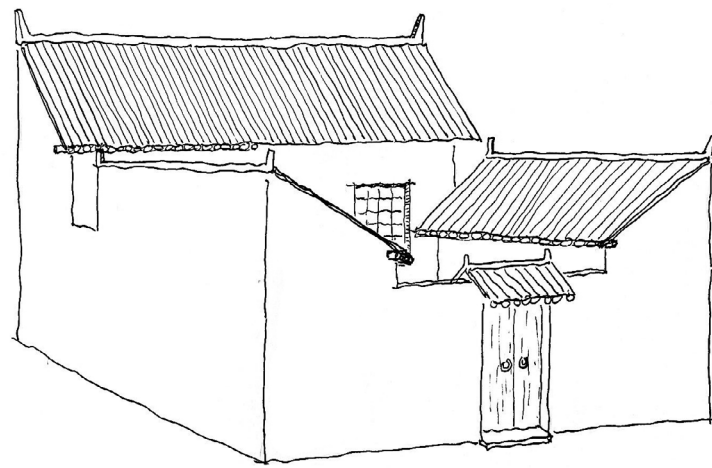
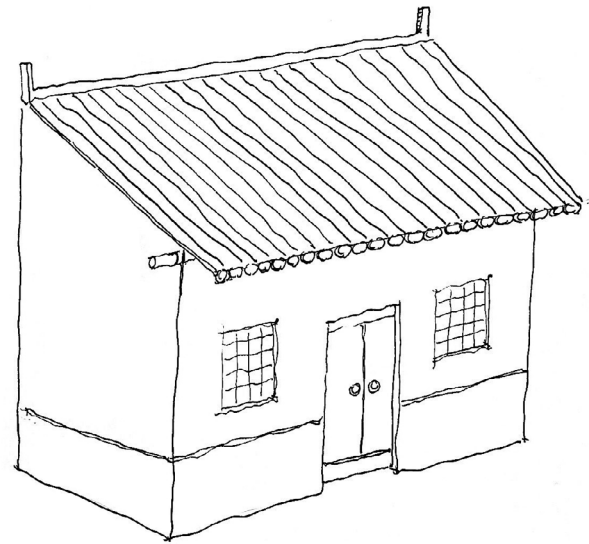
This thesis proposes an architectural approach that engages traditional materials in the context of modern construction technologies. One primary material presence in the traditional village is rammed earth. With inspiration of a few examples of new Chinese architecture that employs rammed earth, a proposed hotel also attempts to understand the role of rammed earth to experience tradition in a modern environment where architecture provokes memory.

Memory through architecture



Traditional Guanzhong Dwelling [1]

Xi'an is the capital city of Shaanxi Province that in the Northwest China. The city and its suburban areas are located on the Guanzhong Plain where loess, "a loosely compacted yellowish-gray deposit of windblown sediment", is the representative geographic feature. Rammed earth became the dominant construction technique for local dwellings for hundreds of years. Traditional Guanzhong Dwellings have a compact layout with introverted courtyards. "House built in half-like" is a popular saying that perfectly describes this characteristic. The unique shape and yellowish exterior walls emerge as a part of its identity.

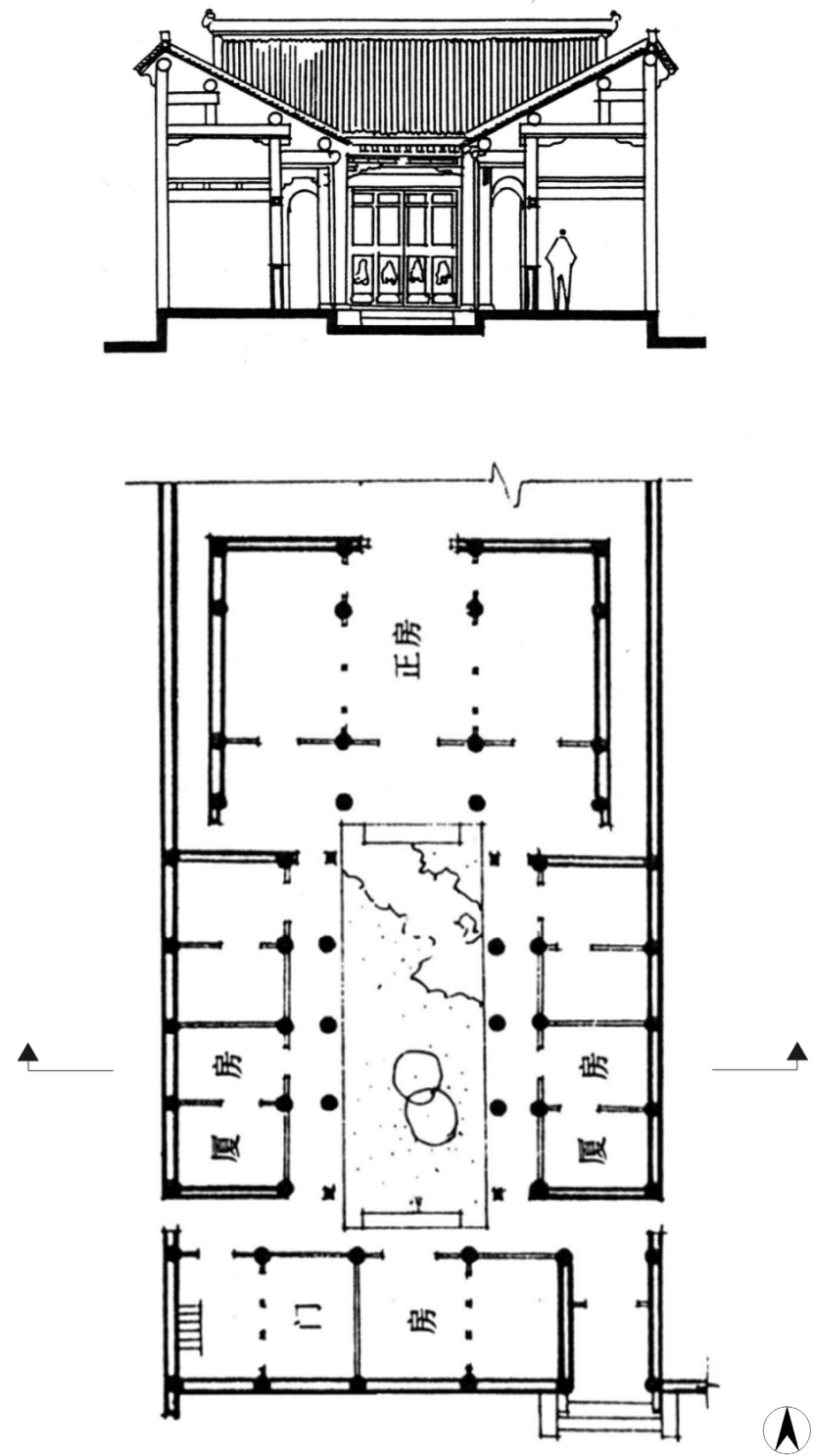


"House built in half-like"

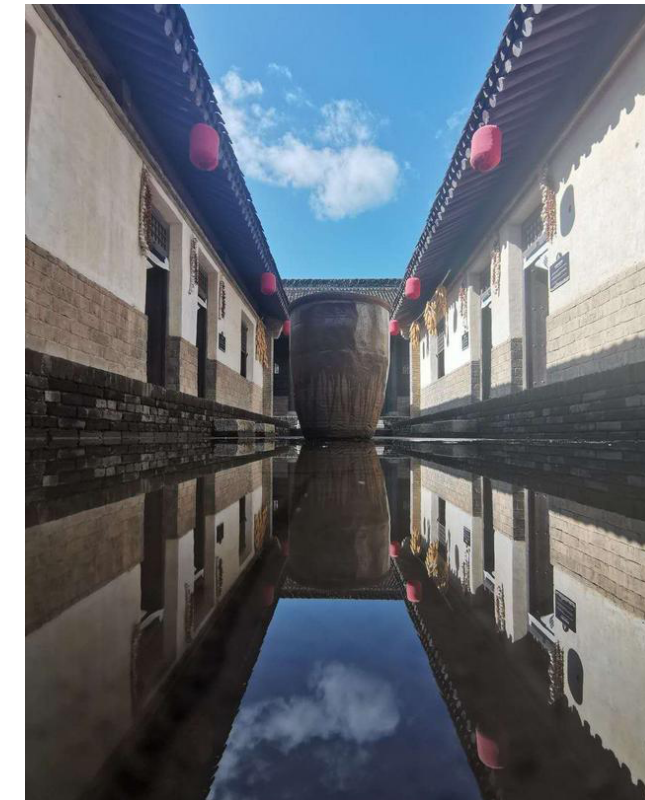


Shed roof [2]

The Guanzhong Plain is an area with relatively arid climate. With no running water, the shed roof was an intelligent way to collect rainwater in the courtyard in addition to its low material consumption and cost. The house with half-like layout and local material is driven by cost and labor. Even wealthy people built their houses in this layout, using brick but appreciated the performance in collecting water.



Typical courtyard section and plan [3]



Long narrow courtyard [3]

The Long narrow courtyard is an intelligent way to give the house a better thermal performance. For dwellings in the north temperate zone, the balance between natural light and thermal performance is important. Here, the courtyard always extends north-south, so rooms especially the principal room on the north end will get abundant natural light and get warm in winter. However, in summertime there are fewer vertical walls exposed to the sun. Rammed earth and the overhanging eave keep the indoor temperature low.



Local materials [4]



Rammed earth & grey tile [5]

As explained before, loess is the typical raw material on Guanzhong Plain. Rammed earth and grey tiles are processed from it. The two materials are affordable and easy to build with. Moreover, thick rammed earth wall perform as a thermal mass, which is a benefit when air conditioning systems are not in place.

Rammed earth in recent buildings

①



Wang Shu's Shui An Shan Ju (Tiles Hill) [6]

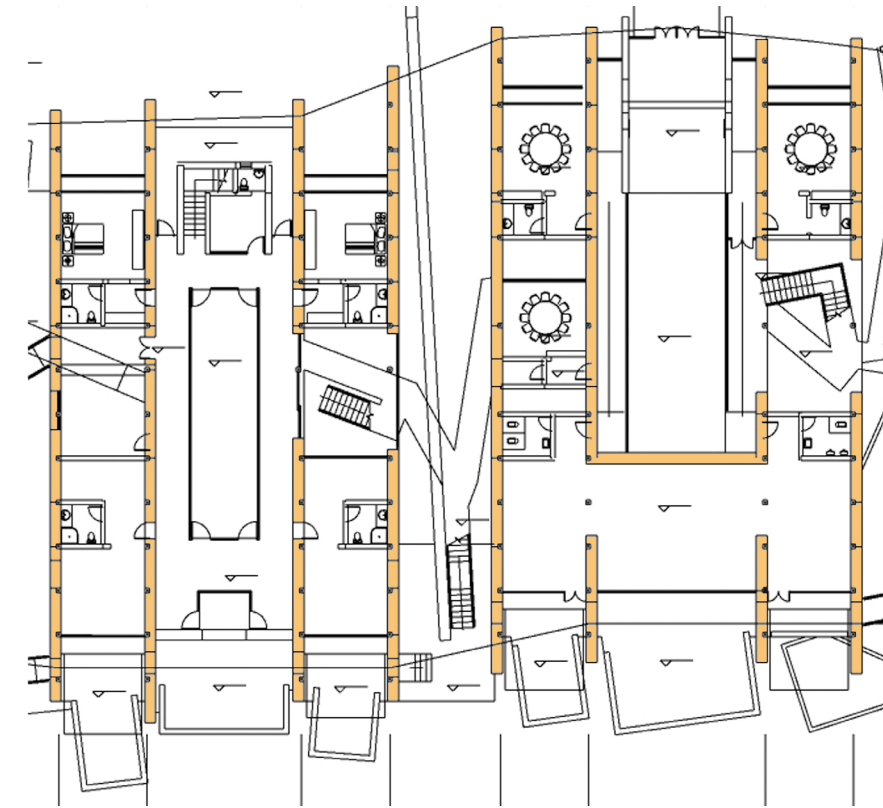
The Chinese architect Wang Shu demonstrates in a hotel building on the campus of China Academy of Art in Hangzhou, Zhejiang Province how rammed earth can be used today, supported by modern construction techniques. The tallest rammed earth wall in this project is over 12 meters, which is possible through its steel reinforcements. Inspired by local villages, Wang Shu expresses a deep understanding of Chinese traditions through this project. He stated that the "Chinese spirit" evoked here is like winding visitors' way through a mountain or stepping into a traditional landscape painting.



Local village [6]



Constructing a mountain village rather than a single building. [6]



Steel frame in rammed earth wall [6]

This is a partial plan of the first level. The structural grid clearly shows that rammed earth is an infill of the steel frame, which allows gravity induced shrinkage without compromising its structural integrity. The change of the former load-bearing obligation of the rammed earth to the steel frame ultimately allows the 12-m tall wall.



Exposed steel frame on top of the wall [6]



Concrete base and edge [6] [7]

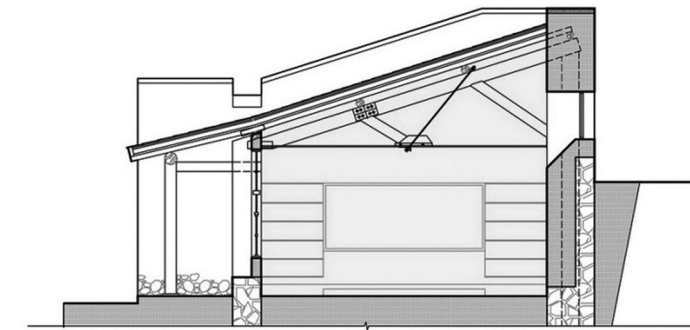
Although the new technique introduces structural strength, rammed earth is still susceptible to rain and wind. To counteract erosion, Wang Shu's rammed earth walls are protected by overhanging roofs and a concrete base and edge. In Hangzhou's humid climate and large amount of rainfall, these methods extend the life of the rammed earth.

2

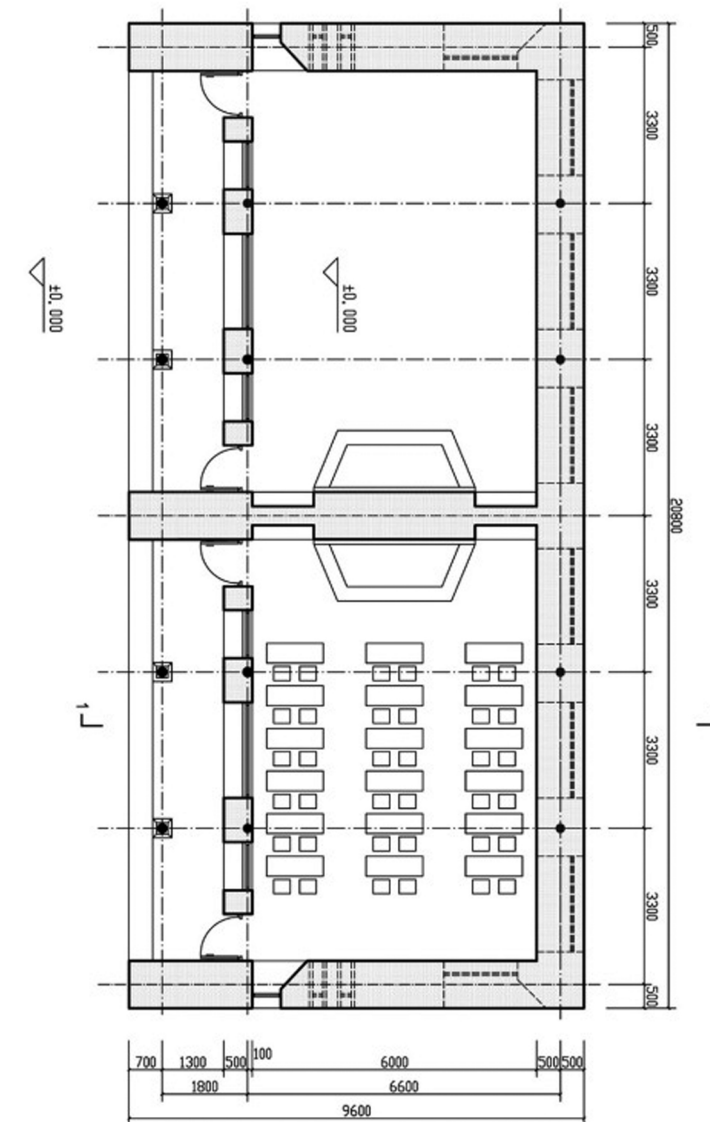


The Maosi Ecological Primary School [8]

In 2007 a team led by professor Edward Ng and the Department of Architecture of the Chinese University of Hong Kong completed a school building in the Loess Plateau region of West China. Unlike Wang Shu's Tiles Hill in Southern China, this project uses the raw material, loess.



Section of the classroom [8]



Plan of the classroom [8]



Classroom with shed roof [8]

The construction observes local traditions, using simple traditional tools, manpower, and equipment. The plan and section clearly show that timber columns in the thick wall make the structure stable. According to field measurements, the indoor air temperature of new classrooms is stable, cool in summer and warm in winter, without needing extra heating and cooling system.



Perspective view of the classroom [8]



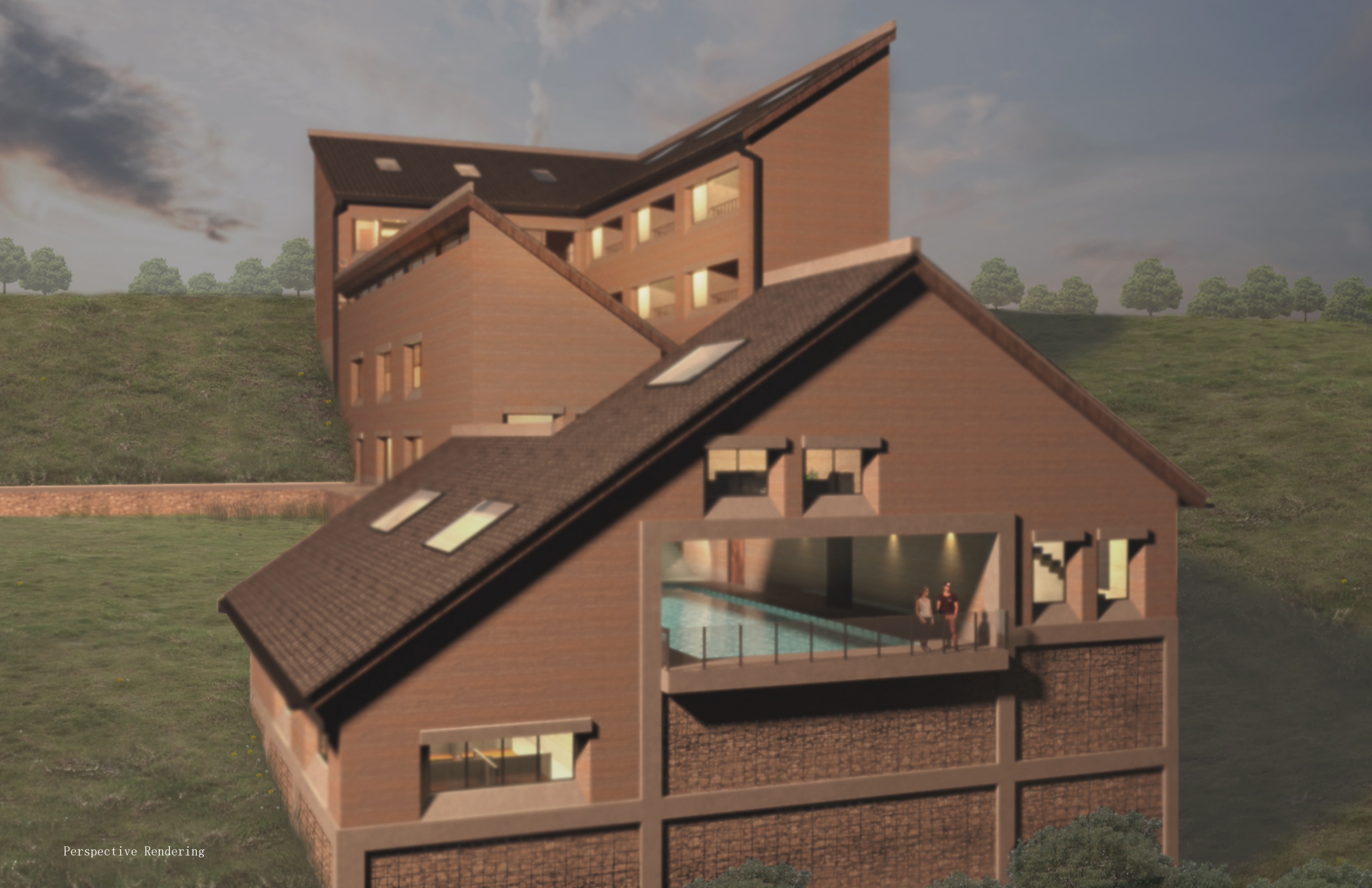
The school illustrates a feasible ecological architecture suited for the conditions of China's Loess Plateau region. It is a reminder of a local building tradition (Fang Xi, 2009). [9]

Research conclusion

The two examples suggest that traditions can be evoked through architecture with modern techniques.

Both examples demonstrate ways to enhance the strength of rammed earth wall by inserting a new frame structure to improve load-bearing and anti-seismic ability. Another further development in use of modern rammed earth is better surface protection with overhangs and concrete insertions to reduce the erosion caused by wind and rain.

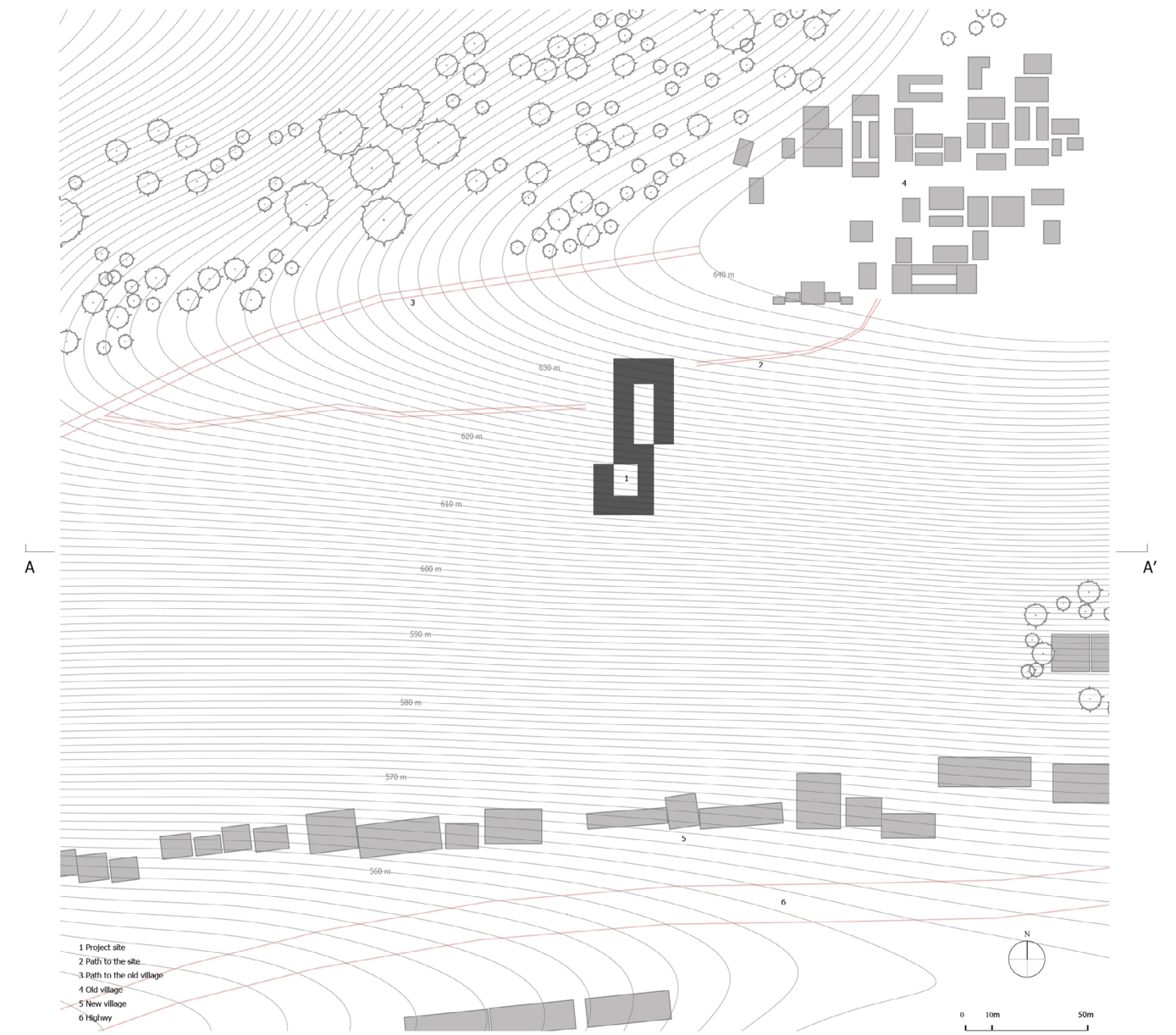
A proposal for an architecture of memory



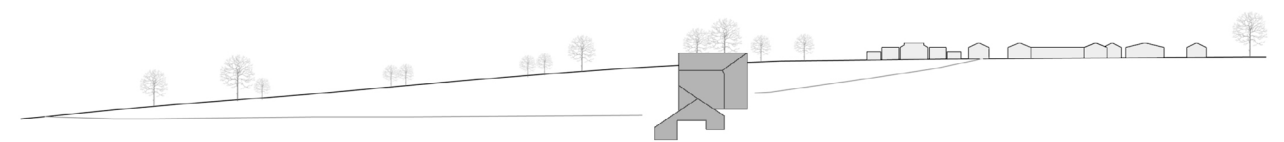
Perspective Rendering

Place and proximity

The project site is on the slope near an old village. This area called Bailu Yuan (White Deer Hill) is famous across China based on a novel of the same name. The highway passing the foot of the hill is a main transportation artery in the area that can always get heavy traffic. The slope faces south getting magnificent views from the Qinling Mountain Range.



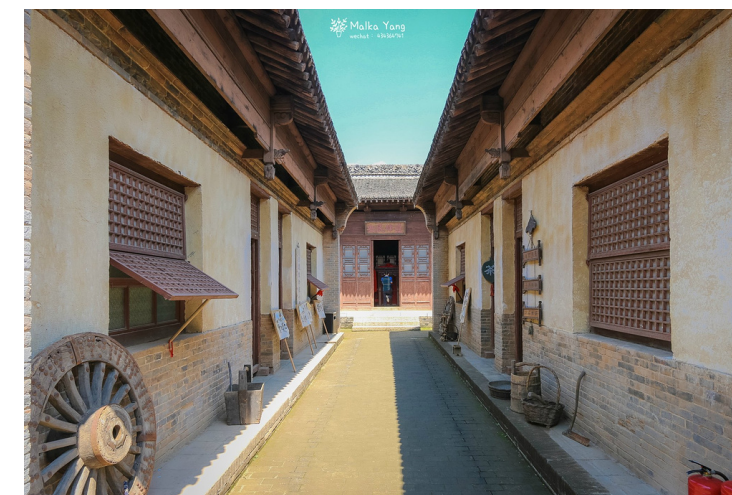
Site on the hillslope



Site elevation



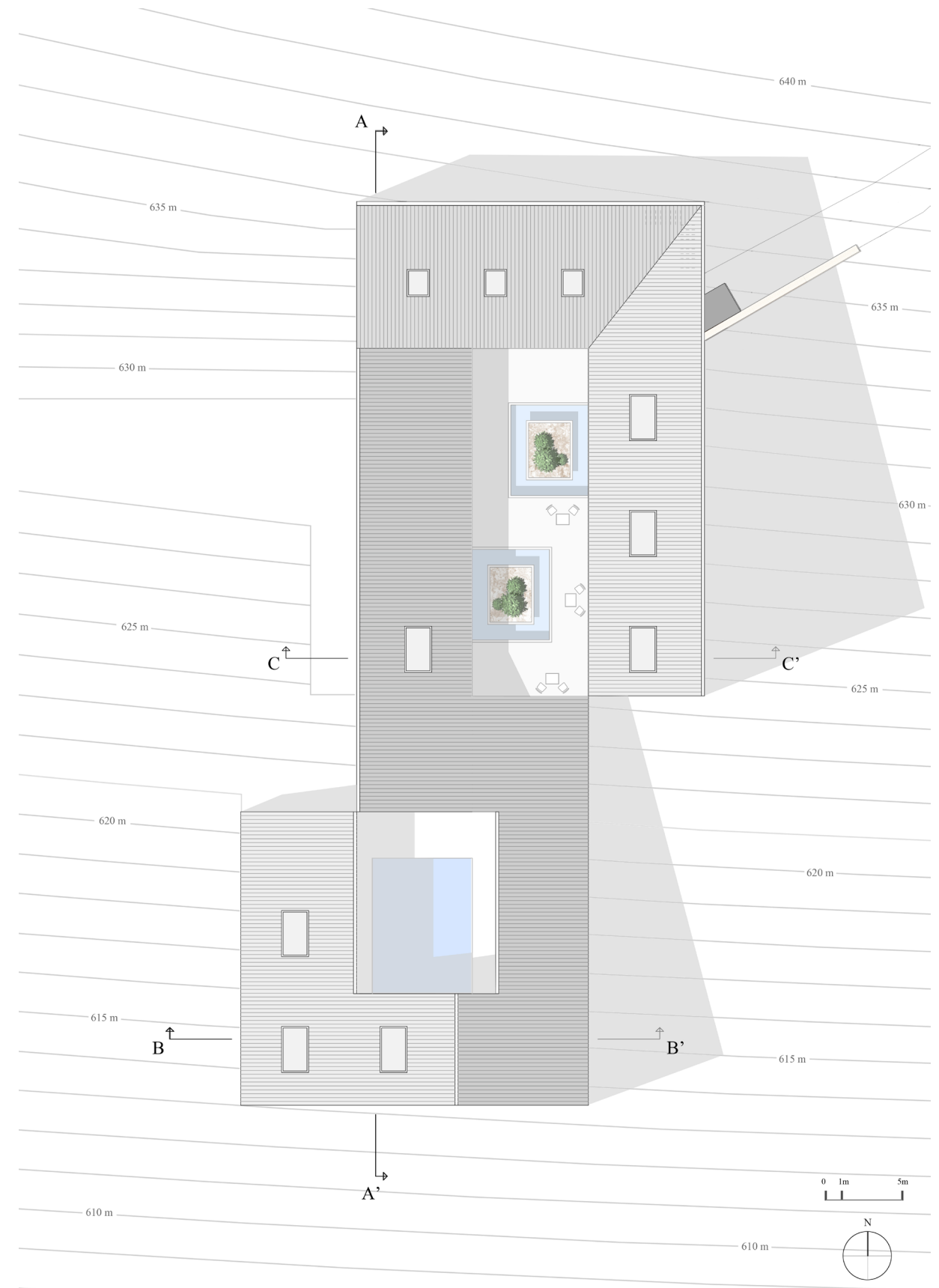
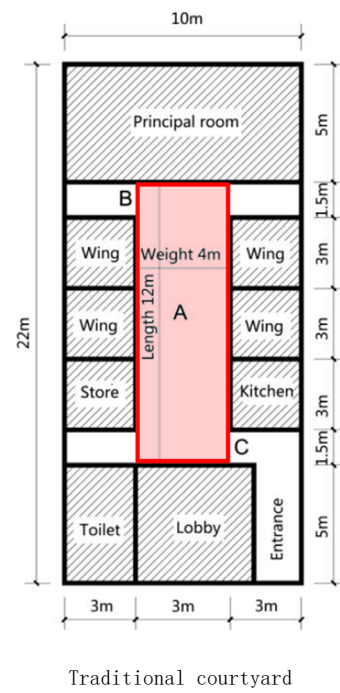
Geographic features around the site

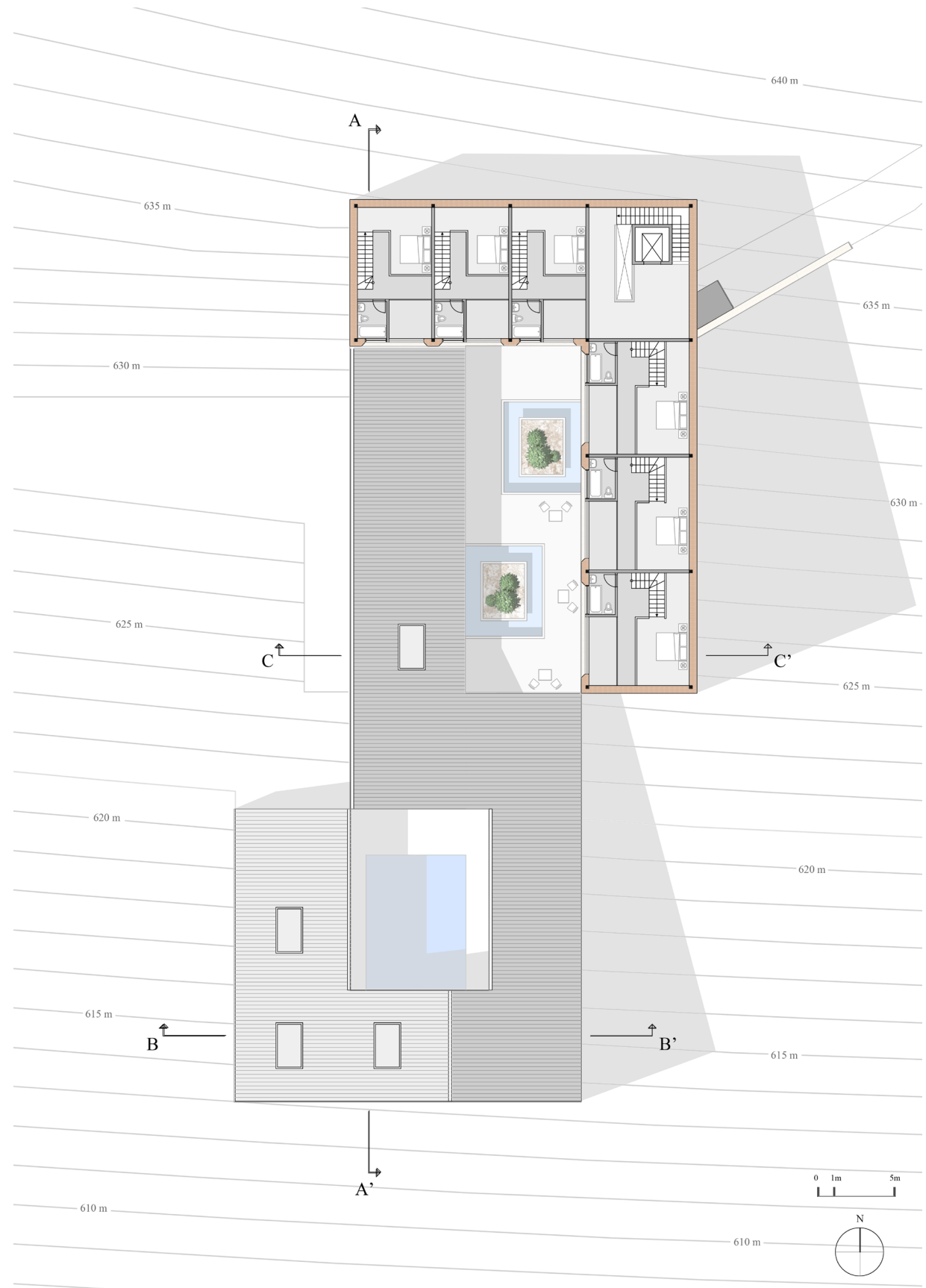


A glance at the old village [10]

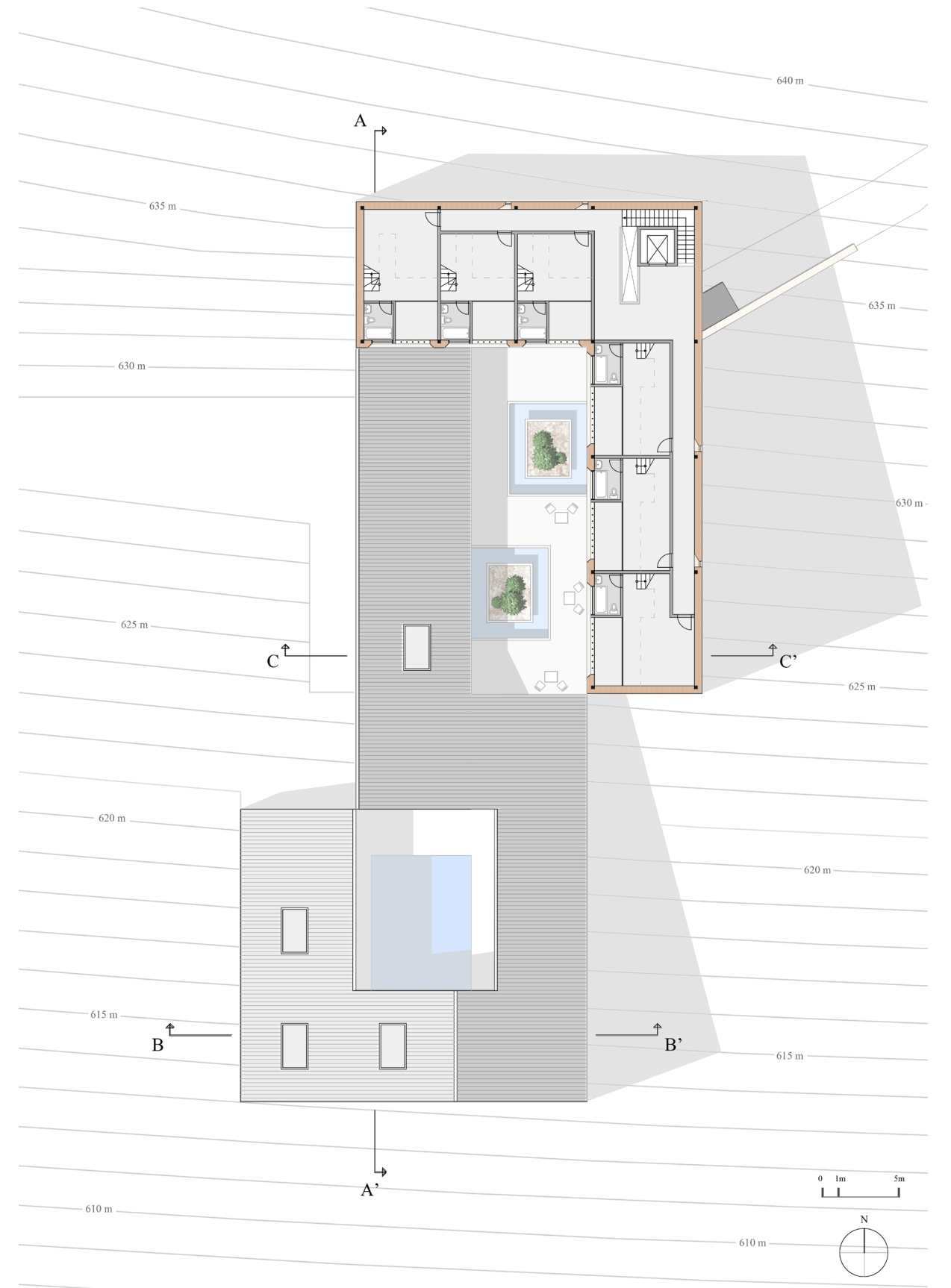
Organization based on tradition

The building is organized by three characteristics based on tradition: the shed roof, the long narrow courtyard, and the rammed earth wall. Not like most traditional dwellings built on the plain, the big challenge is that building a modern hotel with traditional characteristics on the slope.

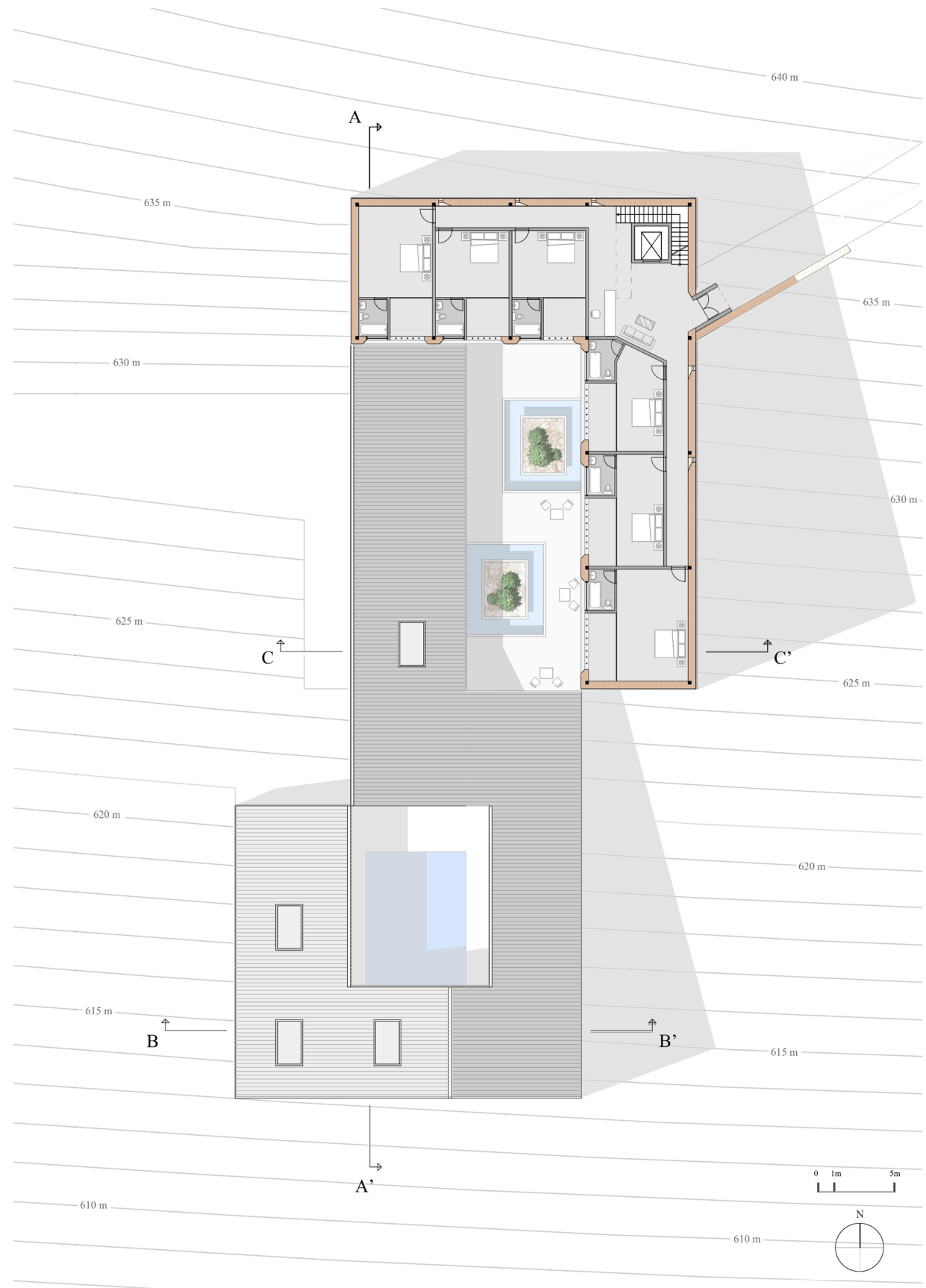




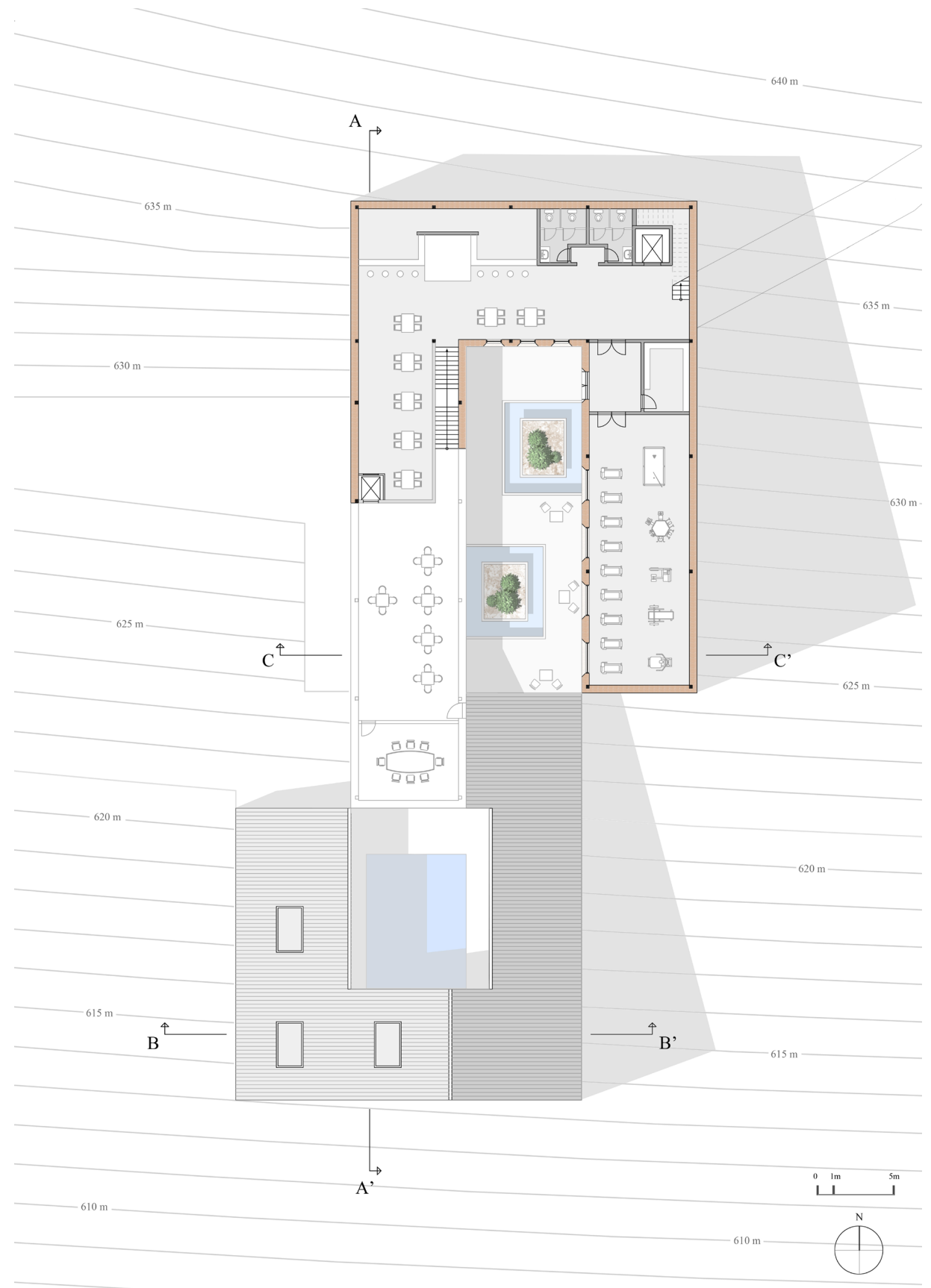
Third floor level 2 plan



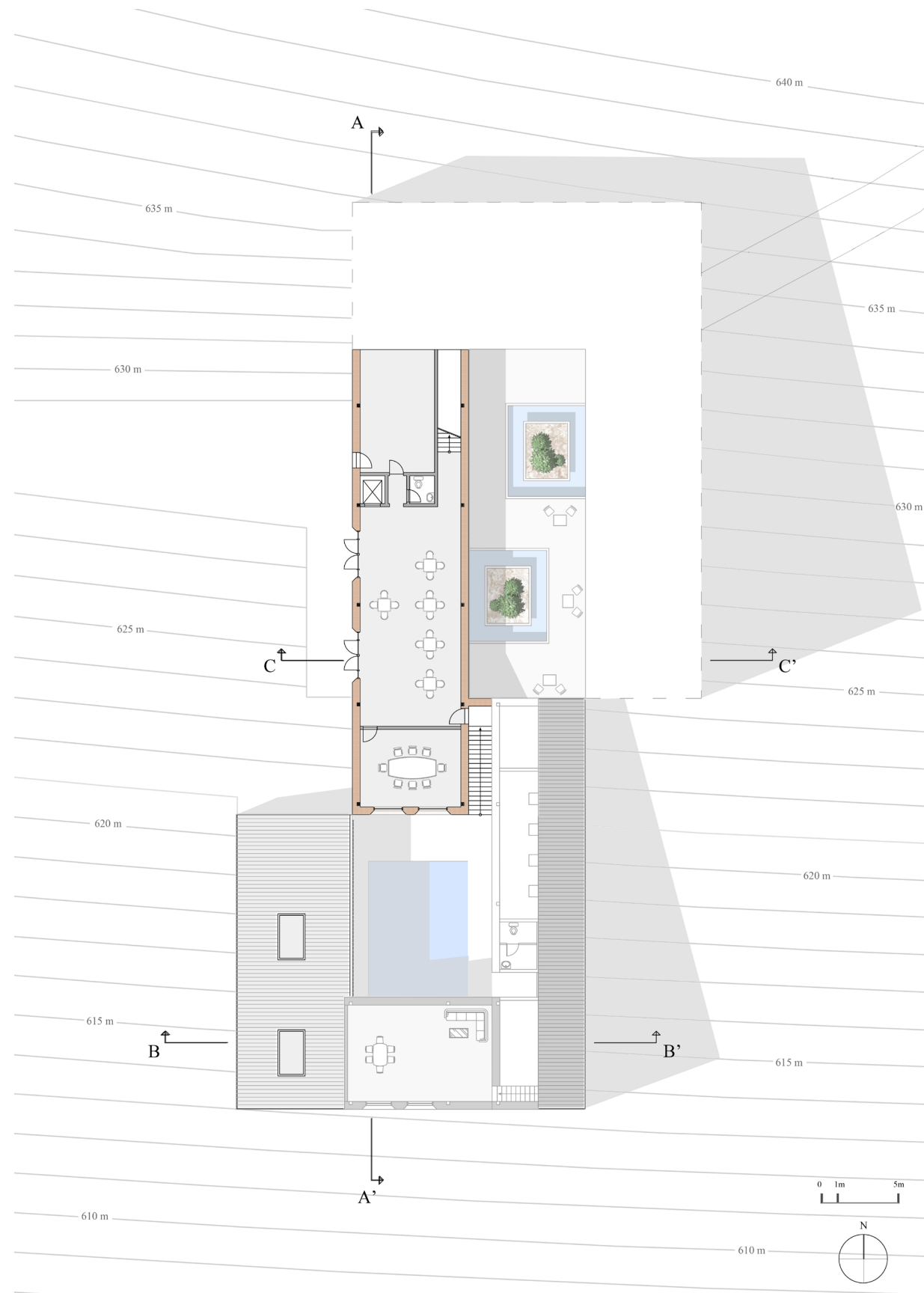
Third floor level 1 plan



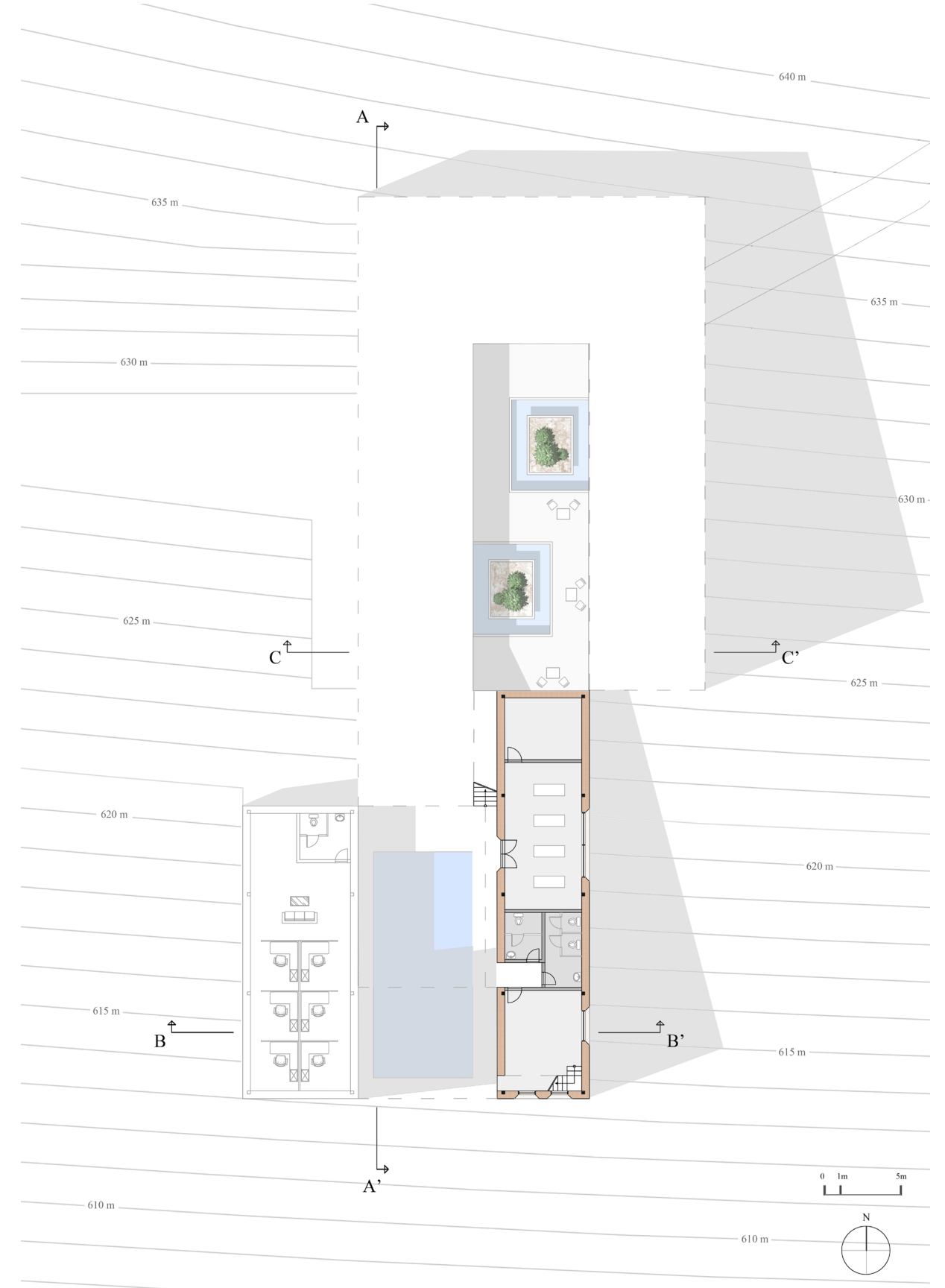
Second floor plan (entrance floor)



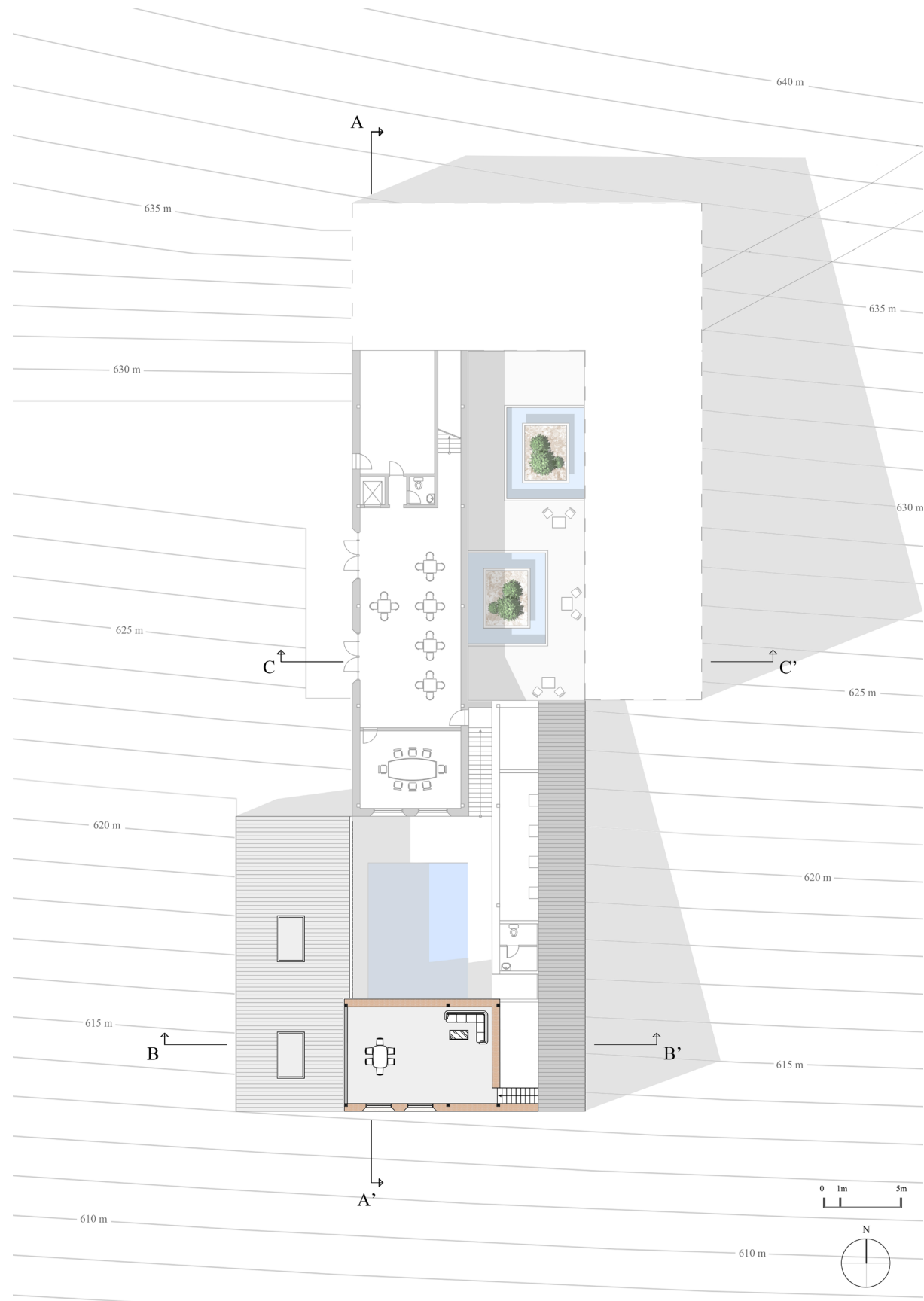
First floor plan



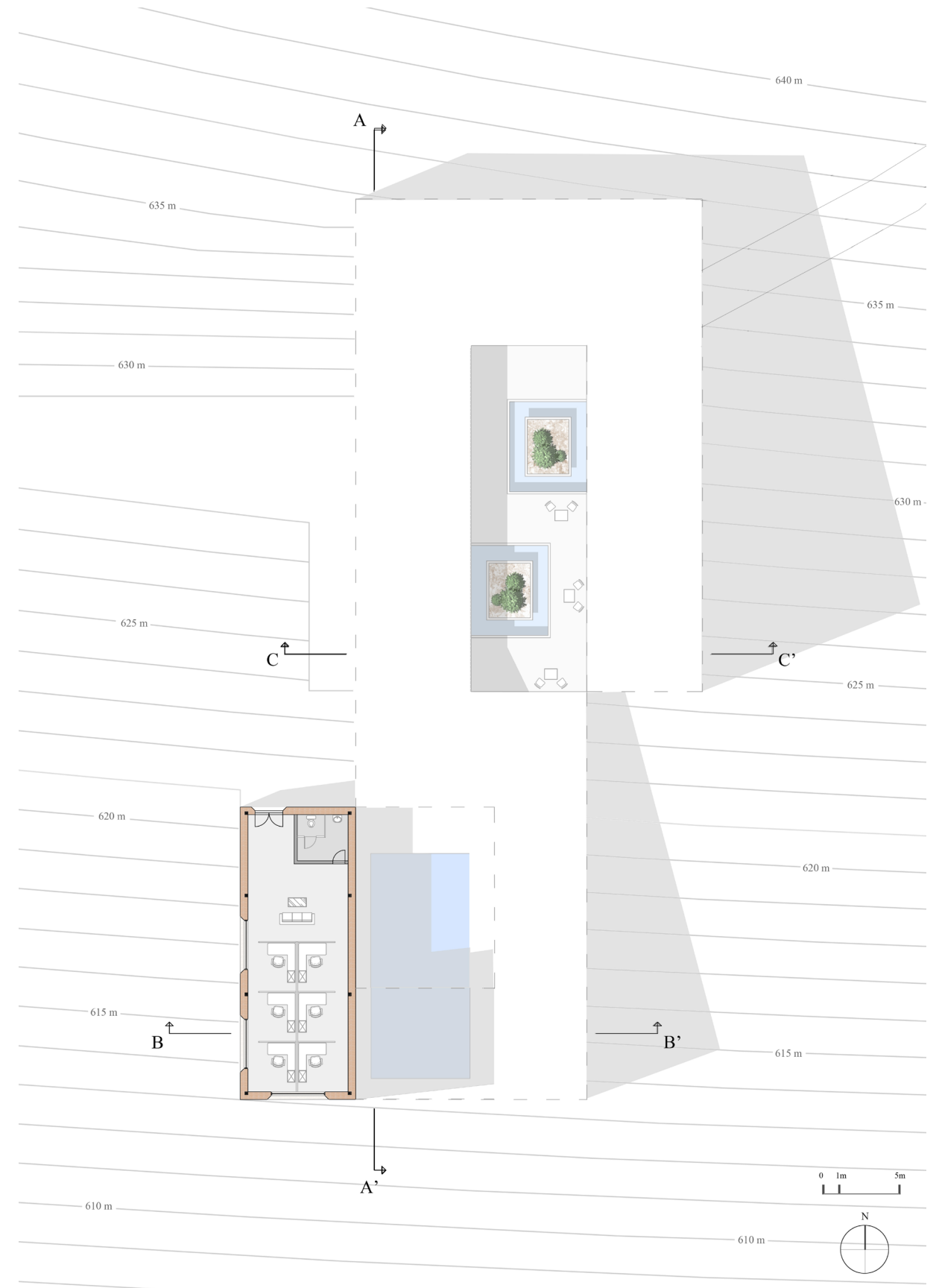
Dinning hall level plan



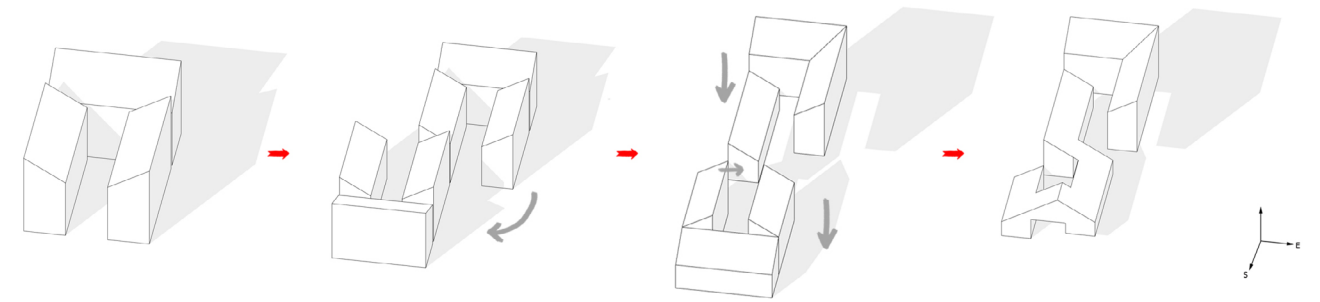
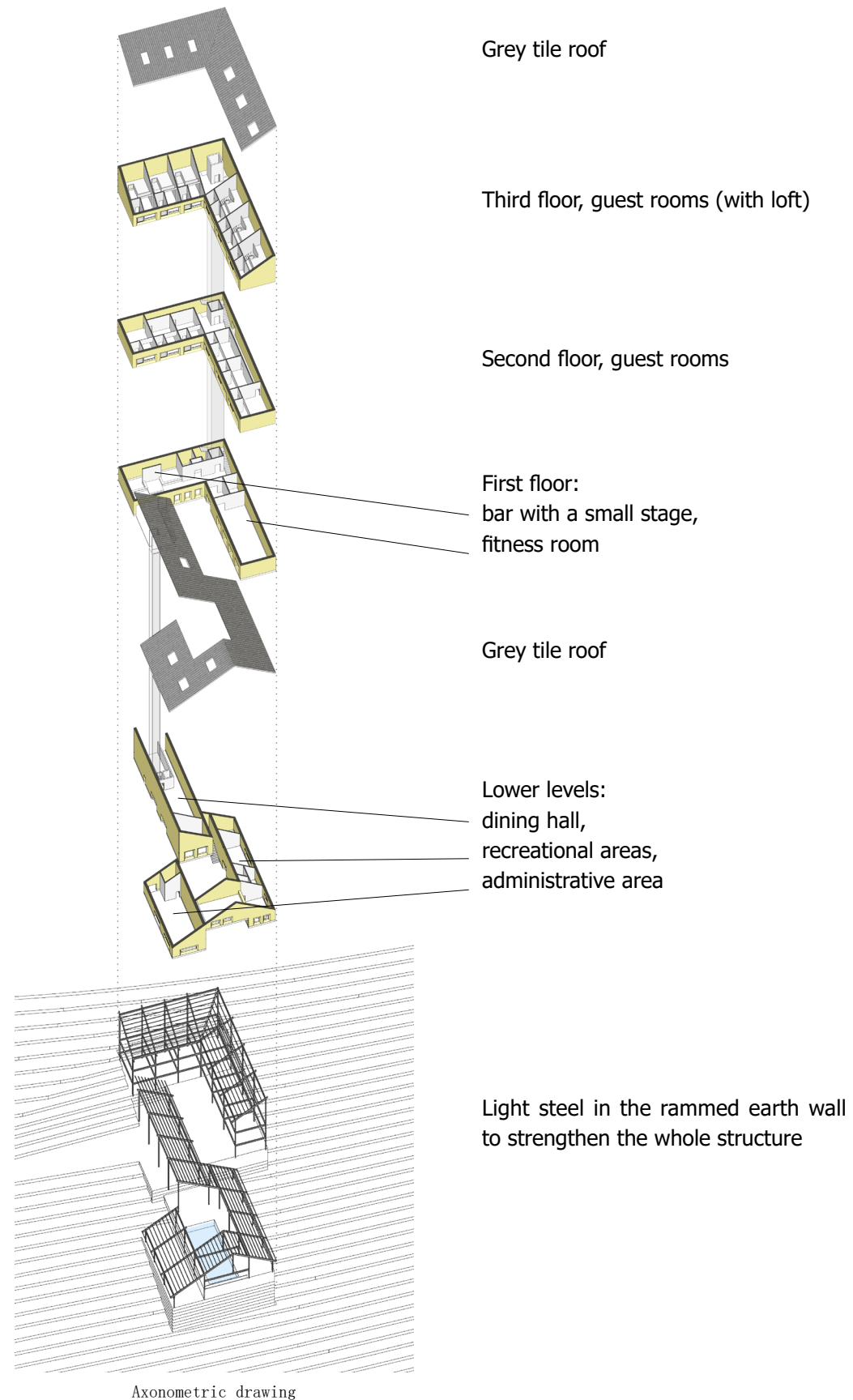
Recreational level plan



Tea room level plan



Administrative level plan



Organization development through translation and rotation

Rain

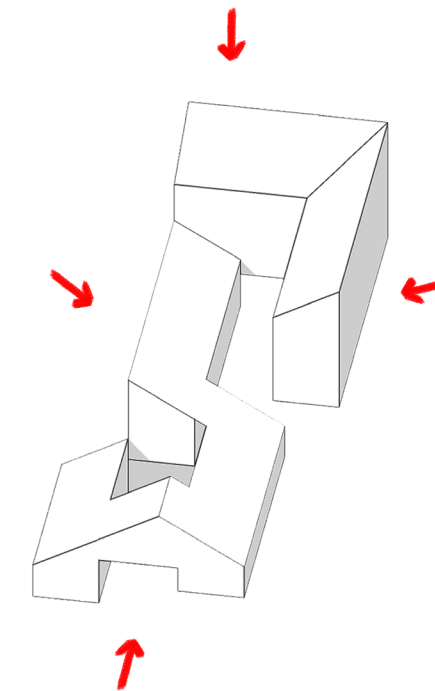
The annual precipitation is less than 500 mm, so this area is relatively arid. Rammed earth reinforced by steel can sustain the rain.

Natural Light

The long narrow courtyard can ensure enough natural light in every season. It can also prevent excess heat in summer and get more heat in winter.

Wind

The prevailing wind in winter is northeast wind while that in summer is southwest wind. The building goes all the way down following the hill from northeast to southwest. This organization will prevent wind in winter but welcome breeze into the courtyard in summer.

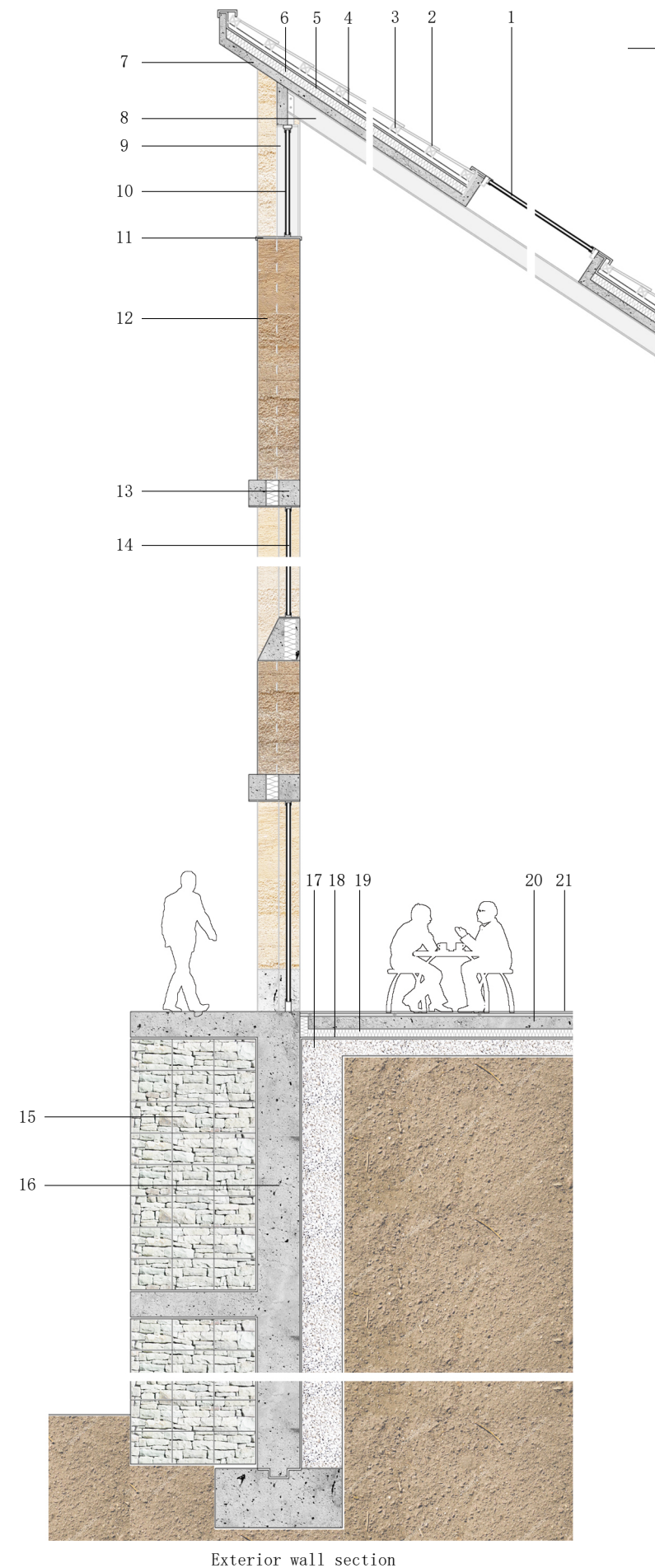


View

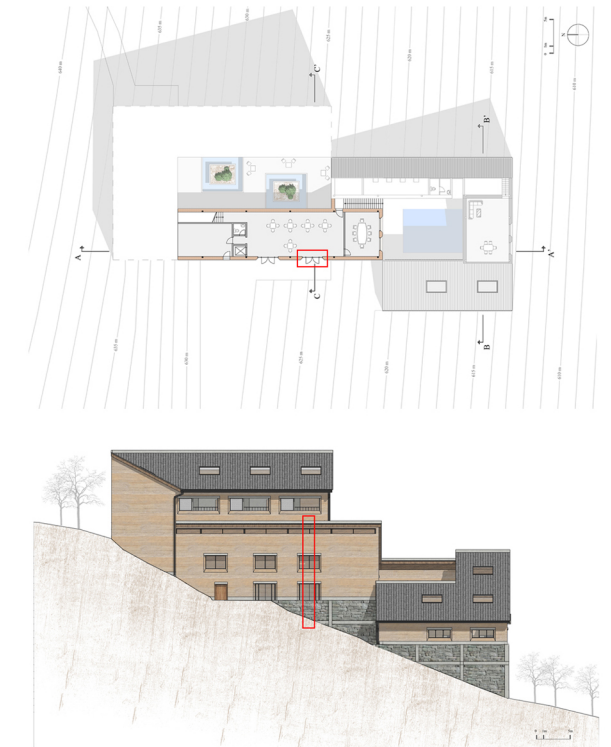
The specific organization of the building ensures all guest rooms get the magnificent view from Qinling Mountain Range.

Modern enclosure vs Tradition

Although the modern rammed earth wall is firmer, load bearing is relegated to a steel frame system inserted. The thickness of rammed earth wall is inherited to keep its thermal performance.

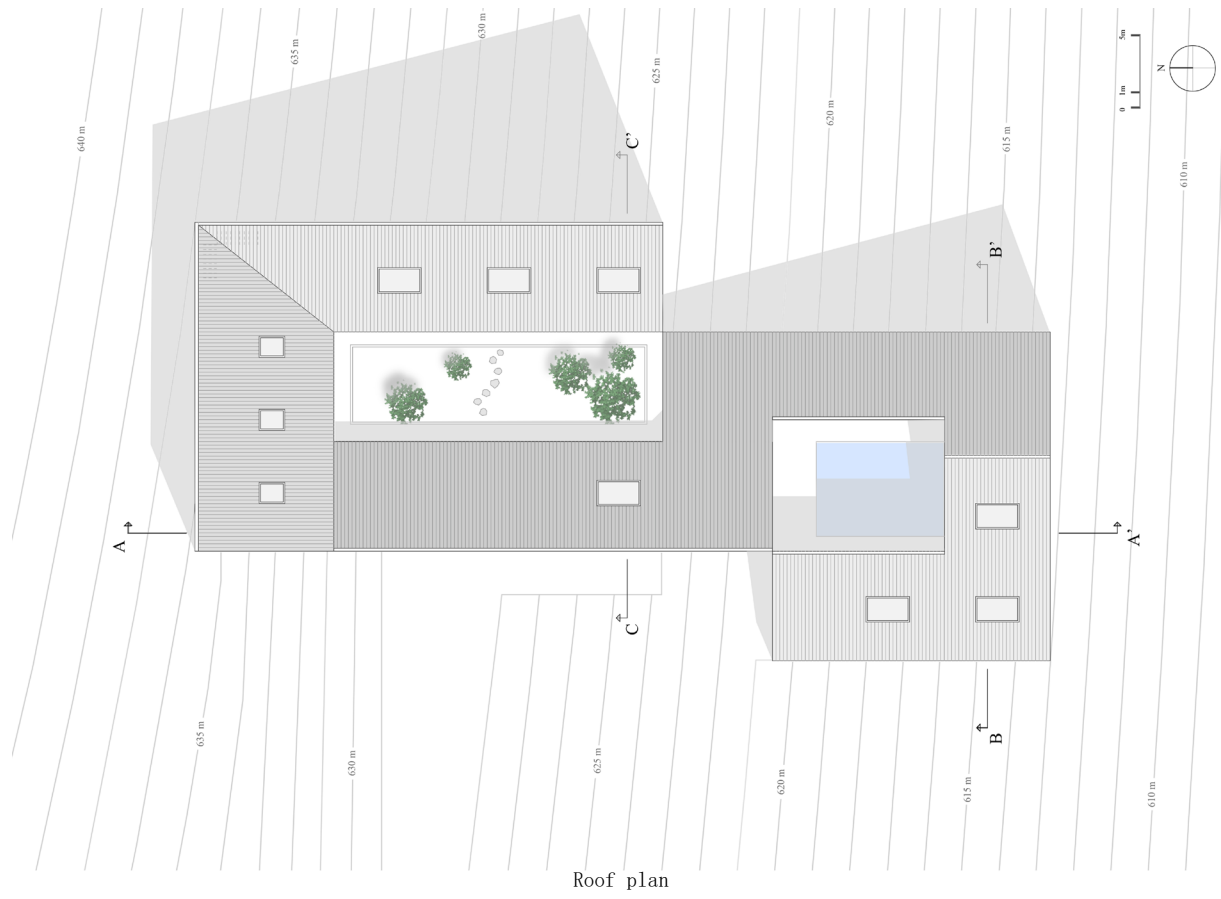


Exterior wall section



Dinnig hall level plan and west elevation

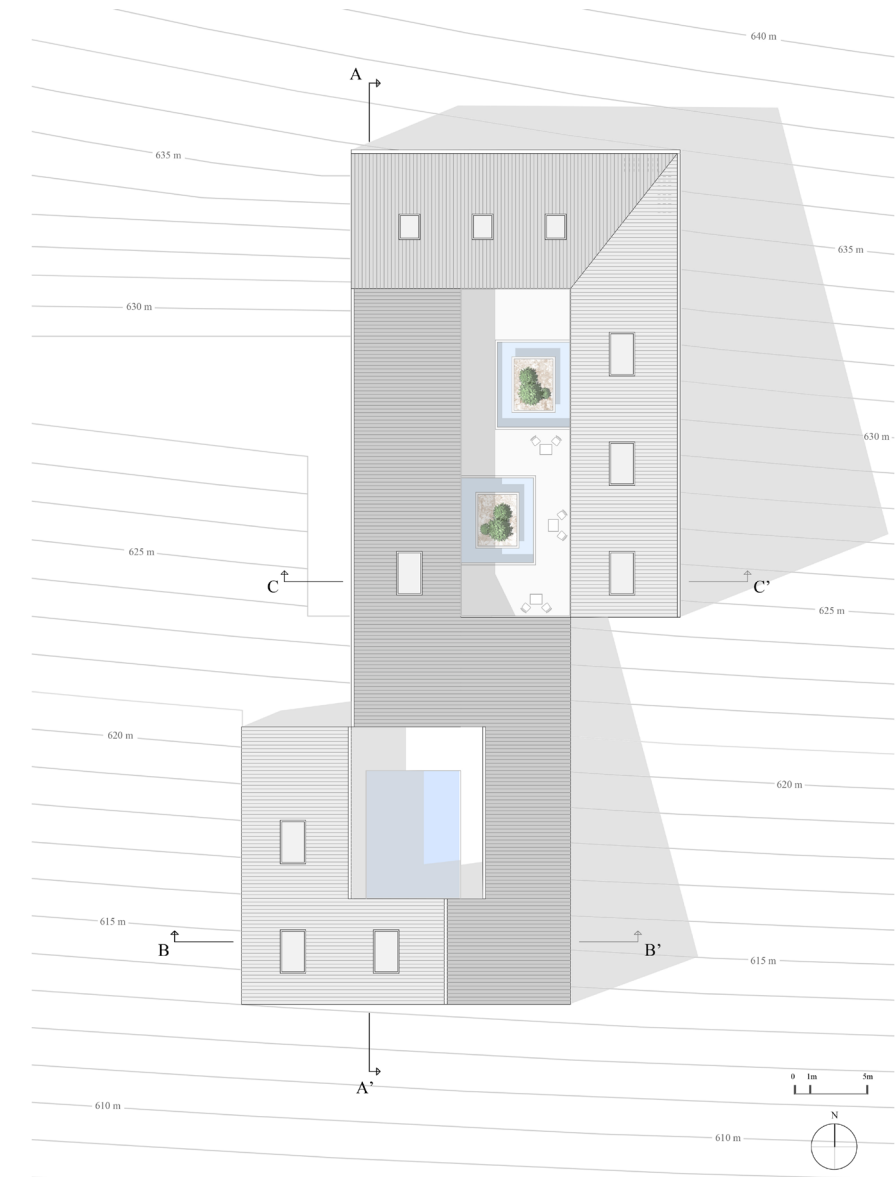
- 1 Double glazing skylight
- 2 Grey tile roof
- 3 Nodes
- 4 50 mm wood board supporting the tiles
- 5 Vapour barrier
- 6 100 mm insulation
- 7 100 mm concrete slab
- 8 Steel rafter
- 9 Steel column
- 10 Double glazing window
- 11 Metal sheet cap
- 12 500 mm rammed earth wall
- 13 Concrete lintel
- 14 Double glazing window
- 15 Gabion system stone
- 16 Concrete base structure
- 17 Gravel
- 18 Damp-proofing layer
- 19 100 mm insulation
- 20 Concrete floor slab
- 21 20 mm floor



Roof plan



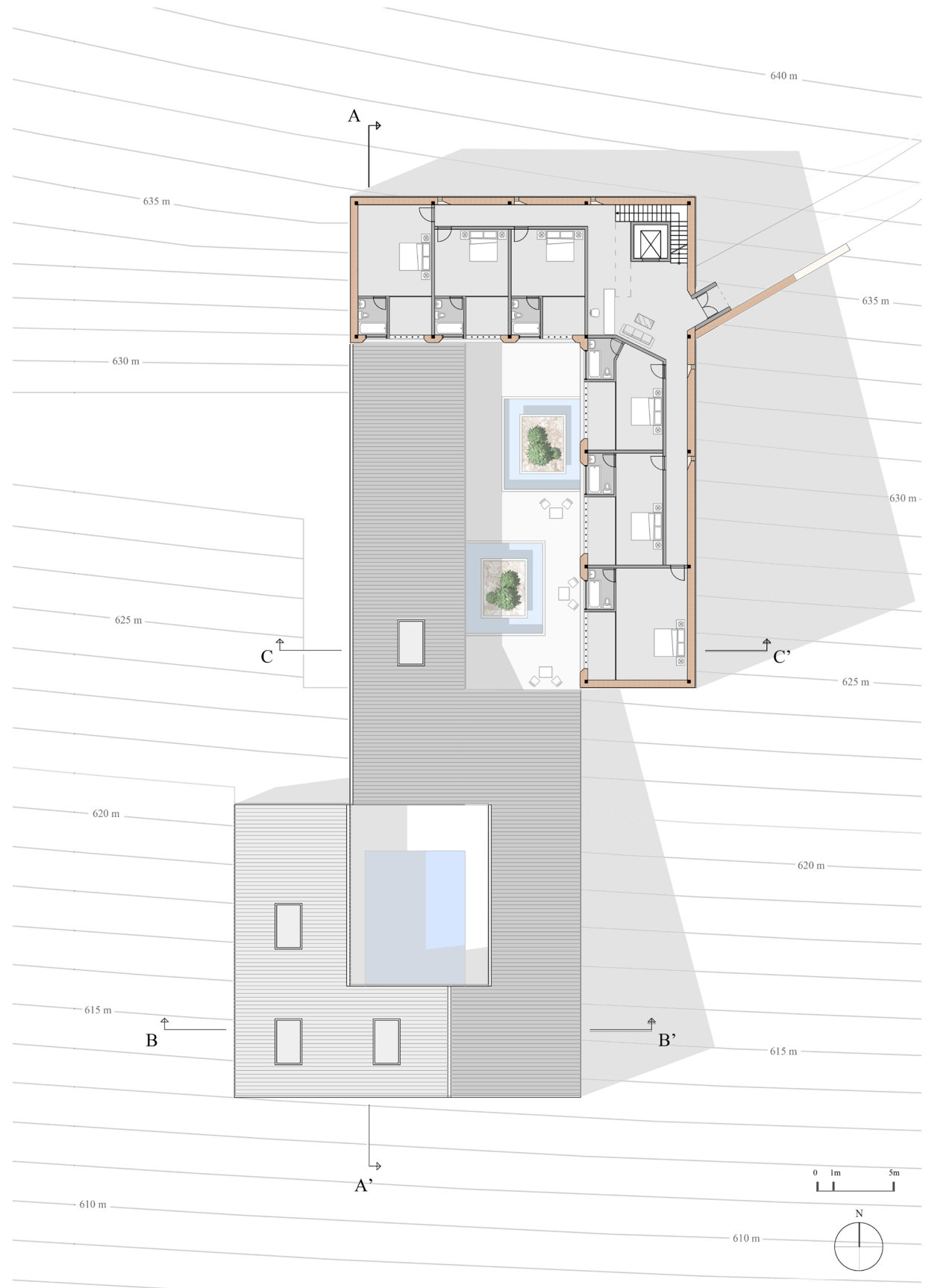
West elevation



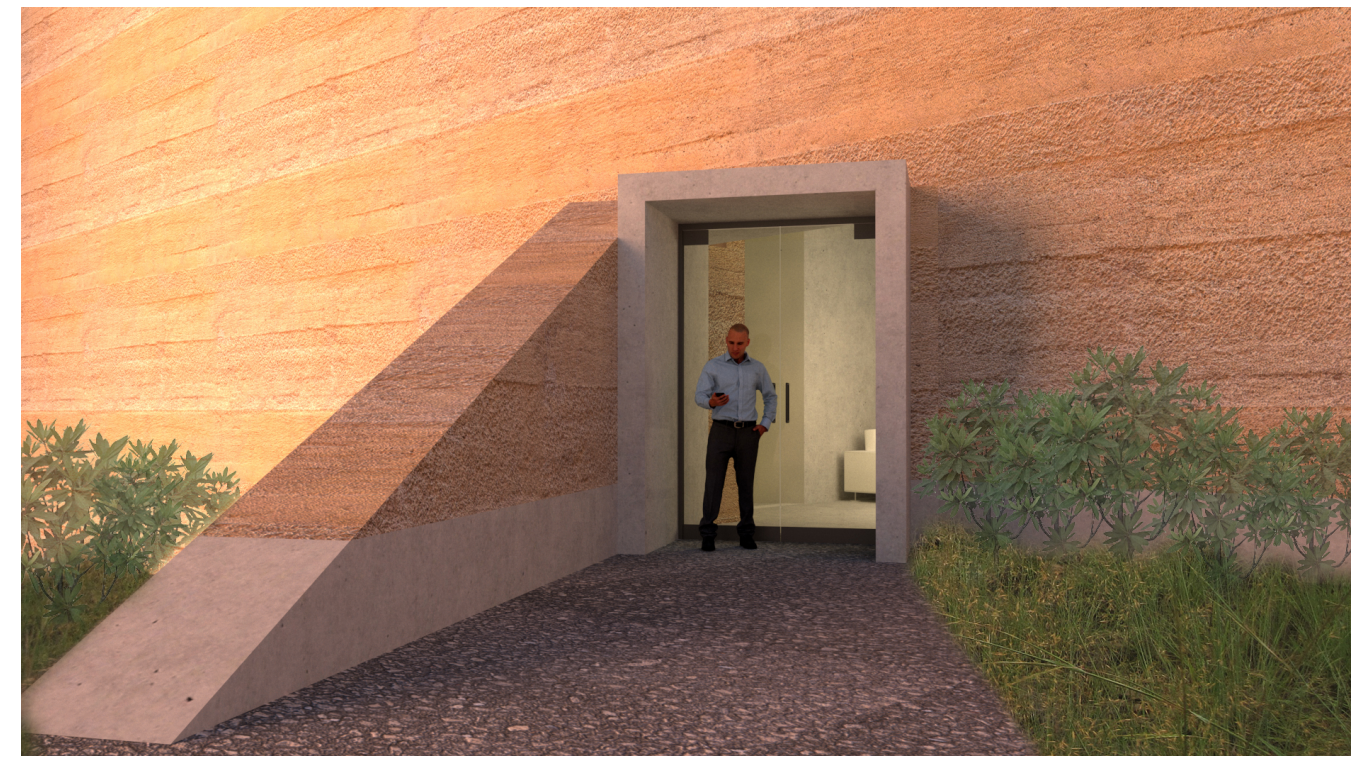
Roof plan



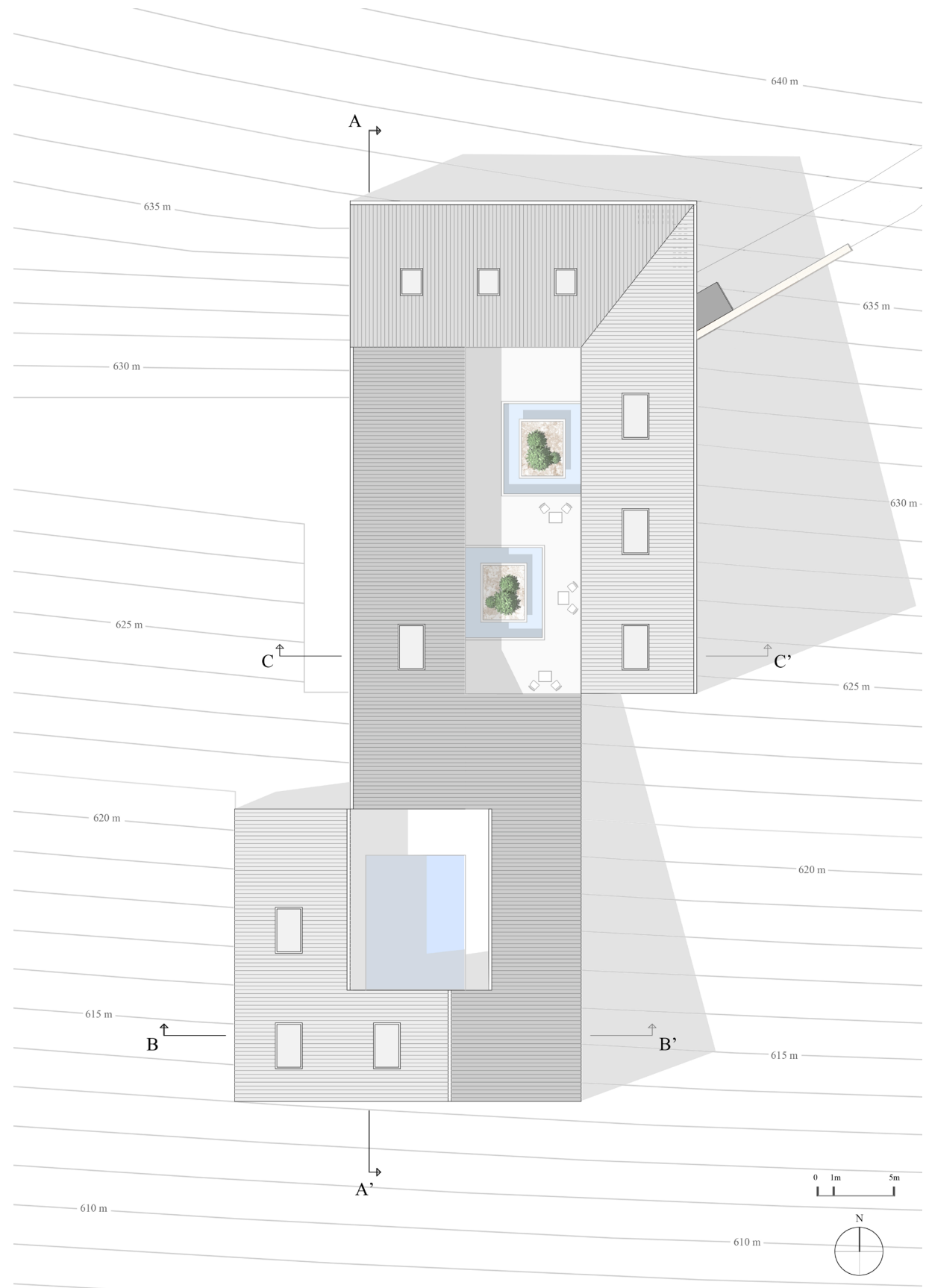
South elevation



Second floor plan



Entrance rendering



Roof plan



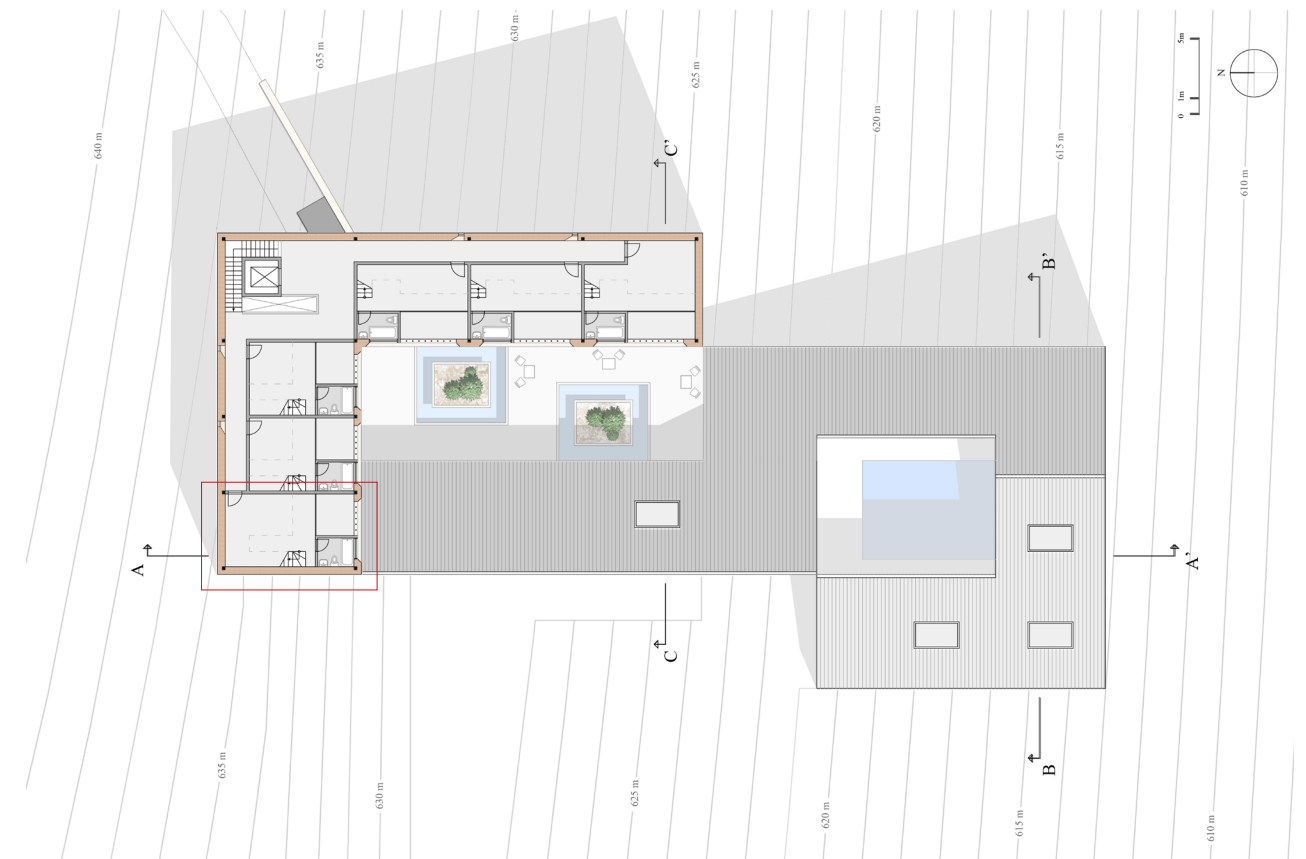
Courtyard rendering



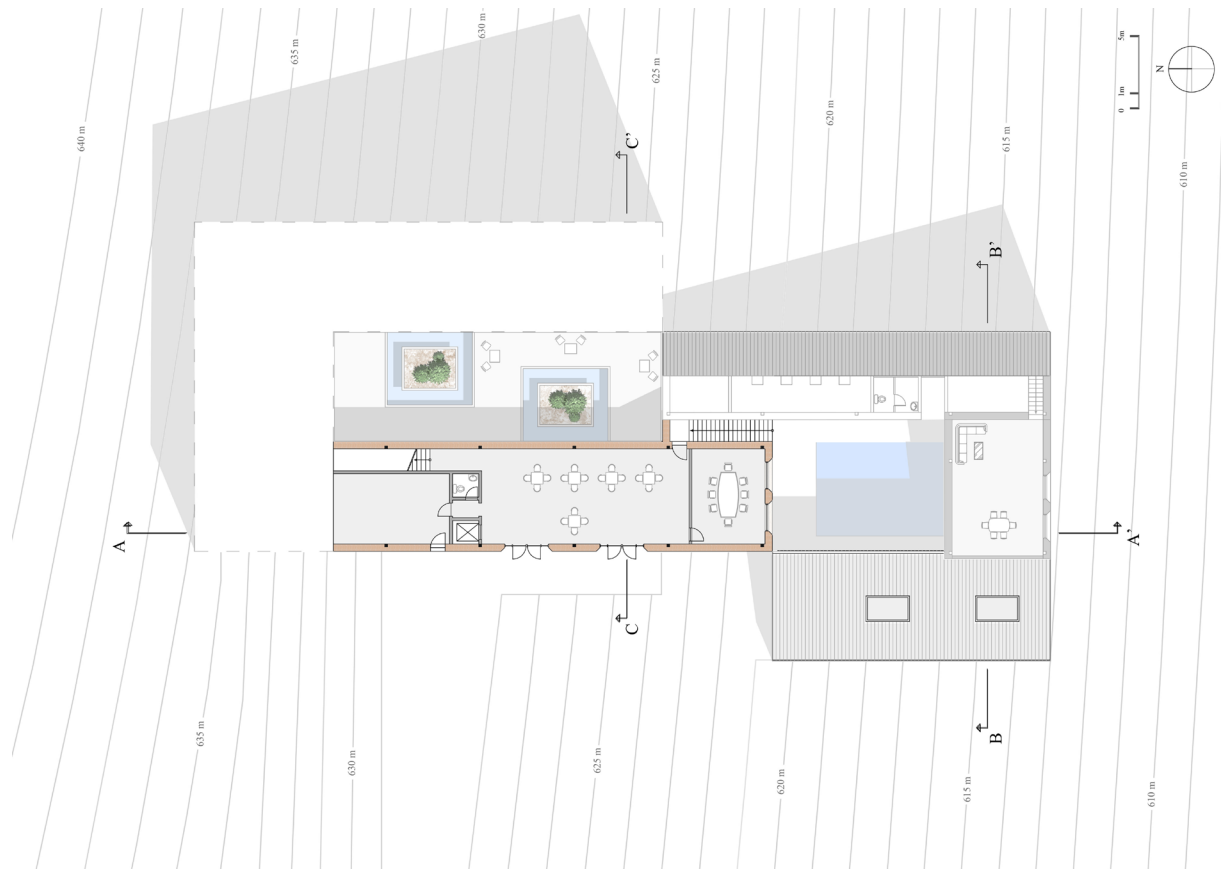
Third floor guest room rendering

Modern convenience vs Tradition

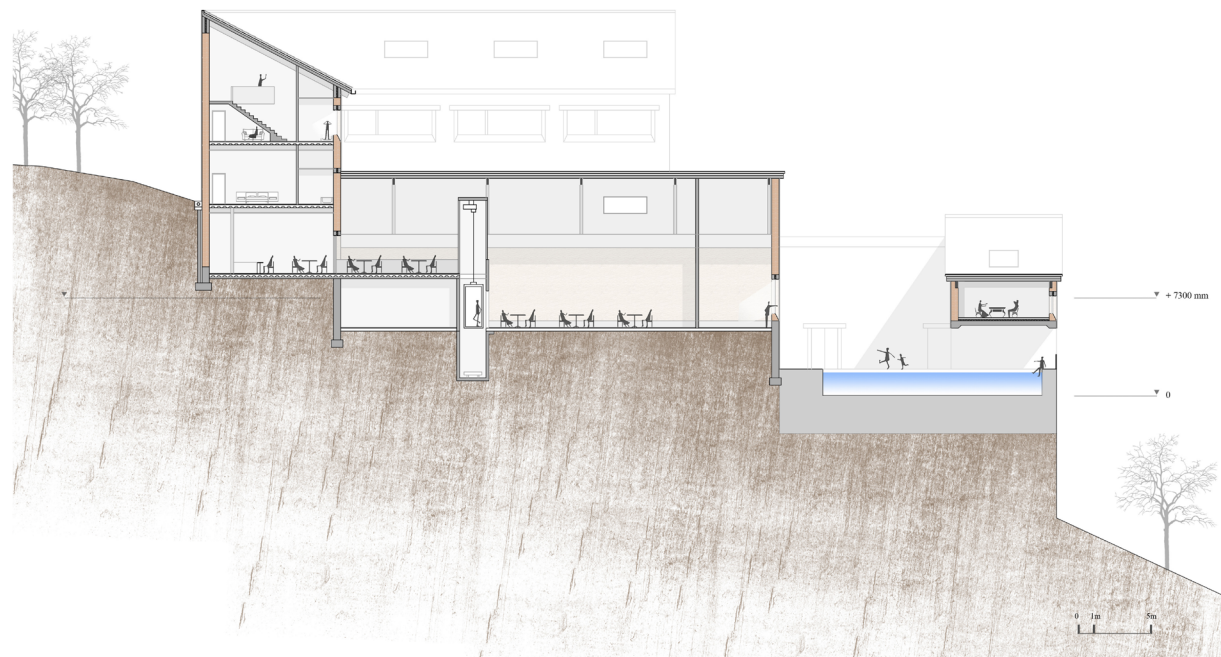
The shed roof creates the potential of having duplex guest rooms on the top floor. Since it is no longer necessary to collect rainwater in the courtyard, a swimming pool serves a reminder of the former necessity and offers a modern convenience.



Third floor level 1 plan



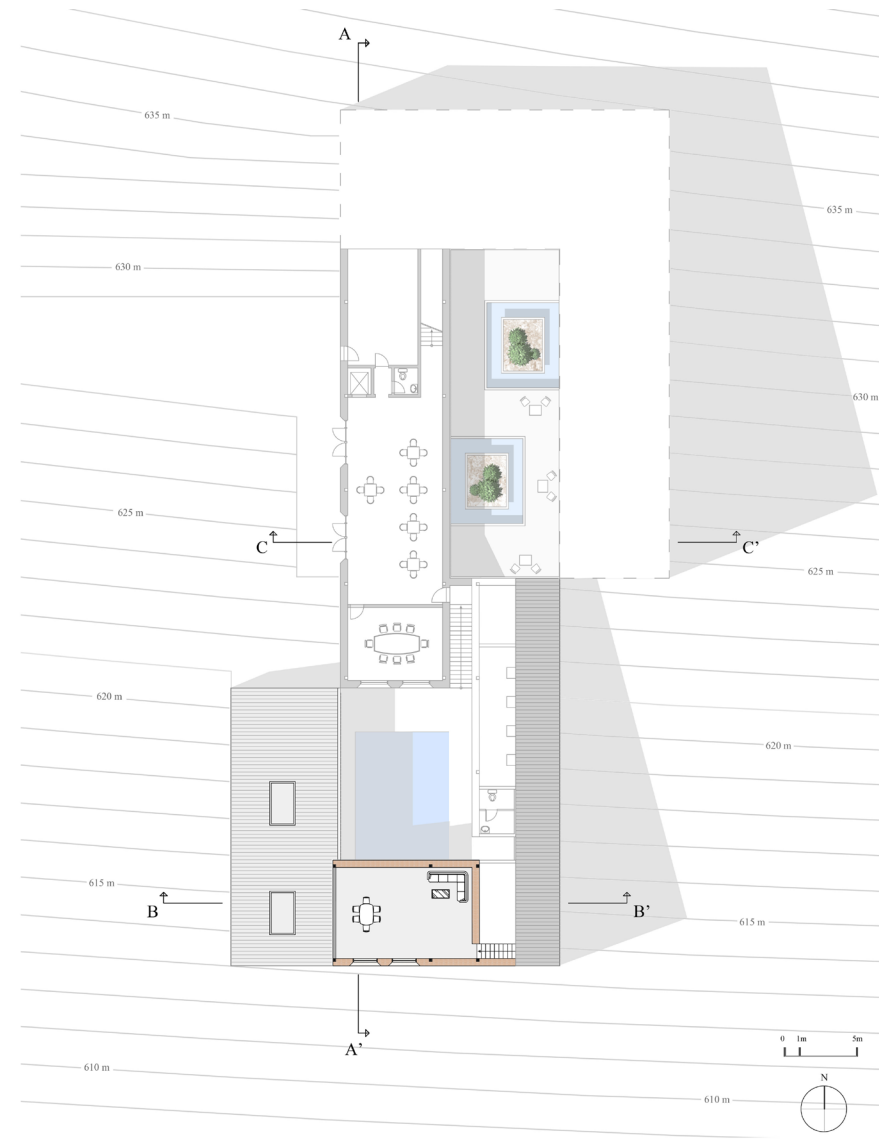
Dinning hall level plan



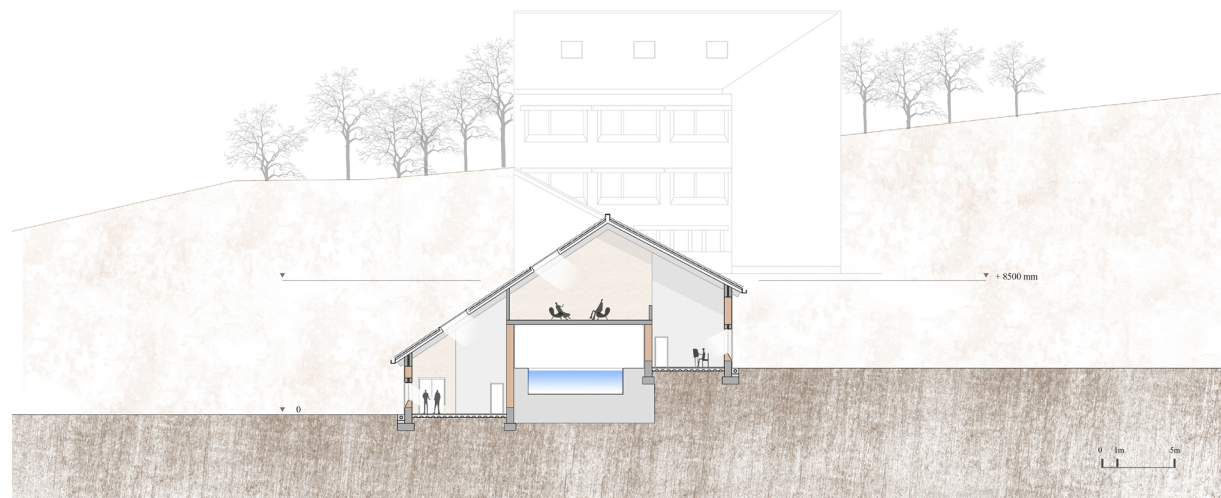
Section AA'



Bathroom rendering



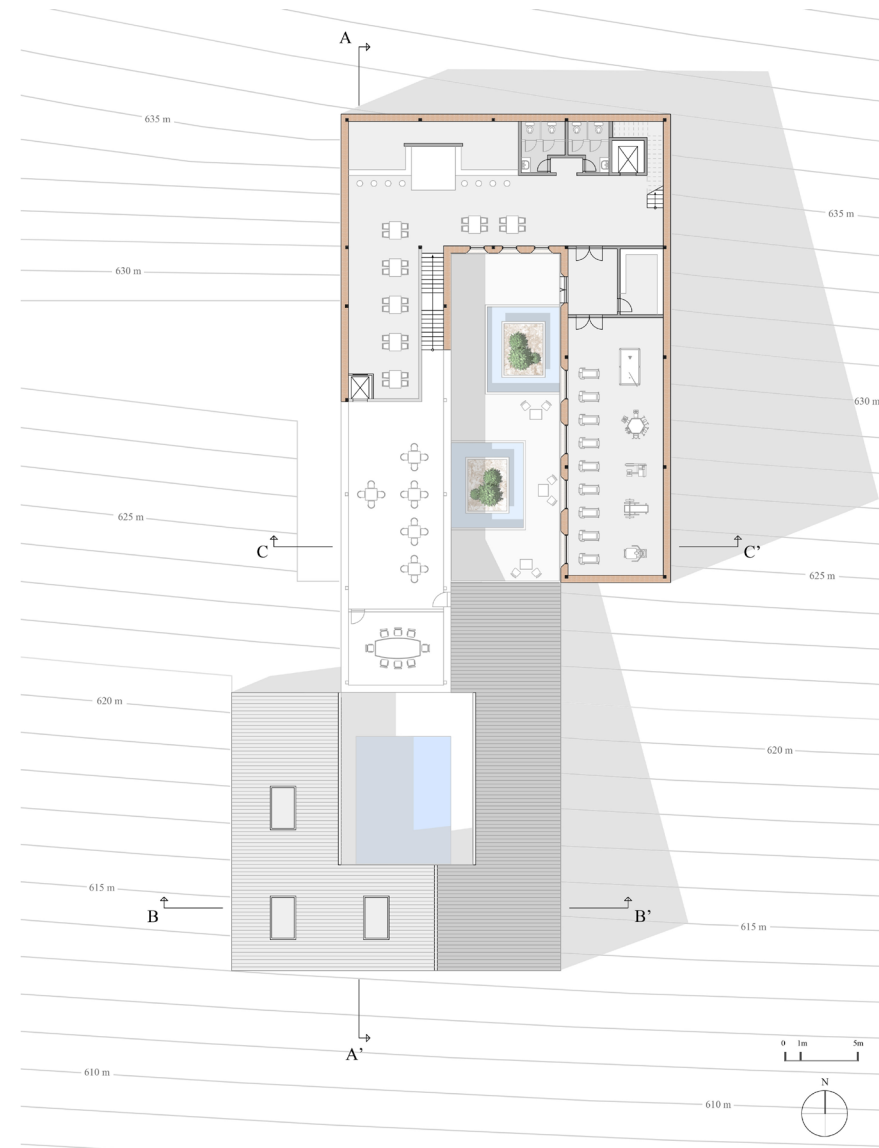
Tea room level plan



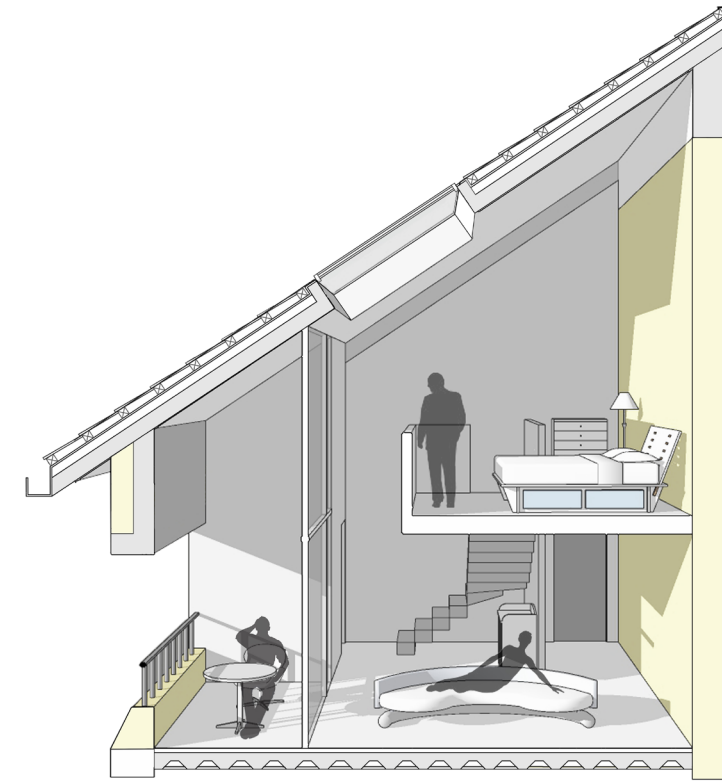
Section BB'



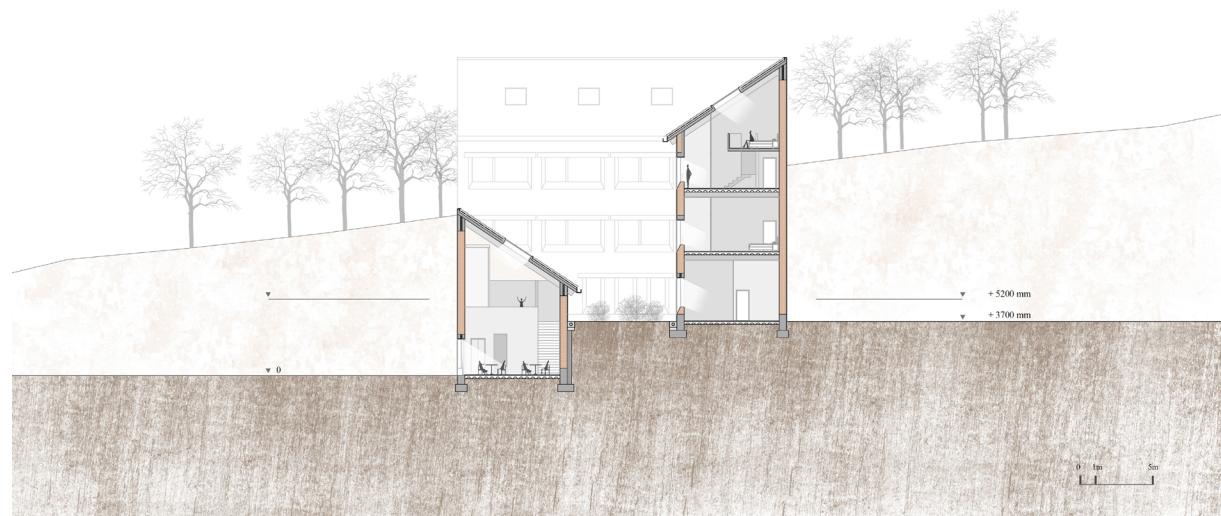
Swimming pool rendering



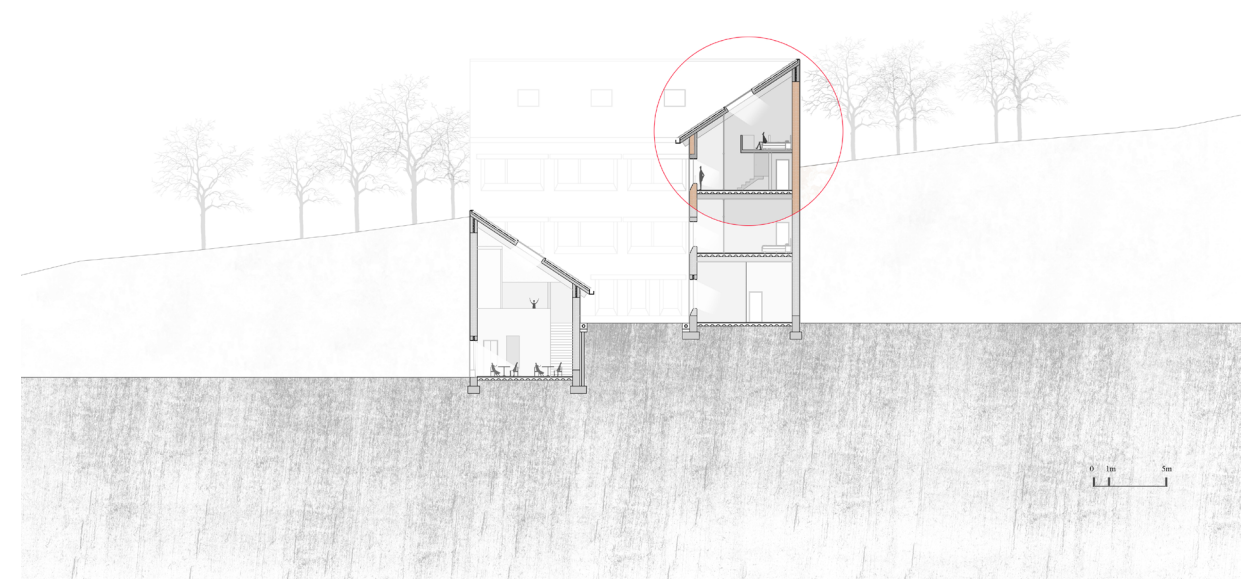
First floor plan



Third floor guest room



Section CC'



Section CC'

Conclusion

The proposal for building a hotel using traditional materials and modern construction techniques attempt to invoke familiarity and memory through its architecture. The project employs the organization of the village buildings in addition to the familiar materials. The challenge is always the necessity of constructing a modern building that contains traditional characteristics that are embedded not as an overt demonstration but as smart symbiotic and collaborative extension of the modern materials and systems that will be inevitably used.

Bibliography

Photographs and research in "The memory through architecture"

1. "Traditional Guanzhong Dwelling", accessed 2020, <http://www.nipic.com/detail/huitu/20200106/182003905060.html>.
2. "Why house built in half-like?", published September 6, 2017, https://www.sohu.com/a/190262709_155946.
3. YU Zhi-chun, LIU Jia-ping, Research on Vernacular Dwelling of Guanzhong Area, Journal of Northwest University (Natural Science Edition), Oct., 2009, Vol. 39, No. 5.
4. "Tradiotional construction techniques in Guanzhong Dwellings", published July 16, 2019, https://m.thepaper.cn/newsDetail_forward_3932818.
5. "What caused the dwellings in Shaanxi built in half-like?", accessed August 6, 2020, <https://xw.qq.com/cmsid/20200806A0VEYR00>.

Photographs and research in "Rammed earth in recent buildings"

6. Landscape-Zhou, "WangShu: Diversities in the design of Tiles Hill", published January 18, 2016, <https://posts.careerengine.us/p/5d8324db722ac65cb129f9a0>.
7. "Tiles Hill on the campus of China Academy of Arts", published April 3, 2016, <http://www.dinzd.com/works/wangshu01.html>.
8. "The Maosi Ecological Primary School", published September 7, 2010, https://bbs.zhulong.com/101010_group_201806/detail10042392/.
9. FANG Xi, The Maosi Ecological Primary School in West China, 2009, <http://www.ideassonline.org/public/pdf/ScuolaEcologicaCina-ENGbis.pdf>.

Photographs in "A proposal for an architecture of memory - Place and proximity"

10. Bailuyuan Film City, <https://travel.qunar.com/p-oi9528165-bailuyuanyingshicheng>.

