The Utzon Academy

Dwelling and learning through water and fire

MA4-Ark54

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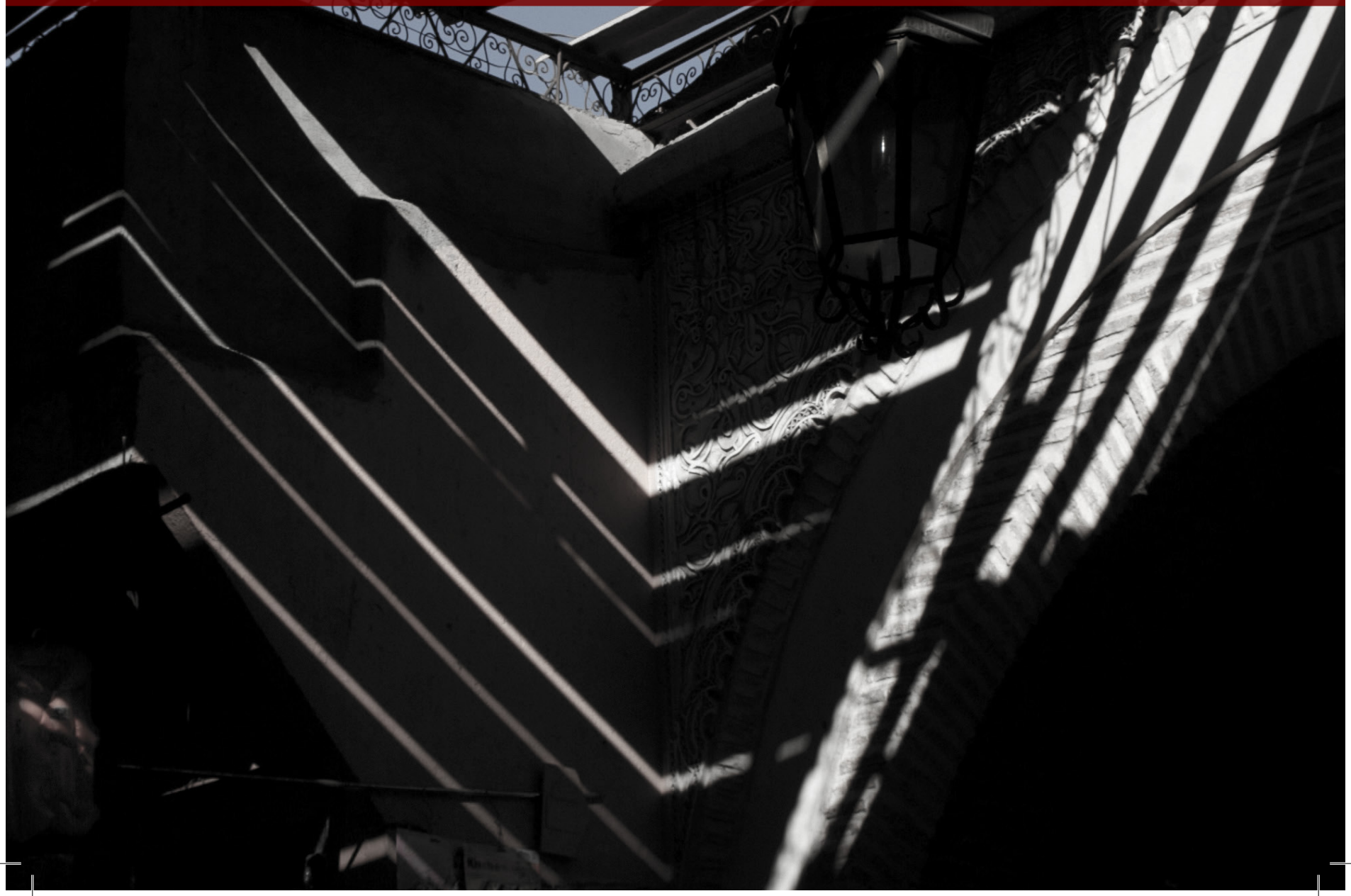

Synopsis:

Situated in the Atlas mountains in Morocco, the Utzon Academy is a place where architecture students go to be inspired. The students will get inspired by the architecture of Morocco and the work methods of Jørn Utzon.
The design of the Utzon Academy will happen through an phenomenological understanding of fire and water in a learning environment. The water and the fire will create spaces for reflection and a gathering space where knowledge can be shared.

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Content

Resumé

Utzon Akademiet, som er placeret i Ourika dalen i Marokko er et sted for læring. Gennem studier af traditionel arkitektur kan de studerende lære af de samme kilder som inspirerede Jørn Utzon på hans rejser til Marokko i 1947.
På samme måde som Jørn Utzon fortolkede arkitektoniske principperl han fandt i traditionel arkitektur og fortolkede disse principper i sin arkitektur, tager Utzon akademiet afsæt i arkitektoniske principper fundet i Aït Ben Haddou. De arkitektoniske principper, der bliver benyttet i Utzon Akademiet, er 'væggen', 'hulen' og 'plateauet'. Disse arkitektoniske elementer er blevet fortolket og organiseret så de danner et sted for læring.

Gennem en stedsanalyse af Ourika dalen læres det, at de vigtigste elementer i dalen er vand og ild. Dalen ville forsvinde, hvis det ikke var for disse to elementer. For at forstå hvordan elementerne kan bruges i en læringssituation laves en fænomenologisk analyse af vand og ild. Analysen, som er baseret på den tyske filosof Gaston Bachelard, viser, at ild kan skabe steder for refleksion eller samling. og at vand fordrer kreativ tænkning.

Utzon Akademiet er kontekstspecifik arkitektur, som det er tradition blandt nordiske arkitekter. I analysefasen er der lavet analyser af arkitektoniske værker af Alvar Aalto, Glenn Murcutt og Rick Joy, som arbejder med at gøre arkitekturen kontekstspecifik. Analyserne viser, hvordan arkitekterne gennem integration af samfundet, indramning af landskabet og materiale valg, formår at få arkitekturen til at passe ind i sin kontekst.
Utzon Akademiet gøres kontekst specifikt ved at tage elementerne vand og ild og benytte dem i projektet, så deres kvaliteter bliver forstærket. Ilden i lille skala bruges i boligerne, hvor stearinlyset benyttes til at gøre boligen til et sted for refleksion og fordybelse. Ilden i stor skala bruges som samlingssted for de studerende. Her kan de dele den viden de har opnået i Utzon Akademiet. Vandet bruges i Utzon akademiet til at skabe et sted hvor de studerende kan lære om de traditionelle marokkanske byggemetoder ved at benytte dem til at bygge med samt at forstå dem som arkitektoniske principer.

Et vigtigt parameter for designet af Utzon Akademiet er, at det integreres med samfundet det ligger i. Analysen af Alvar Aaltos Säynatsälo Rådhus, vises, at integration med samfundet kan opnås ved, at et steds funktioner bliver offentligt tilgængelige. Bygningen bliver et samlingssted for det lokale samfund. Utzon akademiet deler offentlige funktioner med landsbyen i Ourika dalen, som derved får glæde af at Utzon Akademiet bliver bygget. Det lokale samfund i Ourika dalen bliver også integreret i Utzon Akademiet, idet idéen er, at de er medvirkende i opførelsen og driften af stedet. Ved at integrere samfundet på denne måde, får de et tilhørsforhold til stedet. En positiv ting ved at benytte lokale i konstruktionen af Utzon Akademiet er, at de lokale igen opdager deres traditionelle byggemetoder, som ellers er i fare for at gå tabt på grund af moderne byggeskik.

Utzon Akademiet er et sted, hvor studerende og de lokale kan lære om traditionel marokkansk byggeskik, men det er også et sted ,som viser, hvordan moderne byggeteknik kan bruges på en bæredygtig måde. Alle tage i Utzon Akademiet er skalkonstruktioner i beton. Konstruktionerne er minimeret for at bruge så lidt materiale som muligt. De traditionelle byggematerialer i Marokkansk arkitektur, jord og træ, forgår med tiden, hvis det er efterladt. Detaljerne der holder taget er designet som klemmer. Dette er gjort for at gøre det let for de lokale både at konstruere Akademiet, men også at bruge tagene et andet sted hvis Utzon Akademiet på et tidspunkt ikke er brugbart længere. På denne måde kan de forurenende tagelementer fjernes fra naturen og genbruges et andet sted.

Utzon akademiet fremstår i sit design som en mur der snor sig op ad en bjergside i Ourika dalen. Fra bunden af dalen er fællesrum og klynger af boliger placeret omkring centrale gårdrum. En sti følger muren hele vejen op til et fællesrum. Fællesrummet er placeret som det højeste i bygningen.

Introduction

Morocco has the power to change the life of an architect. When coming from a Nordic country the experience of the North African sun, that cuts out shapes of the landscape is stunning. The sun in Africa is an all dominating sun, that dictates life, movement and space. When the sun rises in the morning, it does not rise slowly like in the Nordic countries. It quickly leaves the horizon behind and begin its blazing journey across the arch of the sky. The raw power of the sun make things that we, in the north take for granted, a precious commodity. Water and the coolness of the shade become the things which everything else is built around.

Nordic architects have found great inspiration for their work in the architecture of Morocco. The Danish architect Jørn Utzon travelled in Morocco in 1947 and was greatly inspired by the relationship between the sun and the shade, the honesty material use and form of the vernacular architecture, the colours and the patterns. Jørn Utzon had an ability to destill the architectural principles of the vernacular architecture and use the principles to create meaningful contemporary architecture in other contexts.

In Nordic architecture there is a tradition for building in strong relation to the context of the building. The understanding of the context inform the design of the building. Understanding of the context does not only mean an understanding of the physical space where the works of architecture were built. It also includes an understanding of how a building can add value to the local society. The local society should be involved in the creation of a building that is added to their society. Then the building will become a part of the society.

This thesis project is a proposition for a Jørn Utzon Academy in the Ourika valley in Morocco. The Jørn Utzon Academy will be a place where students of architecture can learn from the Moroccan vernacular architecture. The learning environment for the students will be enhanced through a phenomenological understanding of fire and water. Fire and water are elements that dictate life in the Atlas mountains but they are also elements that, in their pure form as phenomena create space for gathering, solitude and creation.

In the same way as Utzon understood architectural principles from an analysis of vernacular architecture, this project will too destill architectural principles found in the vernacular architecture and reinterpret them to create an Utzon Academy that is a place for learning, not just for the students who study there, but also for the local people who live in the valley.

Motivation

Architecture that refers to itself as easy readable pictures instead of relating to the landscape has become a common theme in the contemporary architecture. The architecture is decontextualing the environment in which the humans live and dwell.

Jørn Utzon, Sverre Fehn and Alvar Aalto are among the most famous Nordic architects. They all travelled in Morocco and drew inspiration from it which inspirited them to do great architecture. Utzon and Fehn both ended up with winning the Pritzker architecture prize, regarded the highest honour in the architectural profession. Alvar Aalto died before the price was created, but it is reasonable to argue that he would have been a likely winner if he had been alive. It seems like the architecture of Morocco is founded upon principles of architecture that transgress time and place.

Through two travels in Morocco, one as a part of the Emergent Studio at the Portsmouth School Of architecture in England, and one with the 2012 Jørn Utzon Spring Workshop, the inspiration for this thesis was developed. Professor Roger Tyrrell, who is the head of the Emergent Studio and cofounder of the Jørn Utzon Research Network, developed a program for an Utzon Academy. The Academy should be a place for students could gather, dwell poetically, think and act in the Ourika valley. The proposed brief for the Emergent Studio have been redeveloped to match the criteria from Architecture & Design at Aalborg University in Denmark.

In 1963 Bernard Rudofsky wrote the book “Architecture without architects” in which he wrote that: “The shapes of the houses, sometimes transmitted through a hundred generations, seem eternally valid, like those of their tools.” (Rudofsky 1964:3) At this point Utzon had already built The Kingo Houses and was working on the Sidney Opera House, projects that both rely on principles found in vernacular architecture. Utzon had discovered traditions that had seemed long lost.

In creating an Utzon Academy in Morocco it is important to get an understanding of how Utzon found inspiration in the architecture of rural Morocco and how he interpreted it to make a contemporary architectural composition.

Looking at the works of architects that have rooted their architecture strongly in the context will serve as inspiration. Alvar Aalto, Glen Murcutt and Rick Joy work with a phenomenological approach to architecture, where the architecture enhance the perception of the natural environment. The architecture serve as a frame that enhance an experience of the place.

It is my belief that if architecture to touch humans on a deeper level, it should relate to an instinctual part of the being.
Architecture should work through materials, architectural composition as a phenomenological experience for all the senses and not just the sense of sight. My hope is that architecture will again move toward an architecture for the senses and an architecture that relate to the context where it is built.

An Utzon Academy should be such a place. A place where people can go and rediscover principles of traditional building and experience the landscape where these traditions have developed through generations.

Methodology

The following paragraph will create an overview on the methodology and design tools used in the project.

Integrated design process

The work with the Utzon Academy will be done as an integrated design process. The integrated design process consist of five parts: *Problem, analysis, sketching, synthesis and presentation.* The phases of the integrated design process are interconnected and refer back and forth to each other. Each phase is characterised by *design loops*. The design loops are of iterations of design that are repeated until a satisfactory result is reached. The integrated design process means that the project have been designed on all scales at the same time, to create a whole where the different elements fit together.

The goal is to make the Utzon Academy a collected whole that take into consideration utilitas (function), firmitas (strength) and venustas (beauty). These three factors that, according to Vitruvius (born 70 B.C), formed the basis of good architecture. In practise this means that work with constructional aspects in the design will be done simultaneously with functional and aesthetic considerations. The functionality, construction and ought to be a part of a collected whole.

Tectonic design

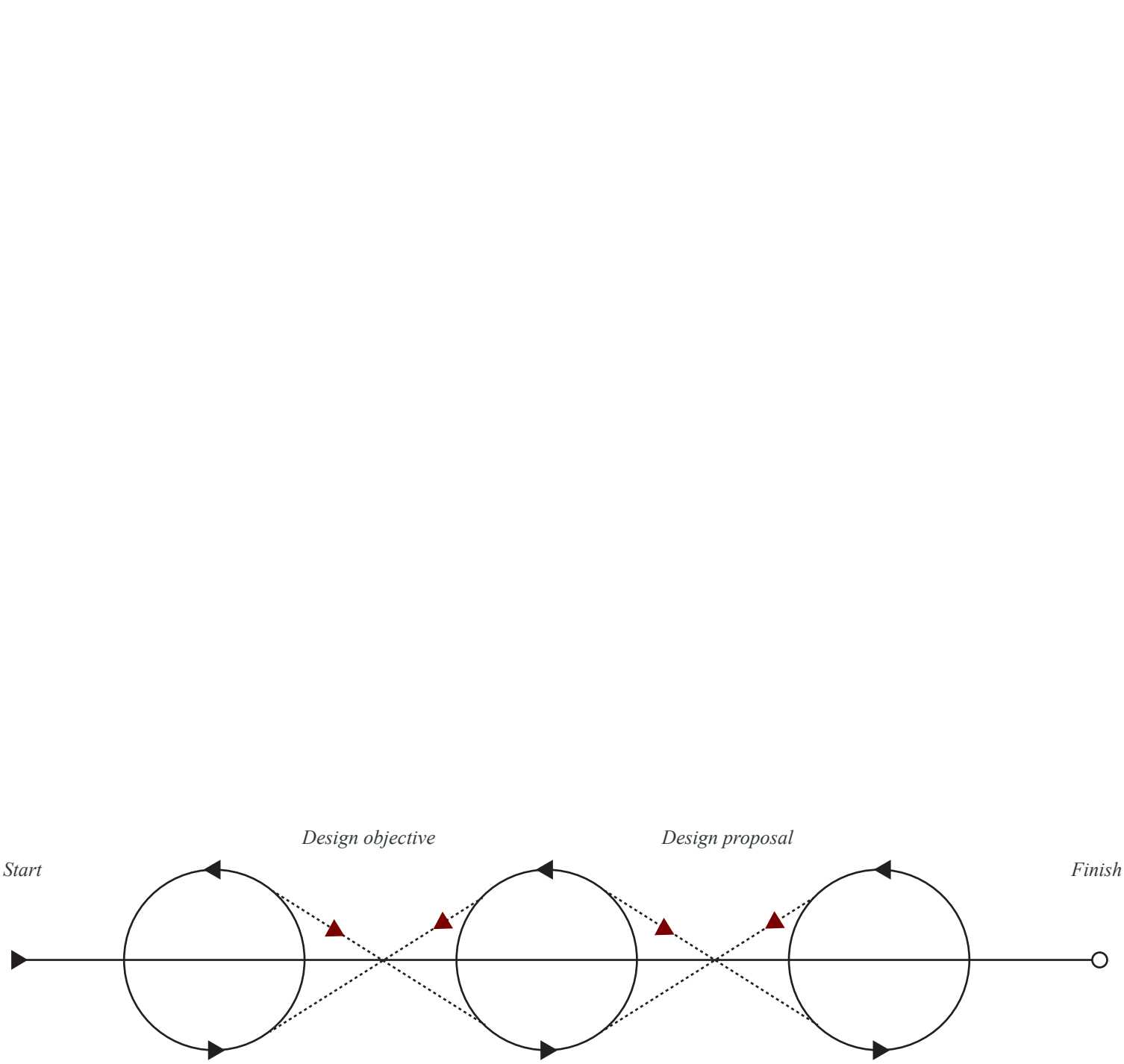
The Utzon Academy will be a place for learning about materials and building methods of Morocco. The understanding of building methods and materials will be based on a tectonic understanding as described by Kenneth Frampton. This means an honesty in the use of materials and a clear and logical constructional system (Frampton 1995:20-23)

To do this the Utzon Academy will designed using traditional building materials but combine it with modern building materials and building methods to show how the Ourika valley is at the border of traditional and modern Morocco. To design in a tectonic and context related way it is crucial to get an understanding of the materials and building methods used in the construction of the academy.

The details we show how the forces are carried through the structure.

Architectural distillation

As a method of understanding the site and case studies architectural distillation is used. The distillation take places and buildings and destill them into concepts and principles. This create a toolbox that can be used in the design of the Utzon Academy. The method is inspired by Jørn Utzon who, in his travels, encountered architecture and distilled it down to principles. The principles were later used in his work in contexts that were far from the place where he discovered the architectural principles.



Ilustration 01: Integrated design process

Program

The program contain the analysis used in the sketching- and synthesis parts of the thesis. In the end of the program there will be an objective for the Utzon Academy. The objective will be the premisses for the design of the Utzon Academy.

“I went to Morocco not to discover new things but to recollect what has been forgotten.”
- Sverre Fehn

Utzon and Morocco

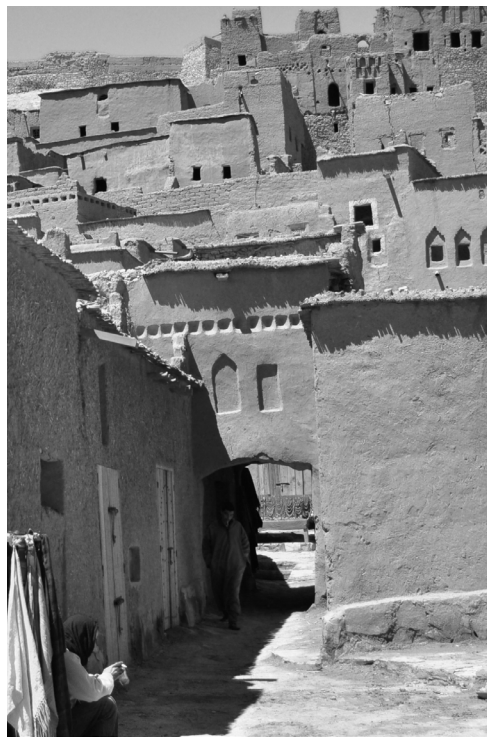
Jørn Utzon found inspiration in his many travels around the world. To understand the work methods of Jørn Utzon the following pages will examine how Jørn Utzon used the inspirations he got in the Atlas mountains and used them to create the Kingo Houses in Denmark. The methods Utzon used for making context specific architecture gathered from this analysis will be used to make the design for the Utzon Academy fit the Ourika valley.

The examination of the design principles of Utzon will happen through a comparison of Aït Ben Haddou and the Kingo Houses through pictures and writing.

Aït Ben Haddou is a fortified city in the Atlas Mountains. Being a one of many caravan stops on the way through the desert, it is built for defence. When the city was built the desert was a dangerous place. Robberies were not uncommon and therefore the caravans had to have a place to spent the night in safety. The city is located on the slope of a hill. The houses are all built from earth and blend beautifully into the landscape. On the top of the hill is the granary surrounded by a wall. It has an almost sacred position. The granary was the place where food and valuables from the caravans were stored and it had to be protected.

Ill 02: Aït Ben Haddou

THE WALL



Ill 03

Ill 05

The wall give protection and privacy. It separates what happens in the outside world and the inside of the building, creating a clear border from the unbuilt and the built, the nature and the cultivated.

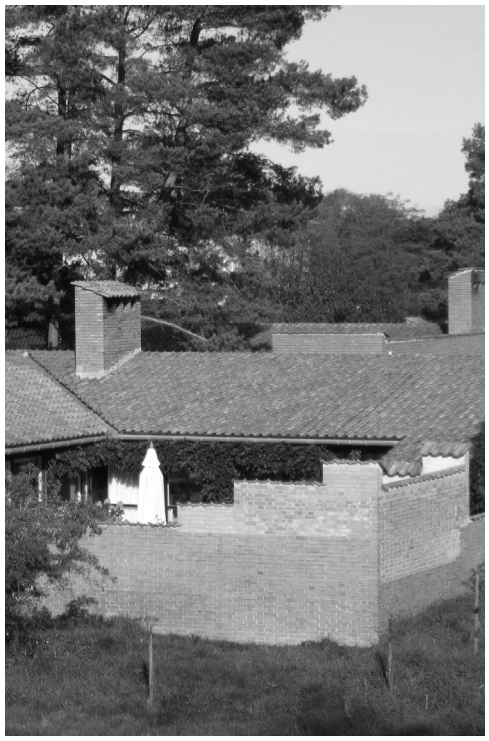
Aït Ben Haddou is surrounded by a wall that give protection from the outside world. The wall is breached by a small opening with a door that can be closed.

When arriving at the Kingo Houses, the only thing visible is a long wall that moves in and out along the road. There are a few openings in the wall, openings filled with closed doors and windows with bars, making it is impossible to see what is going on beyond the wall.

The opening in the wall is a threshold that separates two distinctly different spaces. In the Kingo Houses the threshold is between the public and the private domain, a threshold between culture and nature. In Aït Ben Haddou the threshold is between the dangers of the desert and the safety of the city.

COURTYARD

Ill 06



Ill 07

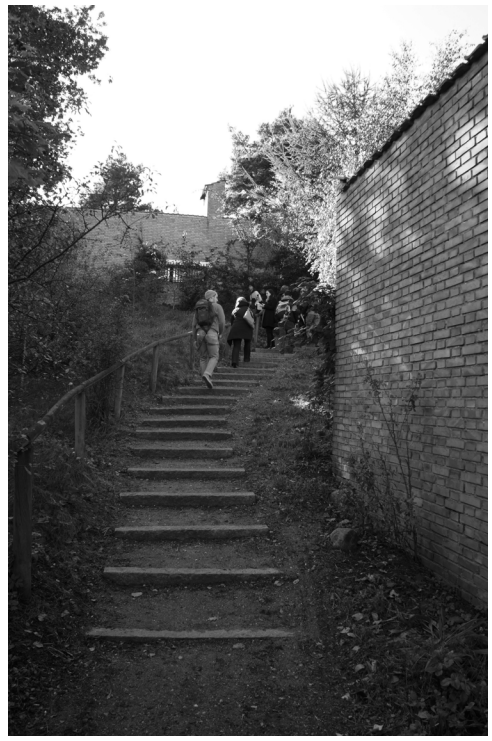
The courtyard creates a natural gathering point. An opening in the otherwise dense and narrow building. It is a place, closed or partly closed to the surroundings but an opening to the sky.

In Aït Ben Haddou the courtyards serve as gatherings points and a way to bring light into the buildings without breaking with the security of the wall. There is no place for large openings toward the outside world, all the openings are facing inwards.

In the Kingo Houses the courtyard is a gradual threshold between the untamed nature and the culture of the house. It is a piece of tamed nature; a space between privacy and the common grounds. The courtyard graduates the transition from nature to dwelling.

MATERIALITY

Ill 08



Ill 09

When the materials are the same as the earth on which it stand, the buildings seem to grow out of the landscape. It becomes difficult to distinguish where the landscape ends and the built environment begins.

In Aït Ben Haddou the materials of the buildings are adobe bricks, stones and rammed earth walls, all made from the desert around the city. The earth is the walls.

In the Kingo Houses the bricks used are local yellow brick. The brick goes all the way to the ground with no separation. The bricks and the roof tiles are from the same clay making it difficult to see where one building ends and the next begins. In the courtyard the floor is made from the same bricks. The landscape and the buildings blend together creating a connected whole.

OPENINGS

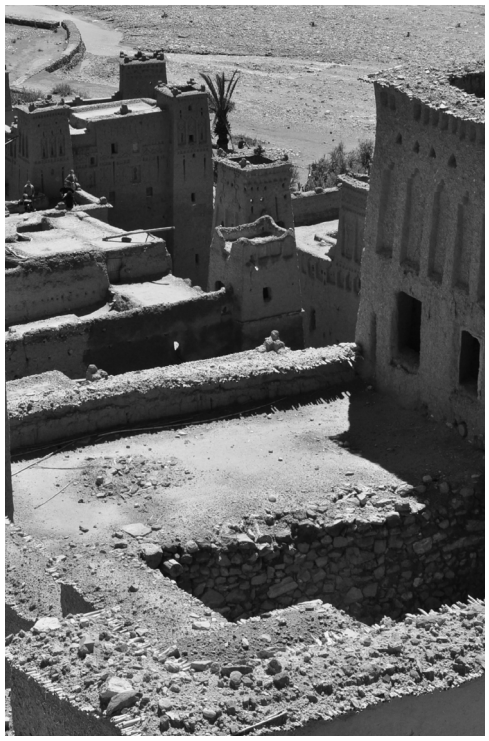
Ill 10

Ill 11

The openings occur according to the functionality of the buildings and the surrounding landscape. The reason for opening the walls is creating a visual connection outwards and to get light into the buildings. When inside the fortified houses in Aït Ben Haddou, you do not have much contact to the outside. The focus of the fortified houses is inward. The rooms are dark. The windows are just large enough to let in light enough for orientation. The window openings have been placed both according to function like light and chimney, but also according to the quality of light in the rooms. The view of the surroundings is gained from walls and platforms.

The courtyards of the Kingo Houses is surrounded by walls. The walls creates a boundary between the natural landscape and the small tamed landscape of the small courtyard, but the boundary is opened in places to create a direct connection between the tamed and untamed landscape. Where the wall is low, it gives a directed view to certain points in the landscape and still keep a sense of privacy.

ORGANISATION



Ill 12

Ill 13

The organisation of Aït Ben Haddou and the Kingo Houses is quite similar. Both projects are placed on a hillside. When walking through Aït Ben Haddou one walks between walls. The walls are the walls of fortified houses. The buildings are placed according to the landscape and form a collected whole blend together. Each house in Aït Ben Haddou is built over the same theme with four towers and a courtyard in the middle. They are individual buildings, but when put together they form a collected whole tied together by the materials and the walls.

In the Kingo Houses, each building have the same overall shape. The houses have been organised according to privacy between the houses and the view to the landscape. This have arranged the buildings like an organic organism across the sloped landscape.

CONCLUSION

On his travels through the Atlas Mountains Jørn Utzon found principles of architecture he could use in contemporary architecture. He did not copy the architecture of Aït Ben Haddou in the Kingo Houses, but he understood the architectural parts that made up an architectural whole. He also understood that the principles did not just work in the context of Morocco, but just as well in the context of northern Denmark.

Jørn Utzon was very inspired by vernacular architecture. He understood that architectural principles of vernacular Morocco have evolved over millennia to fit the context perfectly. Through generations the architecture changed gradually according to a set of the needs of society and the raising needs of the building.

The themes that Jørn Utzon found in Aït Ben Haddou and used in the Kingo Houses was the wall, the courtyard, the materiality, the openings and the organisation. When distilled into principles the five themes are as follows:

+ The wall is a threshold between two distinct spaces. It is a strong architectural feature that helps to define to two spaces and strengthen each side.

+ The courtyard is a private walled space that contain with a different character than the surroundings. The courtyard is a place for privacy and security. In the courtyard the elements and the nature has been tamed.

+ Using the materials of the ground to built the building, tie the building to the place. The building seem to be growing out of the ground and thereby being a natural part of the landscape.

+ The openings connect the two sides of the wall. From the inside the openings direct the eye toward specific points in the surroundings. The opening also let light into the rooms. The placement of openings are placed according to functions and quality of light in the room.

+ The organisation of a series of buildings according to the landscape make the building seem like organic masses that have grown over time. The buildings have been placed according to the views and needs for each building.

To create an architecture that is context specific to the Ourika valley in Morocco it is important to understand what makes up the place.

Morocco

Morocco is a country of contrasts. On one side is the Berber lifestyle where nomadic tradition and simple living. On the other is the modern Morocco where the western riches are the ideal. One of the challenges of the Moroccans is to modernise the country without loosing the hold of their rich traditions. The artisan tradition of Morocco is very extensive. Wood carvings, mosaics and metalwork is still done by hand. In the Atlas mountains the artisan tradition is still very much alive. In the villages various items are created to be sold in the markets of the cities.

The contrasts in Morocco are not only happen in society. It is also a contrast of light and shadow and of desert and water. Because of the strong contrasts all things manifest themselves in a bombardment of sensory impressions. The Norwegian architectural theorist Christian Norberg-Schulz explain the south as: “The morning brings the emergence of space, the evening its withdrawal, but with the sun directly overhead, space reveals itself as it in reality is.” Norberg-Schulz (1996)”.

Numerous influences have had its effect on Morocco over the years. The location of the country just between the Arabic world and Europe have made its impact over the years. The influences have changed the world of Morocco, but the country still manages to hang on to the traditions that have helped to shape the country during the past. The traditional way of living is kept by Berbers in the Atlas Mountains.

The Berbers have been able to adapt to the harsh landscape of the Atlas Mountains and the Sahara Desert. Some Berber tribes have lived on as nomads to present day while others have settled in oasis or valleys in the mountains. The survival as either farmers or animal driving nomads.”

The site for the Utzon Academy is in the Atlas mountains close to the city of Marrakesh. A place where the traditional Berber culture and the modern Morocco meet.

Ill 14-16: Morocco
This page: The Ourika valley in its North African context.
Opposite page:
Top: Craftsman working on mosaic
Bottom: Light and shadow in Morocco

The Ourika Valley

Ill 17: Plan of the valley

see Ill. 26: Section of the valley

Description of the valley

The site for the Utzon Academy is in the Ourika valley at the edge of a small village. A dirt path leads from a parking lot in the east end of the village to the site of the academy in the west end.

The site is on a mountainside that face almost directly south. It is a dramatic place with the mountains rising on each side of the valley and the river running below. Toward east, down the valley, there is an incredible view over the Atlas peaks where the snow never melt. To the south is the river and the mountains on the opposite side of the valley. Behind the first row of hills the snow covered mountaintops can be seen. Toward the west and north, the hillsides block the view from the site. At the site there is a stream where water streams down the mountains in the springtime.

The buildings next to the site are relative new compared to some of the other more traditional buildings in the village. They are made of concrete instead of traditional earth constructions. It show that the modern morocco have moved into the valley.

The people of the valley are combination of Berbers in traditional dress, young people in jeans and mobile phones and children with school bags. The valley is a place where the traditional Berber culture meets the modernised Morocco.

1 The Village

The village consist of traditional Berber houses and newer concrete houses placed on the steep cliff side. The houses are placed high in the landscape so not to be flooded when the river is high. Many of the houses seem to be growing out of the cliff side because the materials match the colours of the landscape. The newer houses are painted pink.

2 The Bridges

The bridges are temporary constructions. They are destroyed every year by the roaring stream and rebuilt with available materials when the river becomes calmer. The only permanent bridge over the river is 5 km. down the road. The bridges lead to houses, fields and restaurants on the other far side of the river.

3 The Fields

The fields are irrigated by the River. They are raised above the river, just enough not to be flooded when the river is high. The fields are one of the main sources of food for the valley. The plants are harvested by the women of the village by hand.

4 Site for the Utzon Academy

The site is a steep hillside. A waterway cuts through the site. Water only roars down the waterway in the spring time when the snow in the high Atlas Mountains melt. In the dry period, it is still possible to see traces from the power of the water. The site is just at the edge of the Village.

Ill 18-21

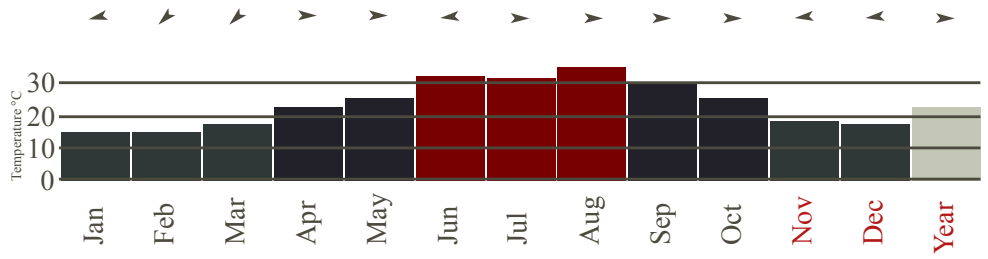
Climate of the Ourika Valley

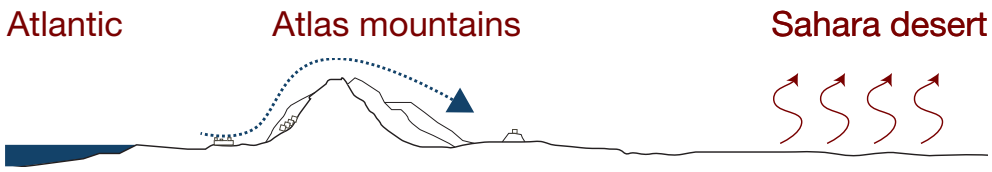
The climate in the Ourika Valley is just as dramatic as the landscape. The temperature changes from an average temperature of 16 °C in the winter months of January to a blazing 33 °C average in August. The august maximum temperature reaches 40 °C. This means that protection from the sun is essential.

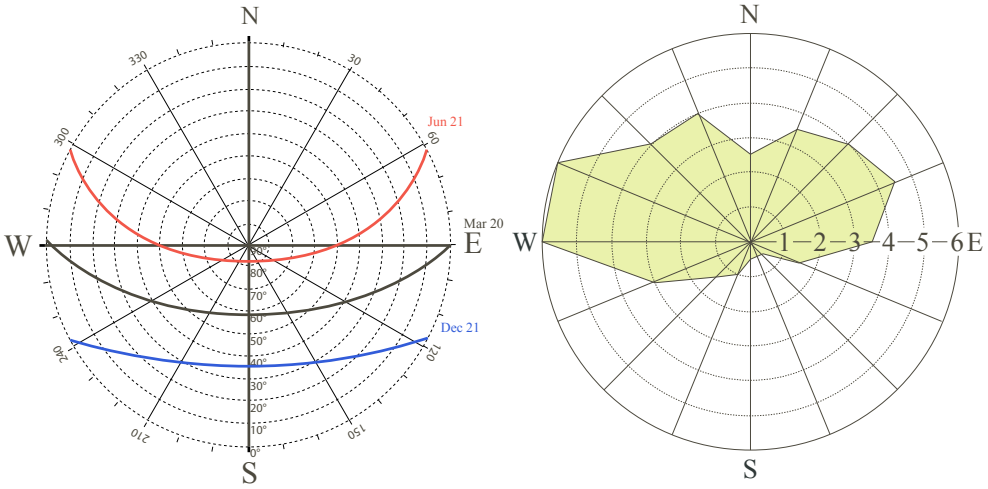
The sun reach a height of 83 ° over the horizon in the summertime June 21st as the highest and 35° over the horizon on December 21st as the lowest. At the March equinox on march 20th the sun reaches 58 °.

The wind direction is primarily from the west and east blowing along the valley. The wind speed reaches a maximum of 6 m/s.

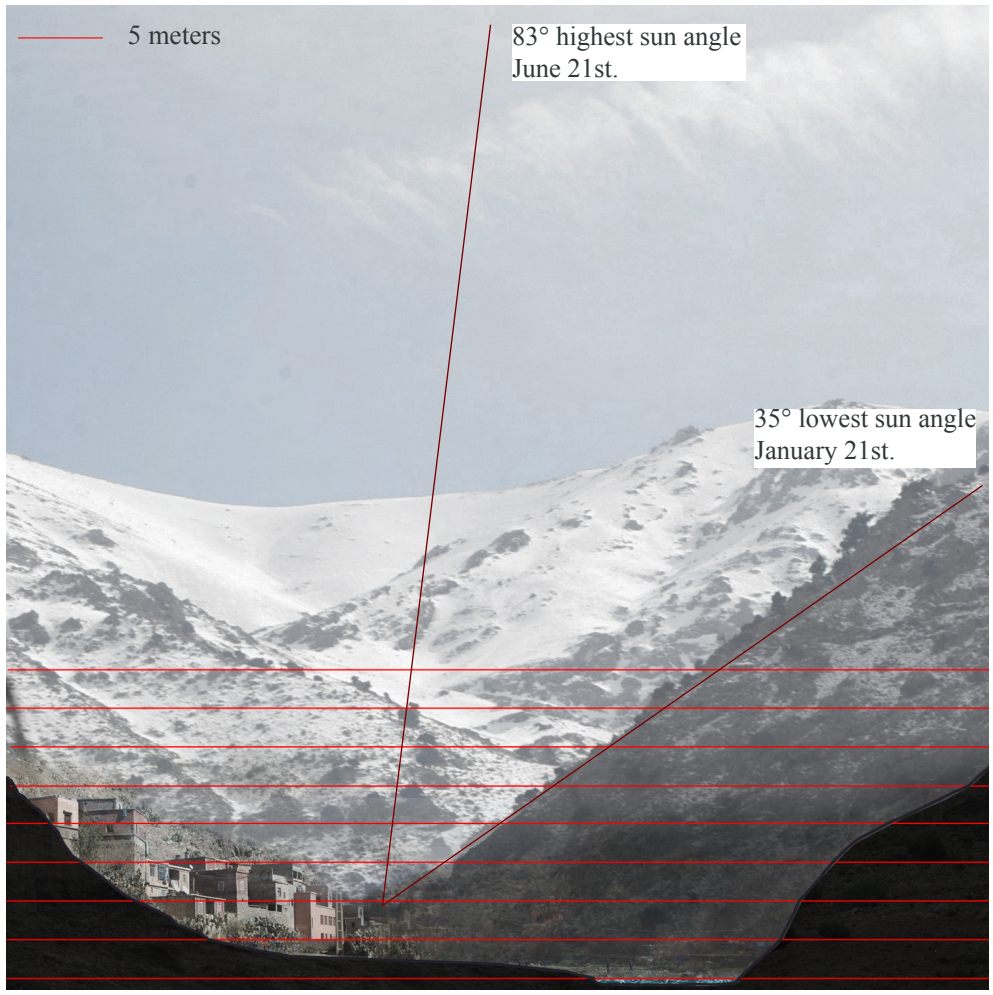
The climate in the Ourika valley is part of a larger weather system that stretches all from the Atlantic ocean to the Sahara desert. The sun heats up Sahara, where the hot air raises. Cold air is drawn in from the Atlantic ocean to the north-west, which is the primary wind direction. The air is cooled as it goes over the mountains. The cooled air makes the mountains a suitable place for dwelling compared to the desert. The water that flows from the mountains because of the summer heat also makes the areas around the rivers suitable for dwelling.







ill. 22-25 Climate of Morocco
Top: Monthly average temperatures and prevailing wind directions.
Middle: Diagrammatic section from the Atlantic ocean to Sahara.
Bottom left: Solar path diagram for the site.
Bottom right: Direction and speed of the wind on the site. The wind speed is measured in m/s.



Ill. 26: Section of the valley
1:1000

Character of the valley

In the Ourika valley two elements stand out: the fire and the water. The fire and the water is essential for the survival of the valley. It is the fire and the water that give the valley its special character.

Fire

In the Ourika valley, no life is possible without fire. The fire is the bringer of light in the dark of the night and a bringer of heat in the winter. A fireplace with circle of light, a natural gathering place. As long as humans have been able to control fire its importance as a space for gathering have been evident. When walking around the valley traces of fireplaces are scattered across the hill. The fireplaces are for cooking, heat and light.
When gathering around the fire the mood change and stories are told. It is around the fire that the knowledge of past generations have been past down to present day.

Water

In the Ourika valley, no life is possible without the water. In the springtime, when the sun melt the snow of the Atlas mountains, the water roars down the mountainsides. In the summer The water vaporises and leaves only a little stream in the bottom of the valley. This is the rhythm of the water. The water that run down the mountainside is used for drinking and cooking but also as a manner of cleansing and cooling in the hot summer sun.

The rhythm of the water means that some areas in the valley can only be used in the dry periods of the year. When the river is low the places that are not under water are used as fields that feed the village. Without the water the valley would dry out and all reason for staying in the valley would disappear.

Ill. 27-28: Fire and water in the valley
Left: Traces of a fireplace in the hills of the valley.
Right: Woman harvesting water plants for cooking.

Conclusion

The village in the Ourika valley is a typical Berber village in the Atlas mountains. Life in the valley is primitive, but modern Morocco is beginning to have a presence in there. The people in the valley have adapted their life to the harsh conditions of the Atlas mountains. At times parts of the valley is flooded because the snow melt in the high Atlas. Because of this the buildings of the village are placed on the sloping sides of the valley.

The climate is very hot most of the year in the valley reaching over 30 °C in mean temperature 3 months of the year. The mean temperature never goes below 14 °C in the winter. The wind mostly come from the west because winds are drawn from the Atlantic ocean from the Sahara desert. This wind can be used to cool the buildings of the valley.
In the summer the sun angle is very high at which time there has to be places to find shade for the strong sun.

Water and fire are the dominant elements of the valley. The valley would not exist without these elements. The presence of the elements dictates the life of the villagers. The water follows the rhythm of the seasons. It means that some parts of the valley can only be used some parts of the year. The fire is essential for cooking and keeping warm in the winter.
The building site is to the western end of the village. The site is on a slope where a waterway runs during the spring. The rest of the year the waterway is dry.

Elemental learning

Phenomenology of Fire and Water

Introduction

The importance of fire and water as physical elements for the survival of the Ourika valley have been established. It is without doubt the two most dominant elements in the valley. It has been chosen to focus on these elements in the further development of the project.

A way to understand the elements of fire and water is to look at them as phenomena and analyse them through phenomenology. The French philosopher Gaston Bachelard (1884-1962), has studied the phenomena of fire and water in a context of creation. In his books 'the psychoanalysis of fire' and 'water and dreams' the topic is the poets creation of poetry, but the process of creativity and inspiration for a poem and the creativity and inspiration for the creation of architecture can in be seen as rather similar, therefore Bachelard is seen as the main inspiration for the following phenomenological analysis of fire and water.

The following paragraphs will examine fire and water through the writings of Bachelard. The goal of the analysis is to show the potential of focusing on the phenomena of fire and water in a place for learning.

Learning from fire

Fire is a dualistic phenomenon. It is the bringer of light and heat as a physical phenomenon but also a place that brings to mind solitude.

As a physical phenomena the light and the heat from the fire function as a media for gathering. The gathering is a necessity for exchange of knowledge in an environment like the Ourika valley, where most people do not have access the books and electronic media. Bachelard writes that: "The fire confined to the fireplace was no doubt for the man the first object of reverie, the symbol of repose, an invitation to repose." (Bachelard, 1938:14)

The fire place is a symbol gathering; a place where stories are told and experiences exchanged. Much can be learned through sharing, and therefore a gathering spaces are important for the process of learning.

Fire can gather but it can also create a place of solitude. The fire in the place of solitude can be a source of reverie, reflection and imagination. The Utzon Academy is a place of learning and creation, and true creation requires imagination. Bachelard writes about the space of solitude: "He knows instinctively that this space identified with his solitude is creative" (Bachelard, 1958:10) Therefore it is important that there are spaces in the Utzon Academy for reverie and solitude.

For fire to be a source of reverie and thereby a source of imagination, the right frame for reverie must be set. A special state of mind must take its place in the observer of the fire. Bachelard writes: "When near a fire, one must be seated; one must rest without sleeping; one must engage in reverie on a specific object." (Bachelard, 1938:15)

The setting here is a seat, a chance to relax the body. The place to relax should not be a bed but a seat, as it is a rest without sleeping. It should be a place for dreaming in an awakened state; a daydream.

The single candle in the window brings the mind to the hermits hut. The hermits hut is, as Bachelard explains a place for solitude and simplicity. This place of solitude and simplicity give room contemplation without distraction. As Bachelard explain: "And there radiates about this centralised solitude a universe of meditation and prayer, a universe outside the universe. (Bachelard, 1942:32).

To understand why fire is so important for creativity one must understand the power of fire. The power of fire can be seen its power to purify. Bachelard writes that "Fire purifies everything." (Bachelard, 1938:103). That everything is purified also means that an idea can be purified through the ordeal of fire. The purification of the idea happens through the thought and the reverie.

Learning from water

As fire, water is a source for dreaming poetically but it differs the way that in facilitates reverie. Water is an element of change. "you cannot go into the same water twice." said the Greek philosopher Heracleitus. (Plato, 360 B.C.E) Because water changes it also promotes change in our surroundings and in humans as beings. Bachelard writes that: A being dedicated to water is a being in flux" (Bachelard, 1942:6)

Bachelard argues that water become stronger if it is combined with other elements. It has the ability to "soften substances." (Bachelard, 1942:105) A hard substance is rigid. It is finite and cannot be subject to change, but the moment it is softened by water, it can become subject to moulding. In the case of a combination of water and earth the elements become a strong source of creation that Bachelard calls "Paste" (Bachelard, 1942:12)
In the moulding of earth true creation takes place. In sculpting the earth the formless earth disappear and is thereby given a cause. The physical act give reason to the act of shaping the earth. Bachelard writes that: "True workers are the those that have taken the matter in hand." (Bachelard, 1942:108) The taking matter in hand is important in the act of creating. The material becomes known by the creator. The limits of the material and shape the material want to form. "When the moulding is in progress, the worker can go on to consider the particular nature of the earth, the flour or the plaster" (Bachelard, 1942:105)

As fire has the power to purify so has the water. Bachelard writes: "The human mind has claimed for water one of its highest values - the value of purity." (Bachelard, 1942:14) The purifying power of water is well known in the Arabic world where the Muslims purify their bodies with water before the five daily prayers. But the purity of water does not only concern purity of the body, but also purity of the mind. With a purifies mind, imagination can be set free. The mere sound of water have the power to promote imagination and bring us into reverie. Bachelard dedicates his entire conclusion of Water and Dreams to the phonetic power of water. It speaks if we listen and its speech will promote imagination. As he writes: "The gentleness of water's flow, too, wants images to offer." (Bachelard, 1942:191)"

Conclusion

Fire and water have great potential in a place for learning. The potential lies in the way that the elements can be used to promote imagination and creativity through reverie.

Fire at two different scales can be used at a place for learning. The different scales of the fire has different potential. The first fire is the gathering fire. It is at the gathering fire stories are told and knowledge exchanged. It is a fire for the community.

The small fire is the candle. It is a fire that promotes solitude and reflection. The fire is in a space where the students can be alone with their thoughts and ideas.

When near a fire one must be seated, relaxed without sleeping for a state of reverie and imagination. As the Utzon Academy is a place for learning, places for thought and places for exchange of knowledge is equally important.

In water there lies a potential for creativity and purity. The creativity arises as soon as the water is mixed with earth. The mixture create a paste for moulding. The creativity come through the process of creation. In the Utzon Academy the process of creation can happen both in workshops when the Academy is built, but it can also assert itself in the creation of the Academy. If the construction of the Utzon Academy is made in a way, so the people that live in the Ourika valley can aid in the construction, they become the sculptors of the place. In this way, they will get a sense that the Utzon Academy belongs in their valley and that it is their to use. In the process they will also learn about the traditional construction methods that they seem to have forgotten.

Building with earth

Earth is the primary building material in the Atlas Mountains. The material have been used for centuries. There is a number of ways earth can be used for building. The following text will give an overview on the different methods of building with earth. Furthermore there will be an overview of the characteristics of earth construction in terms of strength, required thickness and usability. When building with earth, there are some very high safety standards. In the German standard DIN 18954 compression on earth walls is 3-5 kg/cm2. All calculations is done with a safetyfactor 7. (Minke 2009) The paragraph is based on the book 'Building with Earth' (Minke 2009).

Earth buildings have some qualities that has advances in comparison to many industrialised building materials. Loam helps to create a healthy indoor climate. It balances air humidity creating healthy living conditions by lowering the air humidity in the summer and heighten it in the winter. In a hot climate like Morocco, creating a cool indoor climate in the summer is essential. A loam wall stores heat and thereby balances the temperature over the course of a day, creating a pleasant indoor climate. It also mean that it is possible to store the heat from sun in the wintertime and use it for heating the rooms in the cool nights.

Besides these advantages, there are some ecological aspects that are worth taking into consideration. Loam, rammed earth and adobe bricks are all 100% reusable material. When wet it is possible to break it down to clay and silt. It is possible to reuse the material any number of times. Because the clay and silt is already in the ground, it also bring down the pollution from transport to the building site.

Loam

Loam, the material used for mud walls, is a mixture of clay and silt. Sometimes larger parts are mixed into the loam like gravel. There are some considerations that have to be taken into account when using loam. Loam is not water resistant, so the parts of the construction that have been constructed by this material have to be covered by overhangs or surface coatings.

Rammed earth

Rammed earth walls and columns are done by building a formwork and filling it with earth. Then the earth is compressed, either by hand or by a machine. Each compression takes place after 15 cm. of earth have been added. After the earth is compressed, the formwork can be removed. Rammed earth constructions are, like loam constructions, not water resistant and should be covered to protect it from rain. Compared to adobe masonry (described in the next paragraph), rammed earth have a long life expectancy because it is monolithic.

Adobe bricks

Adobe bricks are unbaked mud bricks. They are produced by putting wet earth, silt and sand into moulds and letting it dry in the sun. Adobe construction have been used for millennia and some of these buildings still survive. In Turkestan some buildings have survived made from adobe masonry have survived since 6000 BC. (Minke 2009/61)

Ill 29: Loam wall strength and safety
The table show the compressive strength of loam walls compared to the permissible according to DIN 18954 (Minke 2009)

Specific weight	Compressive strength	Allowable compressive force [kg/cm2]					
[kg/m3]	[kg/cm3]	Wall	Column height/thickness				
			11	12	13	14	15
1600	20	3	3	2	1		
1900	30	4	4	3	2	1	
2200	40	5	5	4	3	2	1

Ill 30-32: Wall types
Left: Loam wall, Berber house, Morocco
Middle: Rammed earth wall, Catalina house, Rick Joy
Right: Adobe brick wall, Berber house, Morocco

Thoughtful building

Sustainable material use

Materials

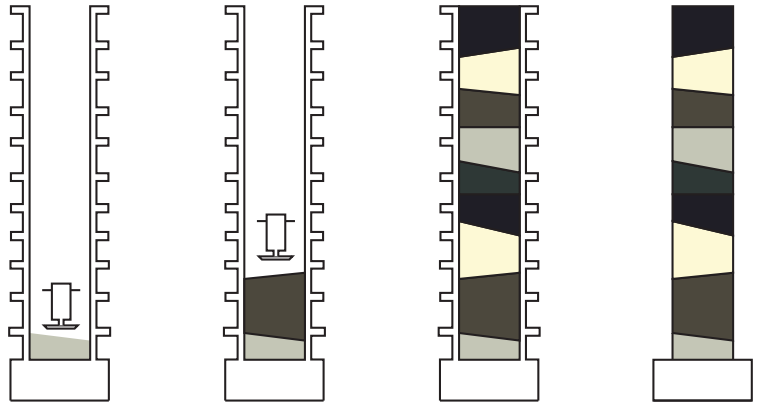
The idea of sustainable material use have been a natural part of vernacular building tradition all over the world, simply because the materials available were materials found in nature. Materials that is a part of natures ecosystem are in this case considered sustainable. If these materials are left they disintegrate and return being a part of nature. Many modern materials does not have this property. Materials like steel and concrete have a very long life span and does not easily return to a state where they fit in natures ecosystem.

Contemporary materials like concrete and steel have properties that the traditional building materials does not possess. Steel and concrete are much more resistant and are better at making certain structural configurations like shell- and tensile structures. The materials are already used in the newer buildings erected in the Ourika valley, and should not be avoided. They should be used in a tectonic manner, where the materials are used in according to their properties.

Construction

If a building is dissembled, the parts that is not a part of natures ecosystem should be easy do remove. In this way these materials can be reused or disposed of in a proper manner. To make the parts of the building handleable in construction, larger parts of the building should be split up into smaller parts.

A way to promote sustainable design is to teach the population of the Ourika valley about the potential of contemporary materials. In this way they can built in a sustainable way in future building. By creating the parts of the building at the site and having the inhabitants of the Ourika valley help in the construction it is possible to teach them about building methods and material potential.



Ill 33-36: Details from vernacular Morocco.
Left:
Top: Adobe bricks drying in the sun.
Middle: Wood tensil to take tensile forces over an opening.
Bottom: Stone and rammed earth wall.
Right: Process of constructing a rammed earth wall.

Case studies

Through history a number of architects have worked with an architecture that is strongly related to its context and work with the surrounding landscape to create a specific experience. The case studies part of this thesis will analyse the work of three generations of architects.
The architecture analysed is chosen because of how it relates to its context through function, materials and organisation and are analysed according to these themes. The goal of the analysis is to derive a series of design principles that can be used in the Utzon Academy.

The Säynatsälo Town hall (1951) by Alvar Aalto is chosen as a case for its engagement with the community in which it is placed. In works as a natural centre for the community.

The Arthur Boyd Centre (1999) by Glenn Murcutt is chosen because it is a creative learning institution that brings together dwelling and a gathering space.

Desert Nomad House (2004) by Rick Joy is chosen because of the way it aim to enhance the experience of the landscape that surround it.

Ill 37

Säynätsalo Town Hall

Alvar Aalto

Function

Alvar Aalto's Town Hall in Säynätsalo is based on a thoroughly empathic way of thinking about architecture and society. The town hall relates to the society for whom the town hall is created. It is a place with a purpose - the purpose of gathering for the community and a place for the public to follow the democratic process. In the town hall the spaces for the public is equally important as the spaces for the politicians that sit in the town hall. Alvar Aalto show that the rulers of the city and the people are two sides of the same coin in a democratic society. Through time the town hall have shown to be a natural gathering point for the city. On a raised plateau in the middle of the building is a public courtyard. The courtyard is the gathering point in the city. The grass covered steps leading up to the courtyard is a continuation of the Finnish forest that surround the town hall.

Materials

The materials of the building is all local. The wood is from the Finnish forest, being supplied from a local wood-processing plant, thereby supporting the community in which it stands. The bricks are also from a Finnish brick yard. Concerning bricks Aalto "...was eager to show emphasize their individuality." (Weston, 1995 p.138). To give the walls a texture that show that they are laid by hand and not by machine, the bricks have been laid a little offset. This breaks up the otherwise large surfaces and thous make them relate to the scale of the human hand.

Alvar Aalto mimic the nature in the building. The window mullions mimic the tall birch trunks of the surrounding forest. The walls do not go all the way to the ground but are raised up on a small stone plinth, as if the stone of the Finnish underground rise up to hold the building. In this way Aalto tie the building to its surroundings.

Walking through the building, the materials change according to the function of the rooms. In the main corridor that leads to the council chamber, the staircase, the council chamber and as a radiator bench in along the side of the corridor brick have been used. It works as a way to remove the boundary of the outside and the inside of the building, so the courtyard become a part of the inside of the building and vice versa. The ceilings of the town hall are generally concrete, but to show the importance of the council chamber, the roof and the floor are both made of wood. Wood, as a softer material, brings a humane character to the council chamber. The wood of the council chamber also rise the senses to the soft smell of the wood.

A beautiful detail in the council chamber is the characteristic the roof trusses. It is clear that a lot of work have gone into this detail and it give the chamber a distinct character that separate it from the rest of the building, thereby giving it special importance. It is at the same time an awe inspiring room for a almost sacred democratic process, but at the same time the room have a human character where everyone from the community can watch the process.

Ill 38-41: Säynatsälo town hall
1: Courtyard and main entrance.
2: brick detail
3: the hallway looking into the courtyard.
4: Finnish forest landscape.

1.

2.

3.

4.

Organisation

The town hall is organised around a raised inner courtyard. The courtyard is transition space that mediates between nature and culture; the nature of the surrounding forest and the culture of the town hall. The large windows of the hallway that surround the courtyard breaks down the barrier between the tamed nature that is the courtyard and culture of the inside of the building. This boundary is further broken by plants inside the window.

The courtyard works as a public gathering space for the community. There are two entrances to the courtyard. One is square and leads to the entrance to the town hall. The other is organic and relates to the surrounding Finnish forest.

Design principles

+ The courtyard is a gathering space for the community.

+ Equal importance of public and private spaces.

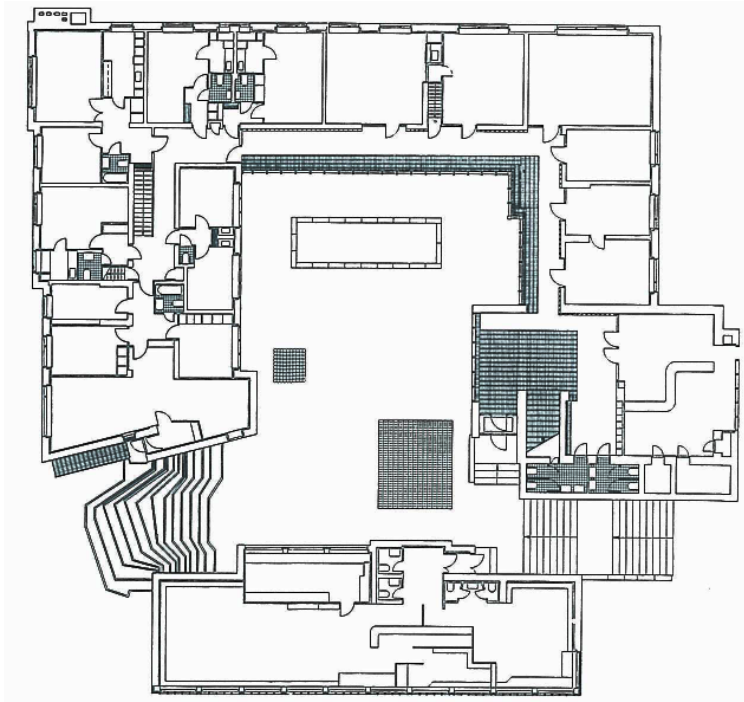
+ Breaking down the border between outside and inside with windows and material use.

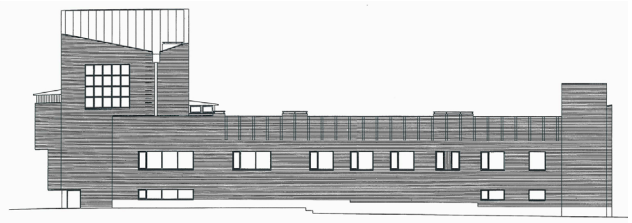
+ Use of local materials to support the local community.

+ Change of materials according to function.

+ The building is an interpretation of its surroundings.

Ill 42-44: Säynatsälo town hall
Left: plan at courtyard level
Right top: north facade
Right bottom: west facade





Arthur Boyd Centre

Glenn Murcutt

Function

With the Arthur and Yvonne Boyd Education Centre, the Australian architect Glenn Murcutt worked with a program that combines dwellings for students and a multifunctional space for education. The Arthur Boyd Centre is a place for students to come and paint at the place where the famous Australian painter Arthur Boyd had his atelier until his death.

The Education Centre consist of a large hall and 32 dwelling spaces for students. The students are able to stay several days at the education centre. As the building was build on a budget and it is for students, the dwelling spaces are minimal and sparse, while still maintaining a high architectural quality.

The Education Centre is a centre where art students go to get inspired by the environment that so greatly inspired Arthur Boyd. With a clear focus on the landscape Glenn Murcutt designed the education centre as a tool for framing the picturesque landscape as an artist would frame a painting. The framing happens in every part of the building. In the dwellings the windows can open in various ways to give different kinds of framing. There is a fixed glass window above each bed. Above that window is a timber screen that can be opened. First it opens gradually to create small frames of view of the landscape. The whole frame can then swing out to create a direct contact with the surrounding landscape and increase the ventilation on the room. When inside the large hall, the columns that carry the large roof frame the nature outside the large windows.

Materials

The Arthur Boyd centre is made from a mixture of wood, concrete and steel. The materials are used where they are most effective. An example of this is the composite beams in the large hall. The beams are made of wood and steel. Wood is good at handling compression, but to make the beam stronger in tension it is reinforced in the bottom with steel where there is tension in the beam.

The materials are partly sustainable as the wood is recycled, except the plywood. Another sustainable feature is, that the building is self sufficient with water that is collected via the roof.

Organisation

The hall and the student dwellings are split up into two clearly separate parts. One part is the grand hall that is clearly directed toward the main view of the Shoalhaven river to the east. The hall is multipurpose and works as dining hall, workshop and concert hall with room for a hundred people.

The other part of the building is the dwelling spaces for the students. All the

Ill 45-48: Arthur Boyd Centre
1: Roof over the entrance
2: Gutter for collecting rainwater
3: Dwelling for students
4: Dwelling facade

1.

2.

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4.

functions needed of the students are placed in this wing including toilets, showers, a kitchen and a storage room. The wing is placed at an angle to the main hall and stretches into the landscape in a straight line. The dwellings and the toilets are all placed with an orientation towards the east and the morning sun. The hallway that connects the rooms are towards the west in the shadow of the hill. To connect the two parts of the building, both parts are placed on a plateau. The plateau visually connects the building into a connected whole.

By splitting the functions of the building into two parts the building become easier to read for people visiting. It also give a freedom to give each part of the building a distinct character.

Design principles

+ The building frames the landscape as a painter frames a painting.

+ The two parts of the program is separated to give freedom of organization.

+ Each part of the building has a distinct character.

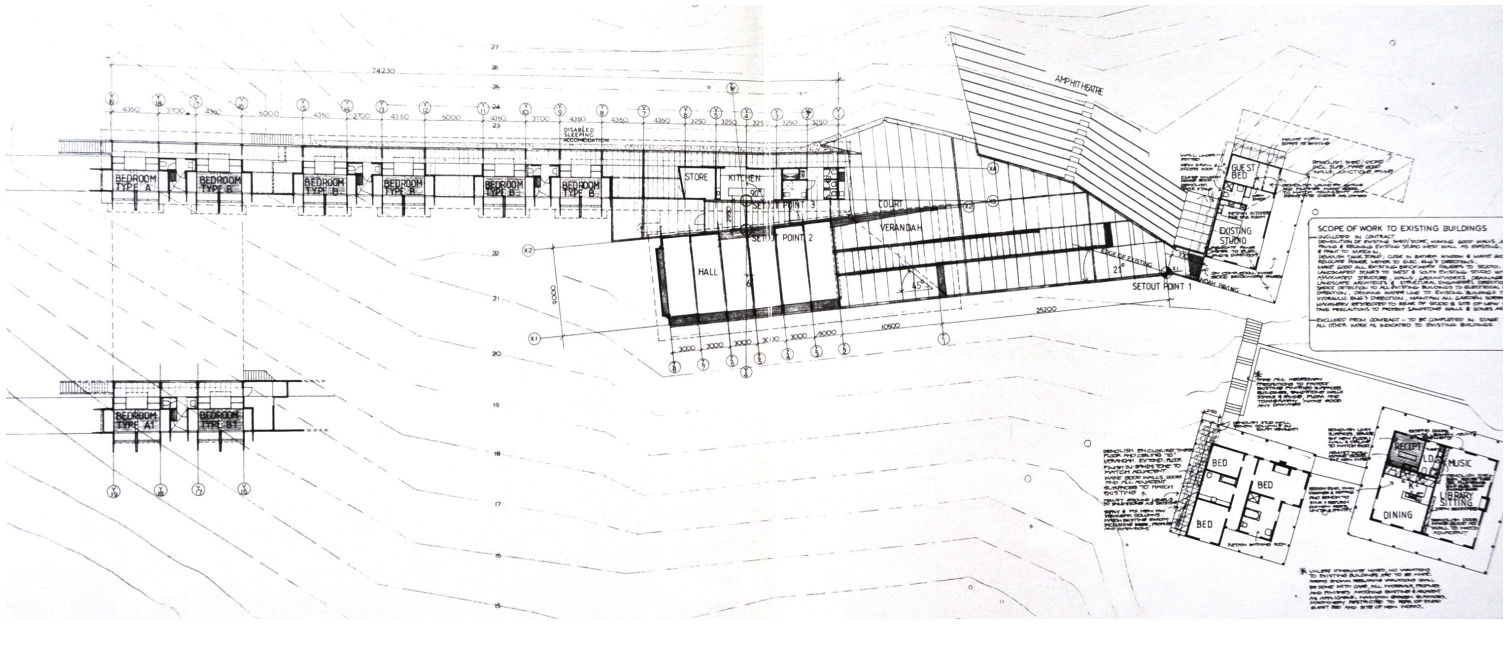
+ Compact dwelling spaces.

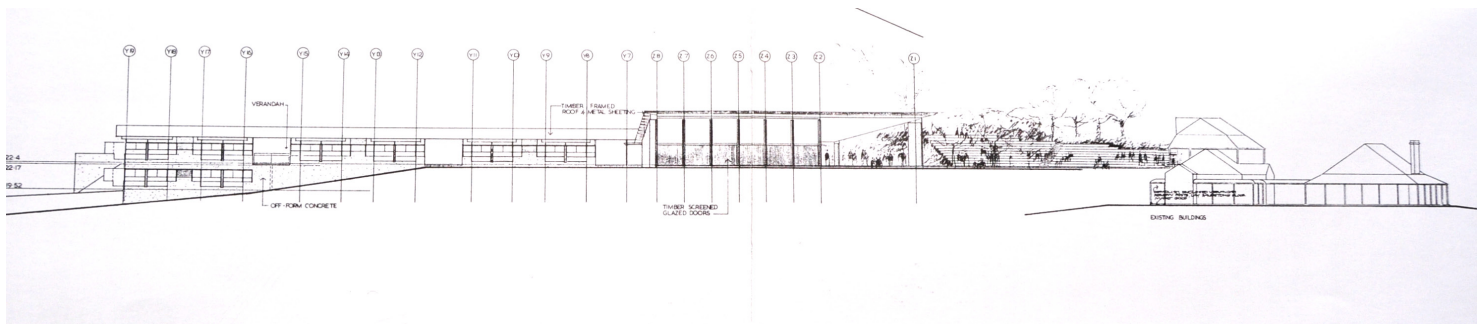
+ Large flexible common room.

+ The building is self-sufficient with water

+ The plateau, on which the building stands, tie all the parts together.

Ill 49-50: Arthur Boyd Centre
Top: Plan drawing
Bottom: Section drawing


AMPHITHEATRE
BEDROOM TYPE A
BEDROOM TYPE B
BEDROOM TYPE A1
BEDROOM TYPE B1
DISABLED SLEEPING ACCOMODATION
STORE
KITCHEN
SETOUT POINT 3
SETOUT POINT 2
COURT
VERANDAH
HALL
EXISTING STUDIO
GUEST BED
SETOUT POINT 1
SCOPE OF WORK TO EXISTING BUILDINGS
BED
BED
BED
DINING
MUSIC
LIBRARY SITTING


VERANDAH
TIMBER FRAMED ROOF & METAL SHEETING
OFF-FORM CONCRETE
TIMBER SCREENED GLAZED DOORS
EXISTING BUILDINGS

Desert Nomad House

Rick Joy

Function

Placed in the desert of Arizona, the Desert Nomad House by Rick Joy continues the thoughts of Glenn Murcutt and Alvar Aalto with building according to the specific context. Rick Joy adapt make his program fit the Arizona desert. The reason why Joy builds in the desert is because it provides a scene that give a sensory stimulation.

The Desert Nomad House consists of three volumes. The shape of the three small pavilions sits lightly in the landscape, as they are raised on stilts. As the Arthur Boyd Centre, the functions of the building are split into different volumes. The rooms are a sleeping space, a living and dining space and a office and guest room.

The three rooms of the house are all turned in accordance to a specific view that Joy have wanted to frame. Instead of the big panoramic view of the desert, the inhabitant of the house get a framed and focused view of the landscape.

The window in the bedroom faces south west framing a mountain in the distance. In the morning, the mountain is illuminated by the rising sun. The warm hues of the sun combined with the sand of the desert, creating a spectacular view to rise to in the morning.

The window in the living and dining room is in a similar way turned towards a mountain in the distance. Being turned towards the southeast the pavilion catch the top as it is illuminated in the evening creating a beautiful scene for cooking and eating.

The office and guest room, the window are turned towards the northwest, framing what Rick Joy refers to as a “still life of a rock outchopping” (Joy. 2002)

The three cubes are separated with the desert between them and under them. This means that the desert will be experienced in all its splendour when moving from one part of the house to the other. The desert become an integrated part of the project. In the same way as Aalto created a tamed peace of nature in the raised courtyard in the Säynatsälo Town Hall, Rick Joy have created a tamed peace of desert next to the house volumes. It is a stone plateau with a lowered hearth for keeping warm in the cold desert night and preparing food outside. The fire is also a gathering point in the nature. Between the houses are only foot paths, like animal tracks in the desert.

Materials

The dominating material of the building exterior is corrugated steel of the facades. The colours of the plates change dramatically according to the colours of the desert light. As the steel plates patinate the play of colours on the facade begin to match the desert surroundings. On the exterior the colour of the desert is as much a material as the house itself. The plateau with the hearth is made from stones from the desert. Because the stones are from the landscape they fit in perfectly. At the edges of the platform some of the stones have started to erode and thereby become a part of the uncultivated landscape once again.

All the interior is made of light wooden plates that stand as a contrast to the rough landscape outside the large windows. As the rest of the building the interior has a

Ill 51-54: Desert Nomad House
1: Exterior view with fireplace
2: interior living room
3: entrance through the desert landscape
4: window detail

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4.

minimalist feel. The kitchen element, that stand in the living room, is a box of stainless steel. Everything on the interior is kept crisp and simple to keep the focus on the nature outside.

Organisation

The organisation of the three cubes is controlled by the view. This is done because it is the desert and the impact it can make on the senses, that create the spirit of the place. By splitting the house into three separated boxes, Rick Joy have had a freedom to place each part freely in the landscape. This is creating an abstract composition between the volumes and given a freedom of control of the view. The cubes are placed in different angles facing different directions, even the entrances are not facing each other. It is like the cubes are rocks landed randomly in the desert. When moving between the cubes, the desert takes over. This freedom of placement makes the house interesting from all angles and breaks with the straight regularity of the cubes.

Design principles

+ The role of the building is to enhance the experience of the landscape.

+ A plateau with a fireplace is a gathering outside.

+ The landscape is an integrated part of the house and how it is experienced.

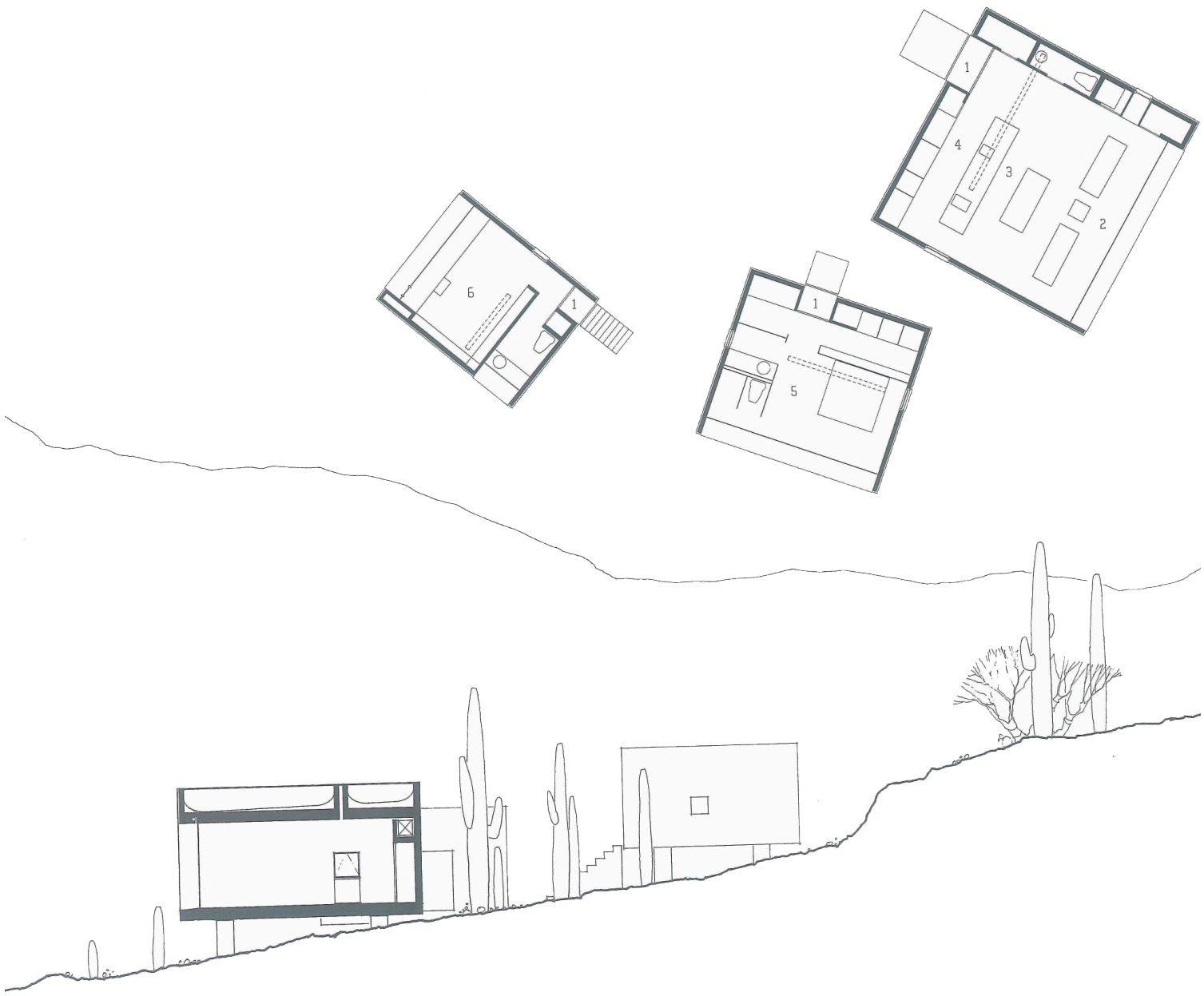
+ The building and the landscape is a place for sensory stimulation.

+ The interior of the building is simple to keep a focus on the outside.

+ The exterior materials reflect the landscape.

+ Minimal impact on the environment.

Ill 55-56: Desert Nomad House
top: plan
bottom: section through the sleeping box and the landscape


1
4
3
2
1
5
1
6

Conclusion

Through the three cases, it is clear that some ideas about architecture have been passed down through history. The ideas have been transformed by the next generation of architects, but the core of the ideas of the phenomenological architecture stay the same.

The idea of building in a way that show the qualities of a certain place and frame these qualities are a theme that is present in all three cases. This architecture have the power to transform space and show qualities of the place, that were not clear before the architecture was build.

In the three cases, Aalto, Murcutt and Joy have all worked on building in a way, that show the qualities of the space in which the building was built. In the case of Aalto the task have been to create a gathering point for the society and a place for an open democratic process. By organising the building around a public courtyard, Aalto have created a public square in the middle of the building. The courtyard is a place for the community, where they can follow the democratic process and have community related events.

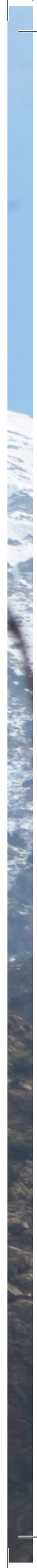
The qualities of the forest is an integrated part of the architecture, but at the same time, Aalto cultivates the nature to make it fit the cultural process of democracy. The building become an integrated part of the landscape.

The designs of Glenn Murcutt continues the idea of Aalto with building to a specific place and bring out the specific qualities of this place. Murcutt destill the idea of a painting and use the building to frame the landscape. To gain the freedom to place the buildings in the landscape to frame the desired views, Murcutt have separated the different building functions into a gathering hall and the living quarters. The separate parts of the building have different characters.

Rick Joy works on enhancing the experience of the landscape. This is done through framing, as Murcutt does it, but also in separating the functions of the building and having the desert between them. In this way the user of the building is confronted with the desert as he between the buildings.

In all three cases, the organisation of the building is very clear. Murcutt and Joy have split up their programs to get further freedom in the organisation of the volumes and functions. Aalto on the other hand have gathered all the parts of the program to surround the courtyard

All three architects have a similar view on the use of materials. They use local materials to support the community and keep down the negative effects on the natural environment due to transportation. In Joys design the impact on the nature is even more reduced by putting the building on pillars. This ‘touching the earth lightly’ idea, is an idea that is largely developed by Murcutt in several of his projects, so the reference from Joy to Murcutt is clear.



Ill 57

Users

The Utzon Academy has to support two very distinctly different user groups. Firstly it is a place for learning for students that wish to learn about traditional Moroccan architecture and Utzon's inspirations from the Atlas Mountains. The Utzon Academy will hold unique opportunities for learning about Moroccan architecture and building techniques that cannot be learned through books. The Utzon Academy sets a physical frame for the students where they can emerge themselves in the building methods through building, reflection and conversation.
The Utzon Academy should be able to take visits of different duration. Some could stay a week while others might stay for months. The architecture and organisation of the Utzon Academy should promote conversation between students the teachers and the local community.
Other users of the Utzon Academy is the locals of the Ourika valley. As the academy is built in their village they should be able to use and learn from the Academy as well as the students. The Utzon Academy should function as a local forum for the locals. There should be a possibility for the locals to use parts of the Utzon Academy at the same time as it is used by the students. Parts of the Utzon Academy should be shared space that can be shared by the students and the locals. An exchange of knowledge between the two user groups should be promoted.

Ill 58-69: Collage from Ourika valley












Room program

Room	Amount	Size	Connections
Public spaces			
Workshops	5	12 m^2	
Hammam (public bath)	1	50 m^2	
Bakery	1	20 m^2	
Amphitheatre	1	Room for minimum 40 people	
Semi public spaces			
Gathering space	1	170 m^2	
Kitchen	1	60 m^2	
Courtyard	*1 for each dwelling cluster*	80 m^2	
Private spaces			
Dwellings	40	8 m^2	

Privacy	Relation to water	Relation to fire
The workshops are shared by the academy and the village. They learn from each other.	The workshops are strongly connected to water as water serves as an element for inspiration and creation.	Fire is not needed in the workshops
Hammam is shared by the academy and the village. In morocco the time when woman and men use the hammam differs. In the same way the times when the village and the academy use the hammam can differ. The bakery heat the hammam to save energy for heating the water.	In the hammam the water is used for cleansing. The water is heated by the bakery. In the bakery water is used for making bread.	Fire is present in the hammam through the heated water and the heated floors. Fire is used for baking bread in the bakery. The heat from the flames are used to heat the hammam.
The amphitheatre is a public space for the village. Here the village can meet for public purposes. Lectures for the academy can also happen here. It is close to the village.	Water is not present in the amphitheatre	Fire is not present in the amphitheatre
The gathering space is for the students at the Utzon Academy. It is where they meet and exchange ideas. Lectures and eating also happens here. The kitchen is connected to the gathering space as it is where the students eat.	The gathering space is on the edge of the water. The water helps to cool the gathering space and connects it to the valley. In the kitchen water is used for cooking and hygiene.	A fireplace is the main element in the gathering space. The fire creates an atmosphere for telling stories and exchanging knowledge. In the kitchen the food is cooked over a fire.
The courtyard is for the dwellings that are connected to it. There is one courtyard for each cluster.	In the courtyard water is used as a cooling element but also as an element that give the courtyard a calm atmosphere.	Fire is not needed in the courtyard.
The dwellings are private spaces. There is one dwelling for each student at the Utzon Academy.	Water is not needed in the dwellings.	In the dwelling the fire creates an atmosphere of solitude and reflection. This atmosphere is created with a single candle.

Objective

Based on the analysis of the context, reflections on vernacular building and case studies the objective for the Utzon Academy is:

How can the Utzon Academy be a place for learning about architectural principles in the vernacular architecture of Morocco?

How can the Utzon Academy use fire and water as elements to create a context specific architecture for the Ourika valley in Morocco?

How can traditional building methods and contemporary building methods be mixed to create a contemporary architectural composition?

Design

The design phase contain the sketch- and synthesis phases of the project. The process show the thoughts choices made in the project, giving and understanding of the development of the project.

Firstly the concept development of the project is explained. After this process that make up each part of the Utzon Academy is shown.

The design phase end out in a conclusion of the project and a reflection on the result.

“Nature knows of no compromise, it accepts all difficulties, not as difficulties as such but rather as new factors that configure totality.”
- Jørn Utzon

Concept development

At the Jørn Utzon Spring School 2012 studies of vernacular Moroccan architecture were carried through. The goal of the spring school was to increase the knowledge of the working methods of Jørn Utzon and his works. At the spring school a visit to Aït Ben Haddou was done to obtain information on the inspiration Jørn Utzon gained from this place. While at the site an analysis of the atmospheres in Aït Ben Haddou was done. This assignment was carried out to destill the atmospheres of the place so they could be created in other contexts. The method was walking from the river at the foot of the hill to the granary at the top while drawing the atmosphere of the spaces encountered. The drawing was done on an 8 meter roll of trace with a flowing line that connected all the drawings. After this the drawing was distilled into principles of light/shadow, colours, function diagrams and textures to figure out what created the different atmospheres of Aït Ben Haddou.

The analysis of the atmospheres in the journey through Aït Ben Haddou showed that there were three distinct themes that were used through the journey to the top to create the atmospheres. These three themes are:

+ The wall
+ The plateau
+ The cave

The wall is the boundary that enclose the spaces and connects every building, from the entrance to the top plateau.

The plateau creates breaks on the steep hill and creates vista points to the landscape. Where the plateau is places, the wall opens up and the space opens.

The cave is connected to darkness and the interior spaces. They stand as a contrast to the light and heat of the outside.

Ill 70-71: 8 meter scroll analysis
Opposite page: The outset of the analysis of the atmospheres of Aït Ben Haddou on the 8 meter scroll.
This page: The distillation strips. Each strip represent a distillation of one element in the original scroll. From left to right: Atmosphere scroll, diagrams, colours, shadows, textures.

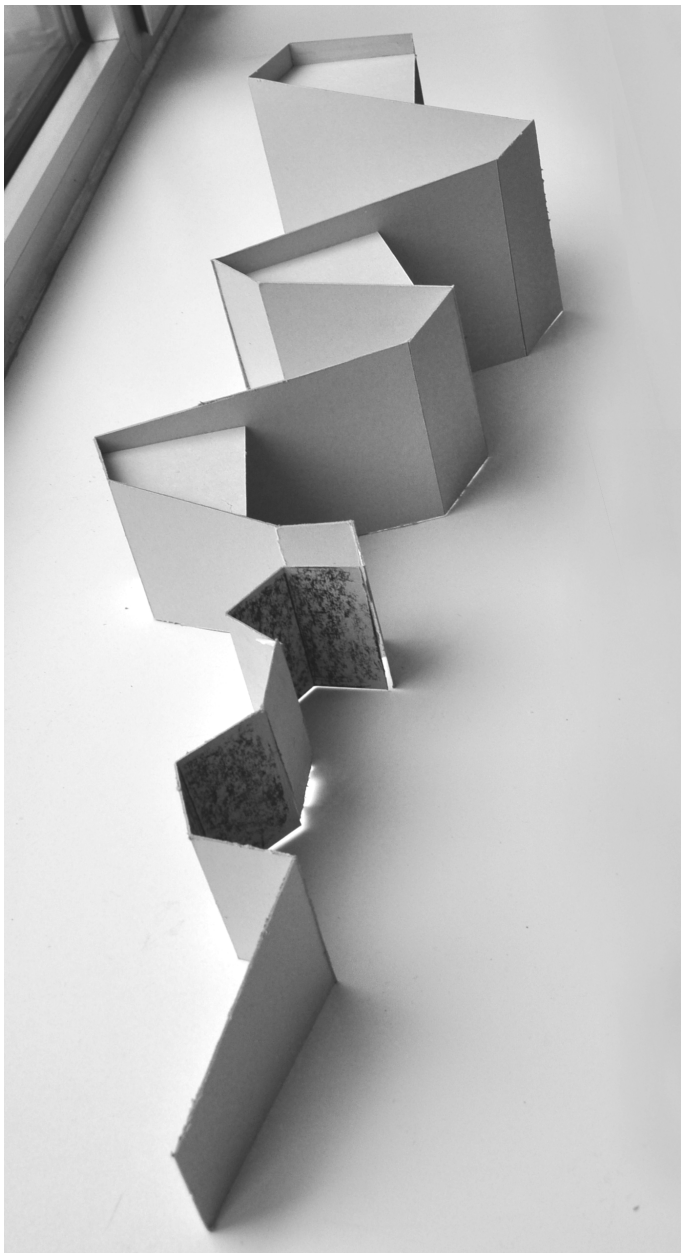
The concepts of wall, plateau and cave is developed. To encompass all three themes in one building a conceptual model was made. The model informed an offset to the development of the Utzon Academy. In the model the wall is the element that ties the building together. It zigzags up the mountainside creating caves and plateaus along the way.
Plateaus are represented by horizontal planes that stand in contrast with the verticality of the wall. The caves are small dark spaces surrounded by walls on more sides.

In the phenomenological analysis of water and fire it was concluded that two different spaces with fire were needed for education: An individual fire for meditation and a gathering fire for sharing knowledge. The two kinds of fire are connected to the two types of rooms. The individual fire is connected to the cave. It is a place where a single student can withdraw with his thoughts and ideas.

The gathering fire is connected to the plateau. It is the space where the students gather and exchange knowledge they have gained through creation and reflection.

The development of the Utzon Academy have spanned over multiple scales simultaneously, from site plan to details to make everything a connected whole. In the presentation the process is split into the development of five parts. The parts are: the area, the dwelling, the bakery and hammam, the gathering space and the details. This is done to give an overview of how every part of the project have been developed in respect to its function and the context.

In the beginning of the design process, ideas for the different spaces of the Utzon Academy was developed. These ideas are presented in the “Spirit of space” paragraph and serve for a guideline in the development of the different spaces.



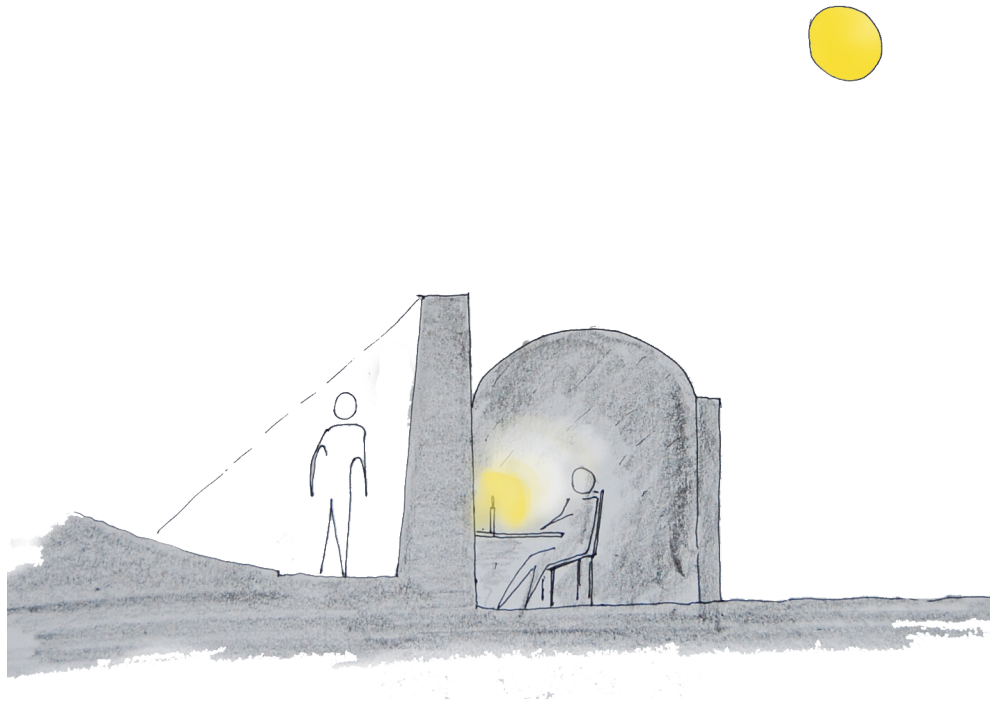
Ill 72: Concept model of the wall
The wall zigzag up the mountain side creating caves and plateaus along the way.

Spirit of space

The dwelling

As he opens his eyes the room is dark and cool. The blanket feels warm and fresh against his skin. The mornings are different here, more quiet and clear. It is like the whole place makes his thoughts more clear, especially in the mornings. He rises and lights the candle on the table. His ideas he writes draws a couple of ideas in the flickering light of the candle. As he writes, the sun slowly rises and light comes through openings in the door. The simplicity of the room becomes clear. There is nothing to distract the mind, just the basic things for simple living: a place to write, a place to sleep and a place for books.

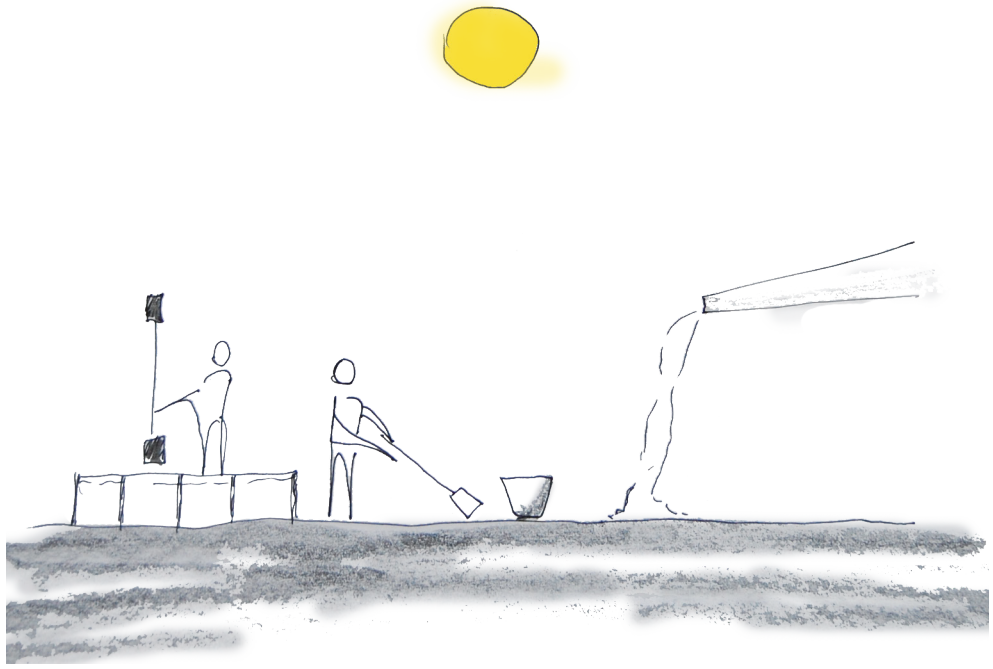
The only sound that reaches the room is sound of water that flows outside the room. The presence of water in the courtyard serves as an reminder of the importance of the water in the valley. It is the element that keeps everything alive and ties everything together. His mind drift to the day to come. A day in the good company of his fellow students. A day where they all learn about architecture through making.



Ill 73-74: Spirit of the dwelling
Top: Concept sketch of the dwelling space.
Bottom: Cells at the Sainte Marie de La Tourette Prirory by Le Corbusier (1960). The space is a simple space for immersion.

The work space

The water makes the earth soft beneath his touch. It becomes workable. The sun is hot above his head as the carries the earth into the formwork and begins to ram it. Sweat run down his body under the hot sun, but the water falling from a wall cool down the air a little. The work is hard. It makes him think about the great deal of work that have gone into building the great cities in the desert. The work is coming along fast as a lot of people are helping out. A local from the village comes by and starts to talk to him. His English is pretty good, so the conversation flows easily. The local has an impressive knowledge of the construction techniques. He tells that he helped in the construction of the Academy and is now working with renovations. The man gives a couple of hints on how to ram the earth more effectively. As the local leave everyone gets back to work, the sun above their heads and the earth beneath their feet.

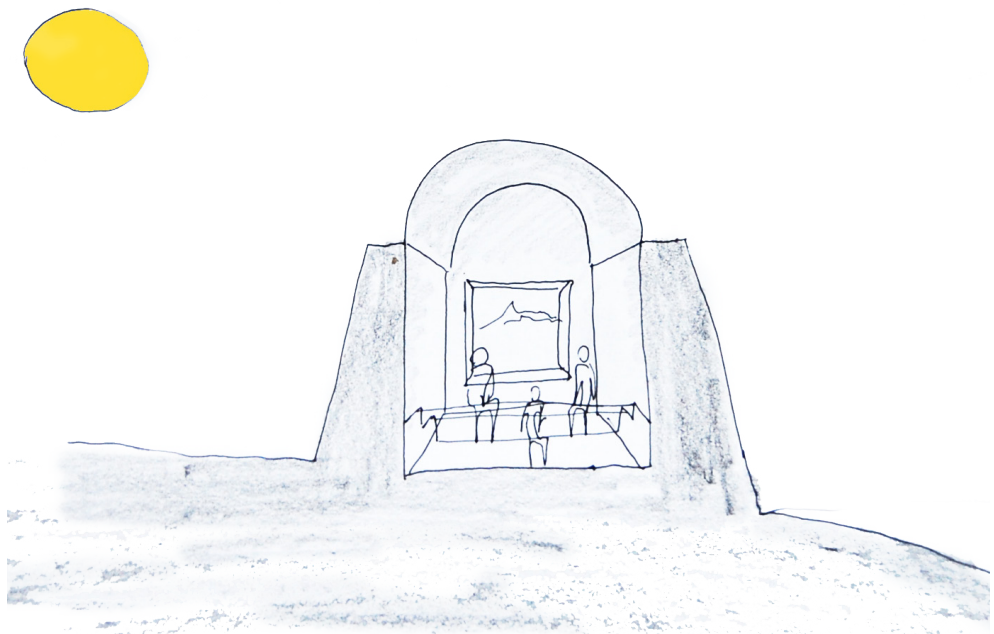


Ill 75-76 Spirit of the work space
Top: Concept sketch of the work space.
Bottom: Fountain at Cuadra San Cristóbal by Louis Barragán (1968).
The power of the water is exaggerated through the large drop from the fountain.

Hammam

As he enter the hammam the hot air feels good on his face. After a long days work with the earth the muscles are sore and the body is dirty. The water in the shower hits his body, washing away the dirt and soreness. The room a nice contrast to the sun outside with its darkness. The sound of the running water is all he hear.

After the shower the enters the steam bath in the end of the room. He can feel how the steam loosen his muzzles. It enters his pores and cleans out every one of his pores. He sits on a wooden bench in the end of the room. Through a window he can see small clouds breaking against the snow covered mountain tops in the distant. It is mesmerising and he forget time and place as he lets his mind wander. The world moves slowly by. The view and the heat calms his mind. He feels cleaner than he have done in a long time.



Ill 77-78: Spirit of the hammam
Top: Concept sketch of the hammam.
Bottom: Living room of Can Lis by Jørn Utzon (1973).
The building frames the view that is made more powerful.

Gathering space

The fire creates a circle of light in the darkness of the night. He can see the faces of his fellow students in the flickering light of the fire. They are all quiet except for one who is telling a story. As he listens he stares into the flames. In the flames the characters of the story come to life in his mind. The flames makes his imagination fly like the smoke that rises from the fire. As the story comes to an end the storyteller is applauded and scattered conversations begin. They talk about the differences and similarities of the world they come from and the one they are in. As he sits there he looks up. The stars seem like a large band of light across the sky.

Ill 79-80: Spirit of the gathering space
Top: Concept sketch of the gathering space.
Bottom: Courtyard of The Salk Institute by Louis Kahn (1966).
Water flows on the plateau and disappears in the horizon.

Area organization

Introduction

As a guideline for organising the spaces of the Utzon Academy as it winds its way of the mountain “A pattern language” by Christopher Alexander was examined. The book presents and explains a language of 253 patterns for architecture and planning. Of the 253 patterns 6 have been chosen as guiding principles for the organisation of the Utzon Academy. The principles were chosen in relation to the context and the principles that were revealed in the case studies.
The patterns are:

+ Neighbourhood & boundary
+ House clusters
+ Courtyards
+ Pools and streams
+ Public outdoor room
+ Main building

The following paragraph will explain the main themes of these 6 patterns through key points and sketches. The patterns will govern the layout and organisation of the Utzon Academy.

Ill 81-83

Neighbourhood & boundary

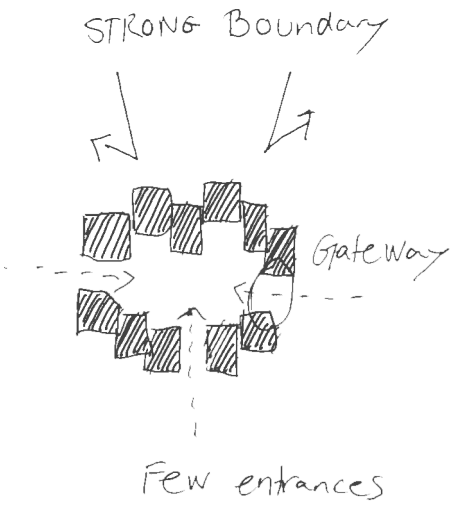
+ There should be a boundary around each neighbourhood.
+ The boundary should be strong enough to let the neighbourhood keep its individual character.
+The number of roads and paths leading into a neighbourhood should be limited.
+ The few gateways into the neighbourhood is of special importance.

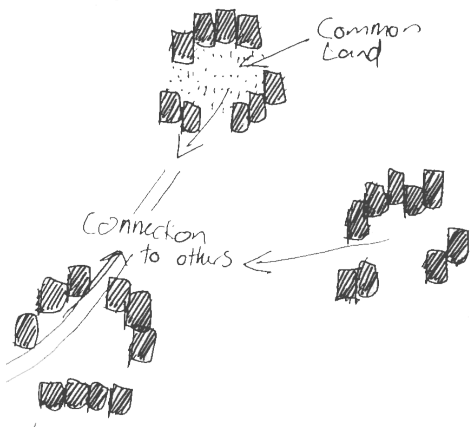
House clusters

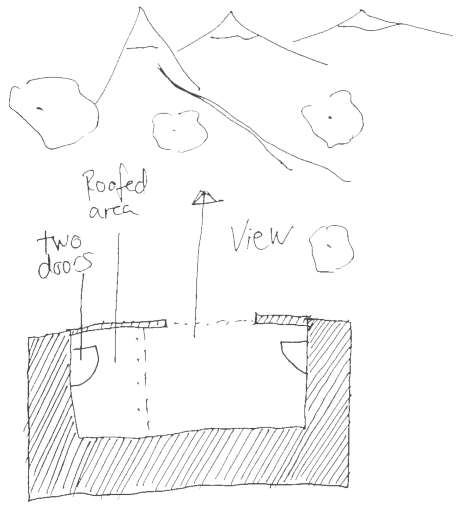
+ The houses of the neighbourhood should form clusters.
+ The houses should have common land between them.
+ Clusters should be formed of 8 - 12 houses.
+ The clusters should not be self contained but should keep a connection to the larger community.
+ The common land should be accessible for everyone without creating the feeling of trespassing.

Courtyards

+ A courtyard should have a view to a larger open space.
+ At least two doors from a building to a courtyard to promote flow through the courtyard.







Pools and streams

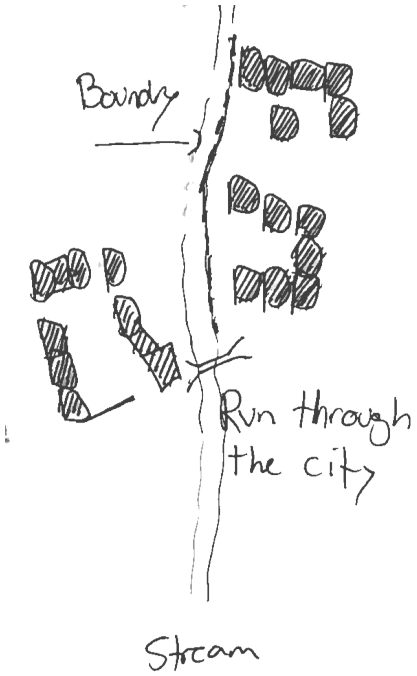
+ Everyone should have access to water
+ The natural streams and pools should be preserved.
+ Water should be allowed to run through the city.
+ The streams can form natural boundaries in the city.

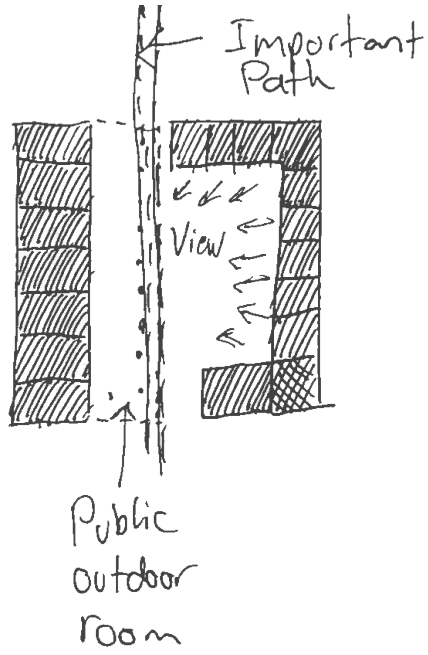
Public outdoor room

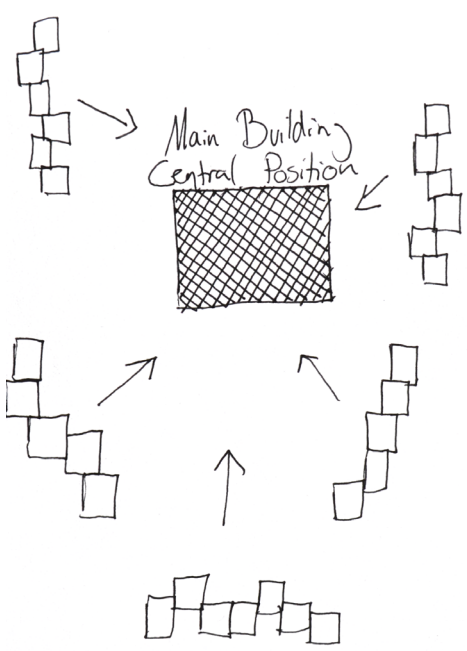
+ There should be a public outdoor room in every neighbourhood and work community.
+ The public outdoor should be open and roofed.
+ No or few walls should separate the room from the neighbourhood or community to which it belong.
+ It should be placed adjacent to an important path.
+ It should be within view of many houses and workshops.

Main building

+ “A complex building with no center is like a man without a head.” (Alexander xxx x/486)
+ The most important function should be at the centre of the main building.
+ The building should have a central position.
+ The building should have a higher roof than other buildings.







Ill 84-86:

Site

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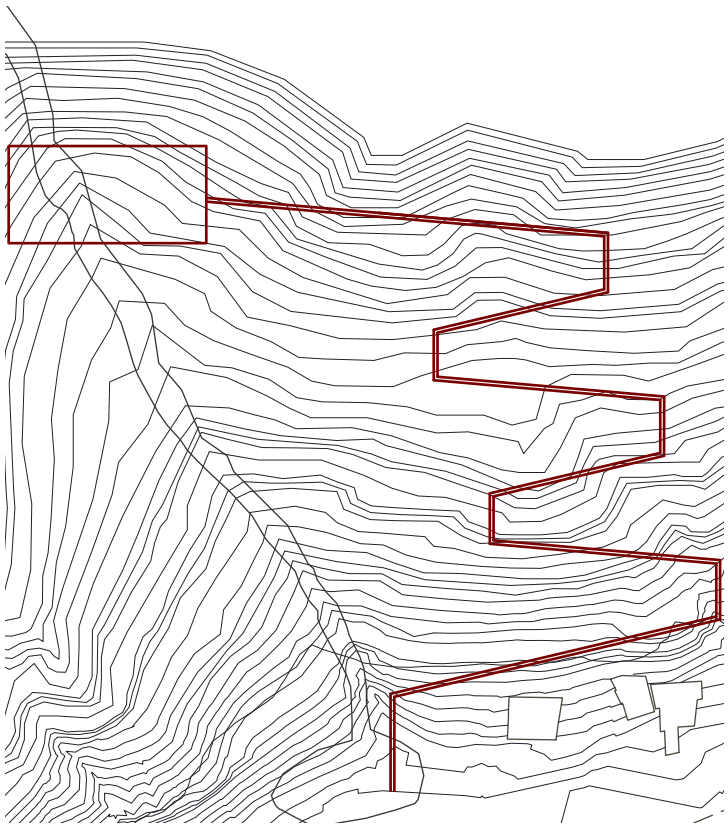
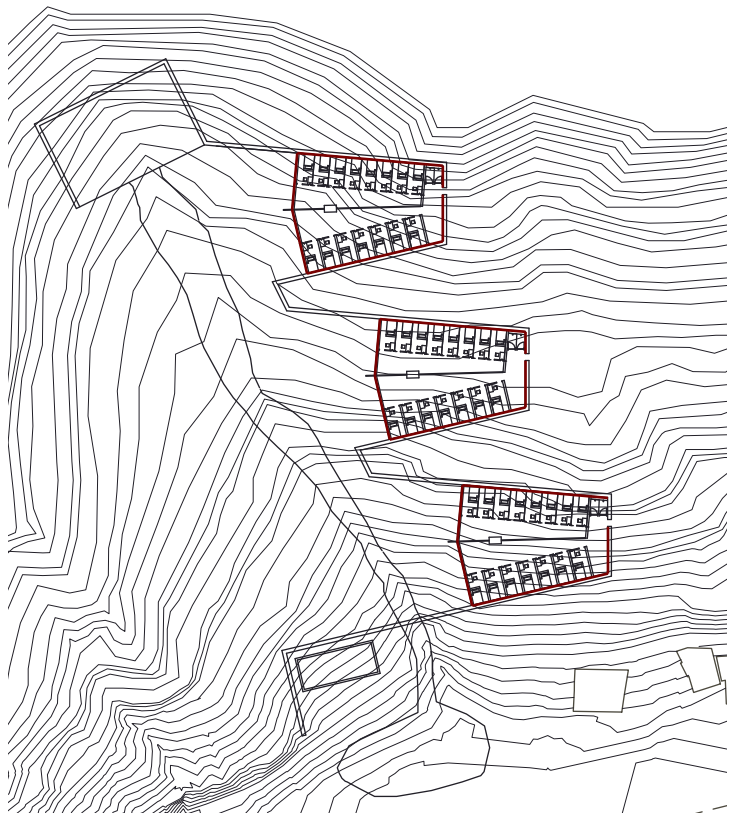


01 Concept

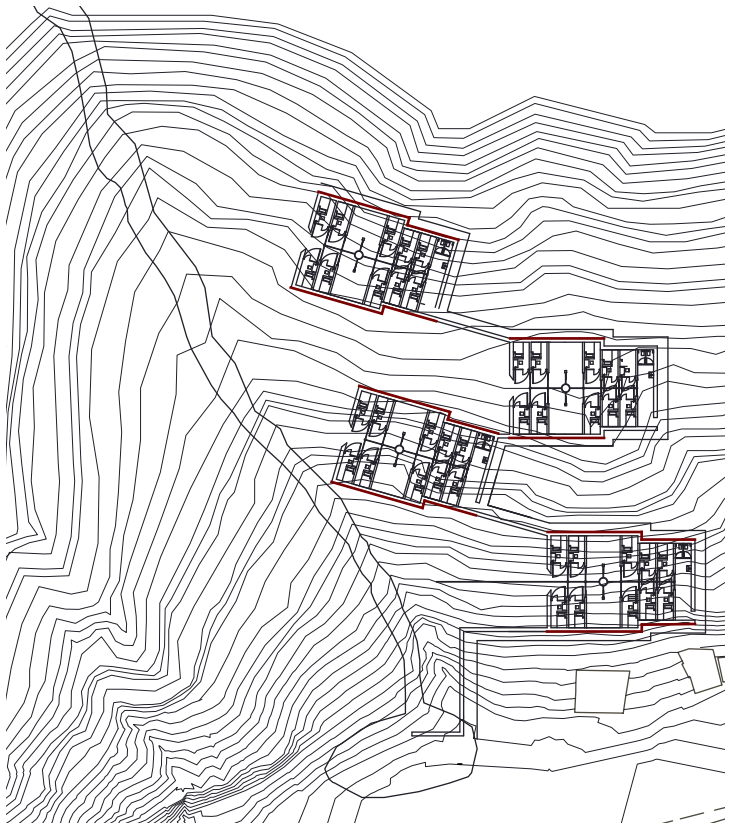
The model of the wall, the plateau and the cave is translated into the first conceptual drawing. The wall folds itself up the mountainside. In the folds positive and negative spaces are created. The wall is the element that will carry water from a water reservoir at the top of the wall to each other part of the building. The wall and the water end in a natural pool at the bottom of valley where construction can take place.



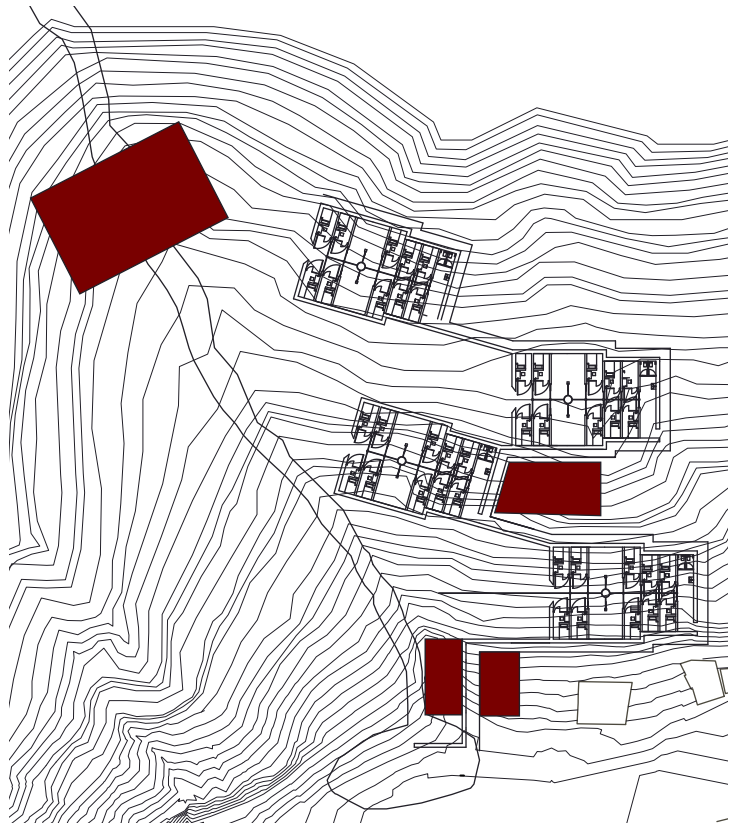
02 - Housing clusters

In the spaces made by the zigzag wall, living clusters are filled in. The living spaces are small cells for a single student. It is the space for the individual fire. The clusters are arranged around courtyards and orientated towards the river. At the top of the hill the main building is placed. It is a plateau with the gathering fire.
The wall creates a strong boundary for each cluster.

Ill 87-88

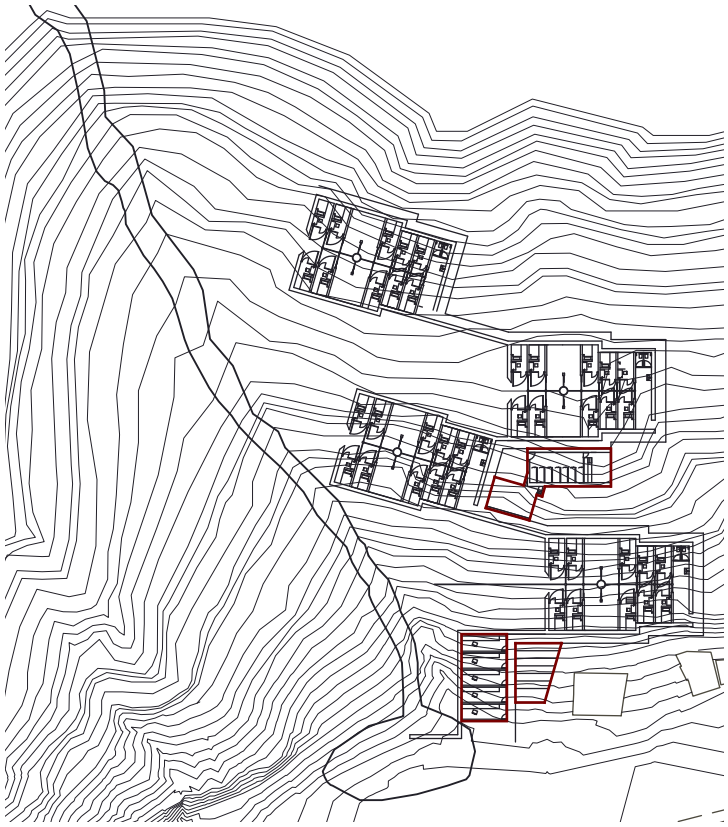


03 - Follow the landscape
The clusters are rearranged to follow to the landscape. This means that the organisation of the clusters change. The clusters to the east are orientated directly north/south and the clusters to the west are rotated 16 degrees to follow the slope.
The path going up the mountain also change so that there is a dwelling cluster every time the wall makes a turn. In this way the journey to the top becomes shortened.

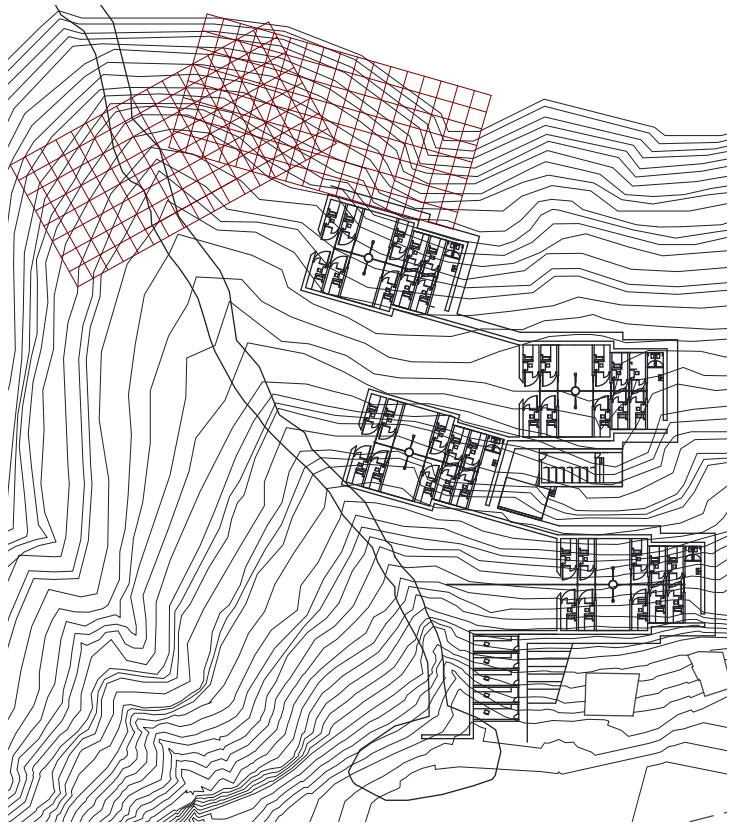


04 - Common room concept
The concept for the common rooms is developed. The common rooms are arranged so the Utzon Academy and the village share the spaces the bottom of the hill. The common spaces at the top are the spaces for the Academy. In the bottom of the path is the workshops and an amphitheatre. These functions are as much a part of the village as the Academy. Moving further up the path is the bakery and the hammam still a part of the village. The hammam is a public bath shared by the village and the Academy.
At the top of the hill is the kitchen and the gathering space for the Utzon Academy.

Ill 89-90



05 - Detailing of the common rooms
The common rooms adjacent to the path are detailed. The workshops are turned towards the path just at the start of the path. Being close to the pool of water it is also a place for creating. There are five workshops.
The hammam and the bakery is rotated according to the path, the hammam being higher in the landscape to use the heat of the bakery to heat the water and floor of the hammam.



06 - Grid for gathering space
For the organisation of the kitchen and the gathering space two grids are laid out. One grid follow the landscape and creates an idea how the kitchen is going to be arranged in the landscape. The grid is 2,3 x 2,3 meters according to the roof elements that is going to be fabricated at the site. The other grid cross the river. The gatherings pace is going to be placed on the river over a water reservoir. The gathering space is the plateau where there is an amazing view over the valley and the atlas mountains.

Ill 91-92

07 - Gatherings pace and wall hierarchy
The kitchen and the gathering space is designed and detailed according to the grid. An amphitheatre is added at the beginning of the path as a place for education and a public forum for the village.

The hierarchy of the walls are changed in the Academy. The wall that connects all the buildings is widened to give is a stronger presence. The design of the clusters also changed in this design step to be more clear and simple. In the clusters the wall hierarchy is also developed to show the load each wall have to carry.

Ill 93-94

Conclusion

The buildings are arranged according to the schemes of the patterns discussed in the paragraph about area organisation. All the parts of the building is arranged according to the slope of the landscape, thereby being very place specific.

The different parts of the building is tied together by a large wall that run up the mountainside. Next to the wall is a path that also connect the different buildings.

In the spring time the water melt in the Atlas mountains and flow down the mountainside. It reaches a water reservoir under the gathering space where it is stored for times where there is no water in the valley. From the reservoir it is lead down in in the wall that connects all parts of the building complex. In the gathering courtyards it is used for cooling. In the hammam it is used for cleansing the body. In the bakery it is used for baking. At the bottom of the wall are the workshops and the workspace where the water is mixed with the earth and then used for creating building materials.

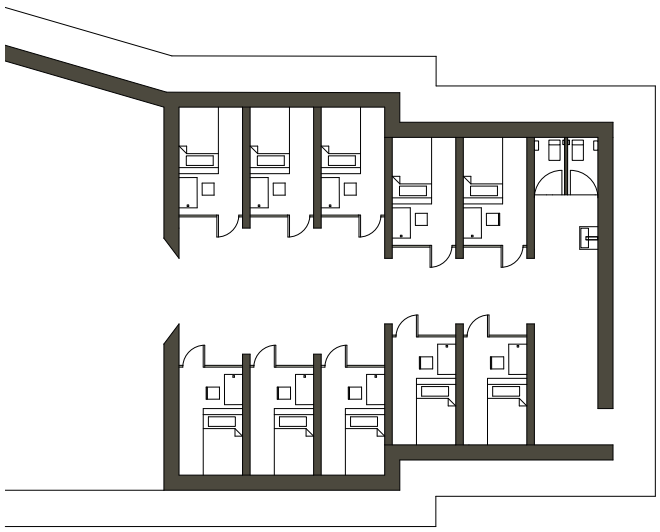
Clusters

1:250

01 - Dwelling cells

In the phenomenological analysis of fire and water it was discovered that a place for learning should contain a individual space for meditation and reflection. In the Utzon Academy this space is the dwelling cells. The cells contain only the most necessary: A bed, a shelf and a table and chair. There is a window at the table to give light and a small door that leads into he cell. On there table there is a candle that promotes reverie. A lit candle also show that there is someone in the cell.

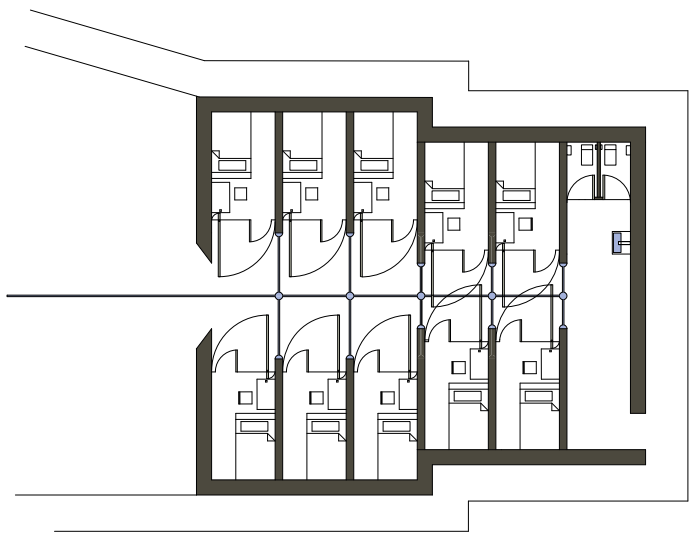
The cells are arranged according to the shape of the wall. Between the two sides of cells are a courtyard with a water pool that cools the courtyard. The fan shape of the courtyard is not very practical.



02 - Parallel layout

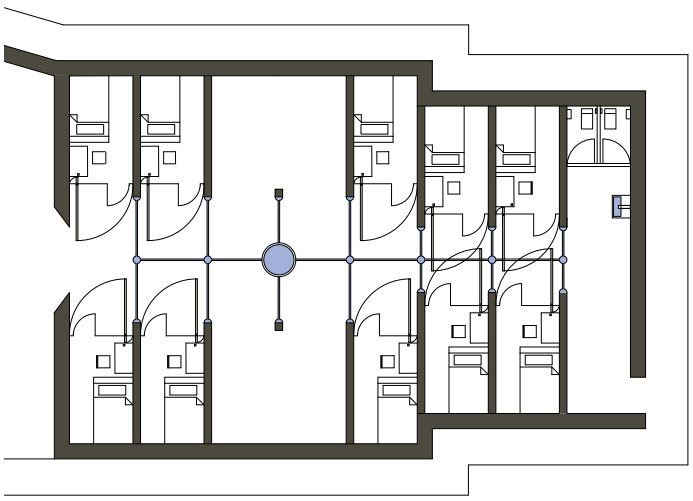
As the clusters are made to follow the landscape the cells are made parallel. This create a better shape for the courtyard that is placed in the west end of the cluster. The east end of the cluster is narrowed to fit the slope of the landscape.

Ill 95-96



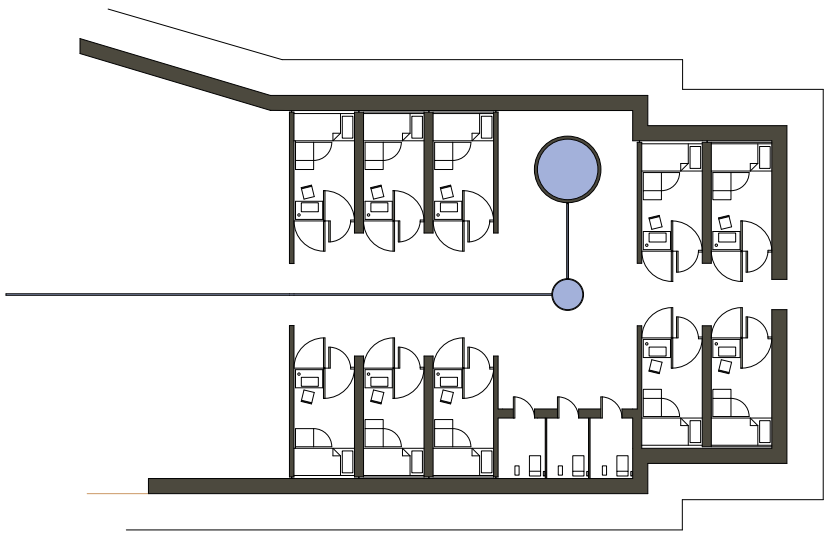
03 - Water and doors
Water features are added to the parallel plan. The water runs down from the main wall at every point where there is a wall. The courtyard lacks a centre. The orientation of the courtyard is towards the end wall where the water runs back out into the river.

The doors in the cells are changed so it is a small door within a larger door. This is a common door theme in Morocco where there is a small door within a larger door. The small door is for when the weather is cold or bad and the large is for the hot summers where as much ventilation as possible is required. There is not enough room between the rooms for the doors to open without clashing in the middle.

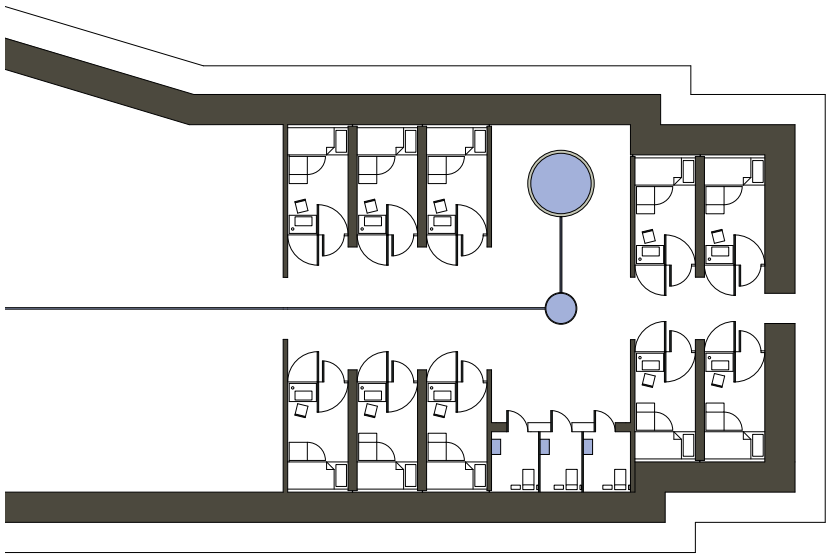


04 - Central square
The cluster is prolonged with the width of two cells to create a central square. In the middle of the square there is a large pool. The pool give the square a centre. The water in the pool cool down the dwelling cluster as the water vaporises in the summer. The water flowing also creates a place for reverie in for the students.

Ill 97-98



05 - Cell and square layout
The layout of the cells are improved. The bed is rotated and moved to the back of the room. A closet for clothes is added to the room. The problem with the doors opening radius is solved by having the large doors rotate at the centre. The dimensions of the courtyard is improved by moving the toilets from the entrance to one side of the courtyard. Opposite from the toilets there is a large pool that catch the water that pours out of the wall through a spout. From there the water runs in the ground to a pool at the centre of the courtyard. From here it runs back and joins the river. The path of the water is now much more clear than before.



05 - Hierarchy
The hierarchy of the walls are changed so it become more clear which wall is the primary that run all the way to the gathering space.
The thickness of the walls in the cluster changes according to the load they are carrying. If a wall is carrying two roofs it is has twice the thickness of a wall that only carries one roof.

Ill 99-100

Conclusion

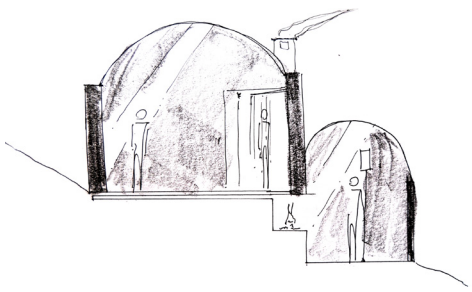
The buildings are arranged according to the schemes of the patterns discussed in the paragraph about area organisation. The dwelling spaces are arranged around a courtyard with a strong wall boundary. Water flow in the courtyard which give a relation to the water of the Ourika valley and create a place for reverie for the students. The water is also used for cooling. The water pours from a spout in the wall and into a pool from where it is lead into another pool in the centre of the courtyard and from there back to the river.

The dwellings in the dwelling cluster is a very simple in their layout. There is nothing to distract the mind. A candle on the table promotes solitude and reflection.

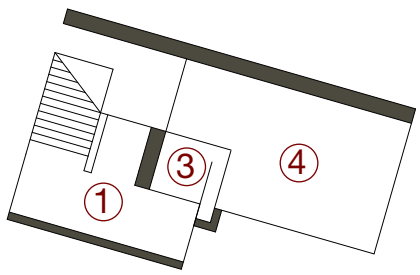
There is a clear hierarchy in the thickness of the walls in the dwelling clusters. The wall that goes all the way to the top of the Utzon Academy is one meter thick as it is the most important wall. It is important because it is the wall where the water for the other functions of the Utzon Academy flow. The walls of the clusters have a thickness that correspond to the number of roofs that rest on them. The walls that only carry one roof are half the thickness of the ones that carry two,

Bakery & hammam

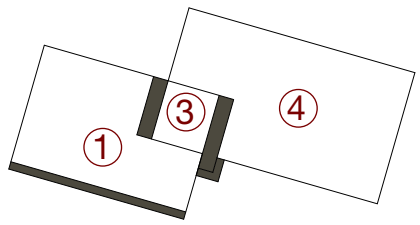
1:500



Concept sketch of the bakery and hammam

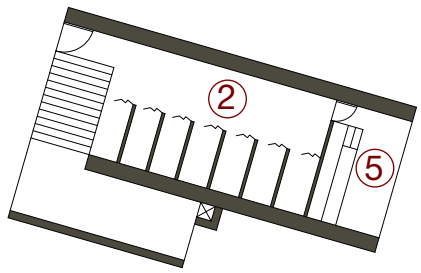


1st floor plan

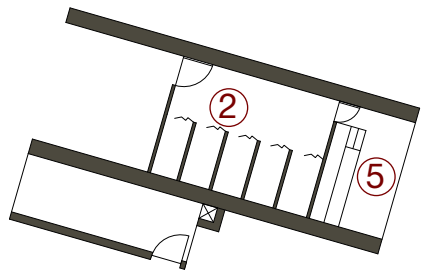


1st floor plan

① Bakery
② Hammam
③ Oven
④ Floor heating
⑤ Steam room/sauna



2nd floor plan



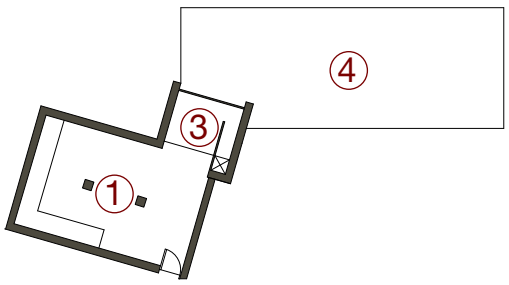
2nd floor plan

01 - Concept
The bakery and the public bath, called the Hammam, is placed on two different levels. When baking bread the heat from the oven is used for heating the floor and the water used in the hammam. The principle of using the heat from the oven to heat a public bath is common in Morocco.

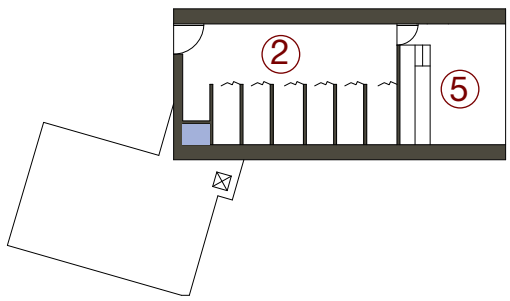
Ill 101-102

02 - One entrance
The hammam and the bakery share the entrance. The entrance is at the floor of the hammam and a stair leads down to the bakery. The stair takes up a lot of space and the layout is not very practical considering the privacy of the hammam.
The hammam consist of a series of shower rooms closed off by curtains. The shower room is unisex but in the moroccoan tradition it can be used by women and men at different times of the day.
In the end of the hammam is a steam room with a large window to the valley and mountains.

03 - Seperate entrances and a realisation
The bakery gets its own entrance. This removes the staircase. It is realised the only thing the hammam and the bakery share is the oven. This means that the hammam can be rotated around the oven. By doing this the hammam and the bakery can follow separate lines in the landscape.



1st floor plan



2nd floor plan

04 - Rotation of the hammam

The hammam is rotated around the oven to fit the path that run along the large wall. This way the bakery and hammam fit the space created by the main wall. Because of the rotation happens around the oven, the heat can still be lead to the floor of the hammam.

Over the oven there is a water tank to heat the water for the showers.

Ill 103-104

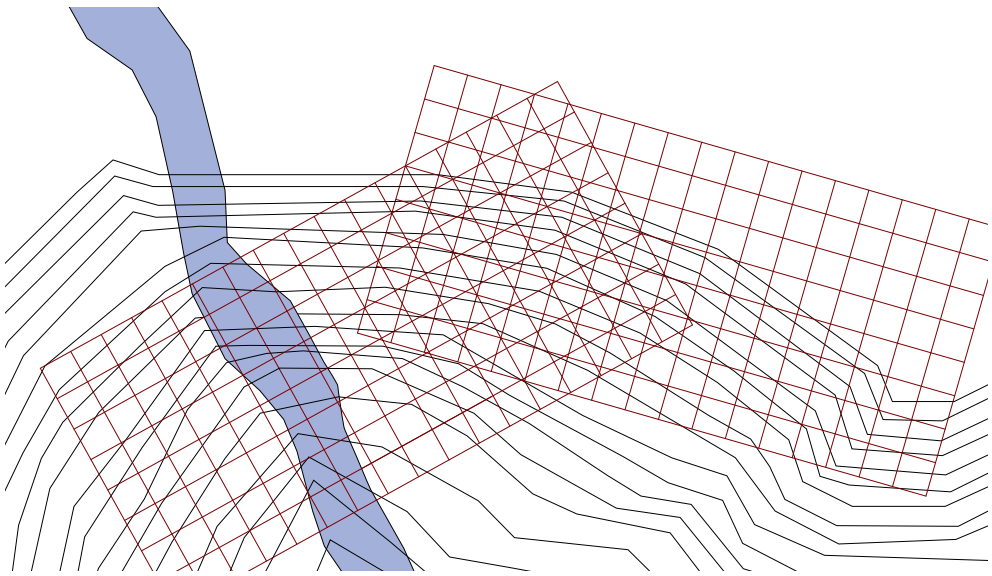
Conclusion

By combining the bakery and the hammam the heat from baking bread can be used for heating the floor and the water for the hammam.

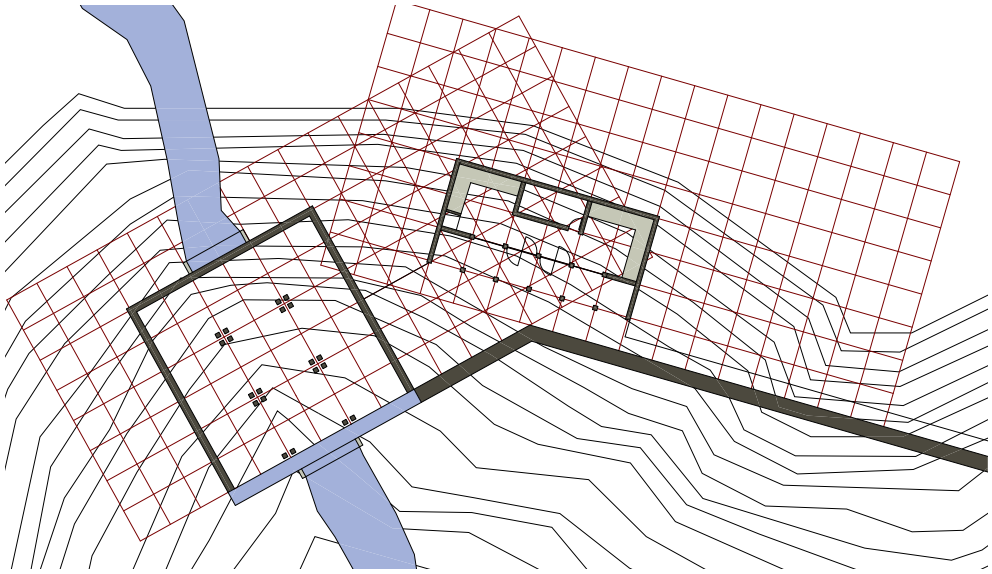
The two parts of the building have to be connected. The connection point is the oven because of this the two parts does not have to lie parallel to each other. The path along the wall that lead up the mountain does not create a square space, so the hammam is rotated to follow the path. The hammam consist of a series of showers and a steam room. The steam room is a place where the cleansing of body and mind becomes one. In the steam room there are some benches where a person can sit and meditate on the landscape of the Atlas mountains while the steam cleans the body.

Gathering space

1:500



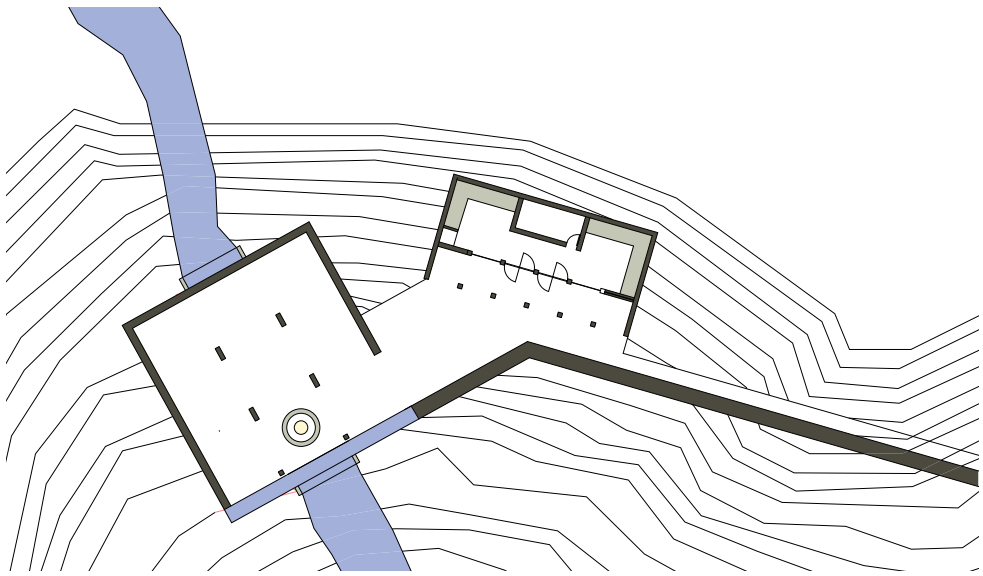
01 - Placement of grid
A grid is placed according the landscape. The grid to the east follow the rest of the building complex while the grid the west is rotated 45° and laid out over the stream on which the gathering space will be placed. Under the gathering space is going to be placed a storage for water. This will provide clean water all year for the village instead of only having fresh water when the snow melts in the mountains once every year. The water will be lead down along the wall to all the clusters and public spaces.



02 - Arrangement to the grid
The kitchen and the gathering space is split into two separate buildings. The kitchen follow the grid to the east. The wall connect the two parts. The kitchen is arranged according to the 2 meter roof elements that are also used in the dwelling spaces. In front of the kitchen, toward the south is an arcade that give shadow to the windows facade.

The layout of the gathering space is arranged according to 4 meter elements. The roof elements rest partly on walls, but in the middle of the room are columns that carry the roof elements. Between the roof elements there are gaps that let in the light. The gathering space is not closed to the south by walls, but create shade for the sun.

Ill 105-106



03 - The fire for gathering
The wall that separate the kitchen part and the gathering space is opened up to tie the two buildings together visually. By walking along the main wall the persons walking up the gathering space are lead to a fireplace that is added at the southern end of the gathering space. From the gathering space there is an amazing view over the mountain tops.

The fireplace is circular, a shape with a clear centre. Around the fireplace there is a bench where the students sit and exchange knowledge and tell stories.
The earth columns in the gathering space are connected to make the stronger. There are spaces between the roof elements where the sun shines through and lights the room.

Conclusion

The kitchen and the common room are important because of the because it is the place for the students and teachers of the Utzon Academy to gather and exchange knowledge. The importance of the building is enhanced by its location highest in the Utzon Academy.
In the gathering space is a plateau where the students can find shade from the African sun. The roof elements, that span 4 meters hover above the plateau create the shade.

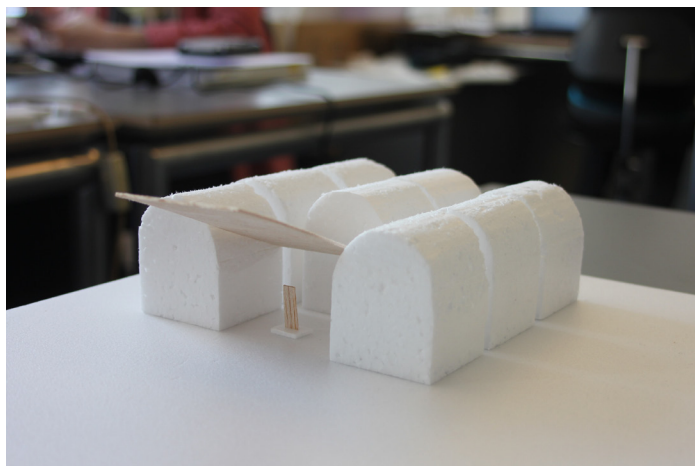
Under plateau the water from the stream is collected in a large water reservoir. The reservoir supply the Utzon Academy with water all through the year. If the reservoir is filled, the overflow is led out on the south side of the gathering space and can continue its journey down the mountainside. The outlet from the reservoir create a small pool in front of the fireplace.
The water from the reservoir is lead into the wall. The wall then leads the water down to the dwelling clusters, the hammam, the bakery and the workshops.

The most important part of the gathering space is the fireplace. The elements of creation, the fire and the water, are juxtaposed to show the contrast between them.

The roofs of the gathering space where developed through model work. This process is explained in the next paragraph.

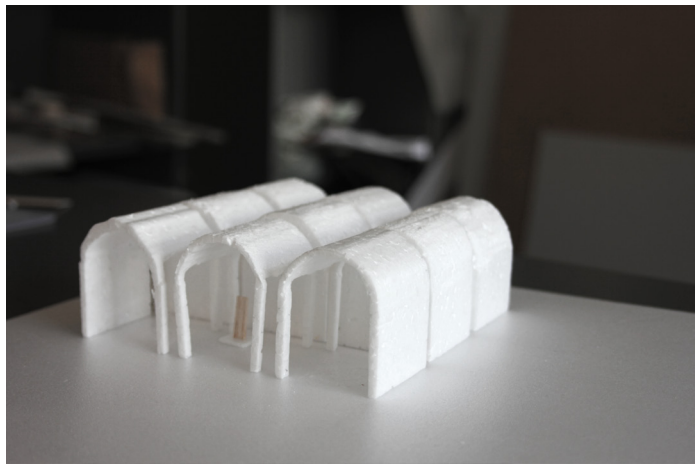
Ill 107-108

01 - Flat roof
+ Frames the view of the mountains
- Changes the scale from the vault shapes



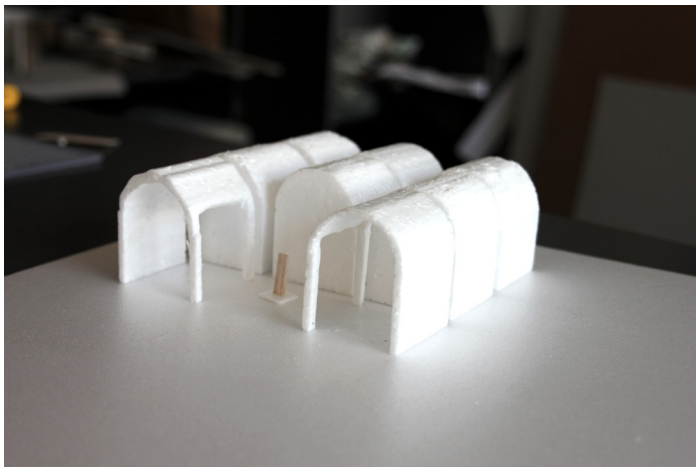
02 - Sloping roof
- Clashes with the vault shapes
- Looks out of place

03 - Open central vault
+ Follows the vault theme
+ Halfway outdoors and indoors
- Too inclosed

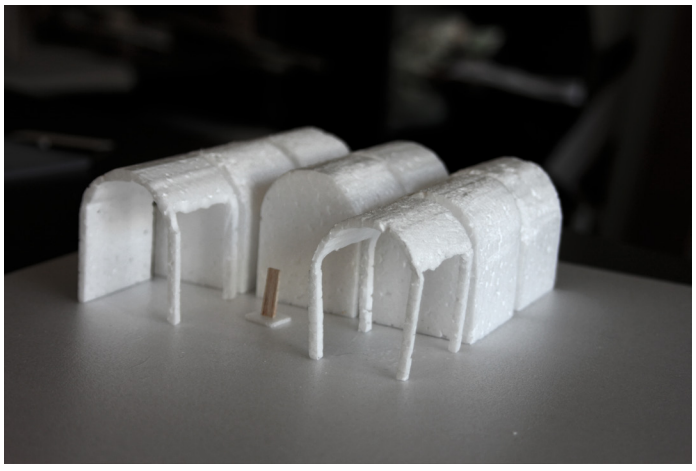


04 - Open to side vaults
+ Transition between outdoor and indoor
+ Creates shadow on the south facade
- Smoke gets caught in the vault

Ill 109-112



05 - Fireplace in the middle
+ Smoke from the fire can easily escape the roof.
+ Shadow in the side vaults in the daytime
+ Fits into the module system.



06 - Open to the kitchen part
+ Connection to the kitchen
+ The focus of the common room is clearly toward the view
+ Connection directly from the wall to the fireplace

Conclusion

Gathering around fire is essential for the gathering space. Around the fire there is room for exchanging the knowledge learned in the other parts of the Academy. In model 01 and 02 an experiment to give the roof of the middle a whole different character than the rest of the Academy. Adding a new form language seems strange juxtaposed to the pureness of the vault shape. Therefore it is decided to work with the vaults shape but change it according to the needs in the gathering space.

In model 03 the middle space is covered with a vault to continue the vault theme. The vaults next to the middle one have closed sides which make the middle vault seem very narrow.

The narrowness of the centre is handled in model 04 where the side vaults are opened. The problem with this model is that smoke gets caught under the vaults if a fire is lit there. The fireplace should be open to the sky.

This is done in model 05, where the middle vault is removed. Sitting at the fireplace the students will be under the starry sky with the fire. A perfect setting for telling stories and exchanging experiences.

The wall towards kitchen space is very closed in model 05 so a natural step is to open the wall between the kitchen and the fireplace. This make the path going along the wall from the bottom of the valley end up naturally at the fireplace, which is the heart of the Utzon Academy.

Ill 113-114

Structural considerations

Finite element calculations

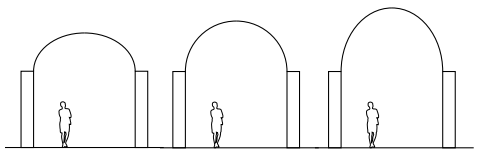
The barrel vaulted roof of the common room rests on the rammed earth walls. A choice it is chosen to make the concrete vault as thin as possible to create contrast to the thick walls. A minimal construction will also minimise the use of concrete, that is not a sustainable material. By splitting the construction into parts of maximum four meters will ease the handling of the concrete shells at the site. To make the roof a minimal construction, structural calculations have been made to figure out the minimal construction thickness of the concrete. The first step is to figure out how the shape of the vault affect the thickness of the concrete structure.

To calculate this the finite element program Autocad Robot Structural Analysis 2012 have been used.

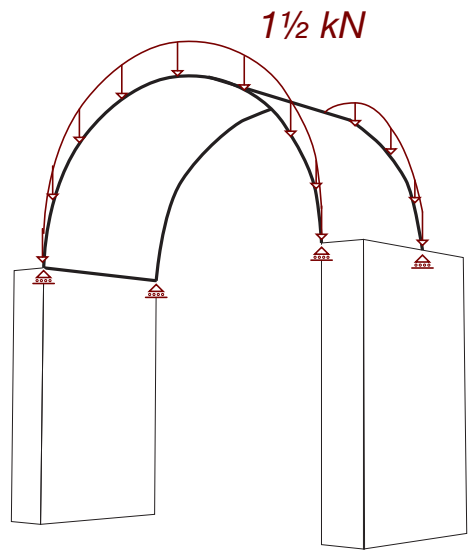
The vault span is 4000 mm.

The first step is to define the shape of the different vault shapes. The three vaults that are examined have a height of 1.5 meter, 2 meter and 2,5 meter.

The vaults have are fastened to the wall by a pinned joint in each corner.



Ill. 115 Three heights of the vault. From left to right: 1,5 meter, 2 meter and 2,5 meter.



Ill 116 Structural system of the vault.

Safety class 2 [Ståbi, 2010, p.162]

Material data:
Material quality: C30 concrete [Robot]
fc,0,d: 30 Mpa [Robot]

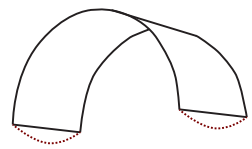
Loads:
Self weight: [Robot]
Waterproofing: ½ kN/m^2
Wind loads: 1 kN/m^2
Snow loads: None
All loads = Self weight + 1,5 kN/m2

Allowed displacement of the vault:
As with a roof beam, the allowed displacement is set to 1/200 if the length.

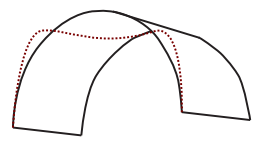
4000 mm. / 200 mm.= 20 mm

Vault height	Concrete thickness	Displacement
1,5 meter	*10 mm.* *15 mm.* *20 mm.* *25 mm.* *30 mm.*	*242 mm.* *73 mm.* *32 mm.* *17 mm.* *10 mm.*
2,0 meter	*10 mm.* *15 mm.* *20 mm.* *25 mm.* *30 mm.*	*122 mm.* *37 mm.* *16 mm.* *8 mm.* *5 mm.*
2,5 meter	*10 mm.* *15 mm.* *20 mm.* *25 mm.* *30 mm.*	*495 mm.* *149 mm.* *64 mm.* *33 mm.* *20 mm.*

Ill 117: Values of displacement according to different vault heights and material thickness.



Ill 117.1:
Main place of displacement in the vault with a height of 1,5 meters



Ill 117.2:
Main place of displacement in the vault with a height of 2 and 2,5 meters

Conclusion

As it can be seen in ill 117, the thickness that is required to span the 4 meters varies according to the shape of the vault. The strongest shape of the vault is the one with a height of 2 meters. The reason why the 1,5 meter high vault is the strongest, even though its shape is closer to the shape of a pure pressure arch, is because the low angle of the arch. The low height of the arch. The low angle means that the structure is weaker between the joints on side of the structure. The structure displace between the two joints as shown in ill 117.1.

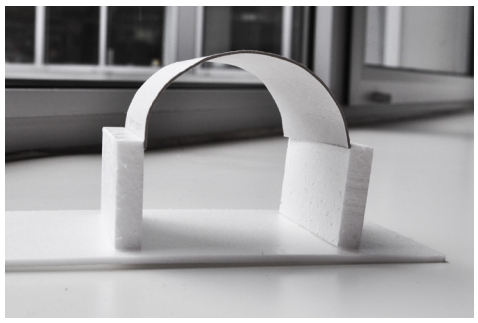
In the vaults with a height of 2 meter and 2,5 meter, the displacement happen in the vault itself as shown in ill 117.2.

The results from Robot are correct, but in reality the construction of concrete shell structures is quite different. Concrete is very bad at handling tension. The arches that are under consideration in this project is not pure compression arches and because of this there is a need for reinforcement in the concrete. The reinforcement should be in the bottom third where of the shell the tension will be. In reality it is impossible to have both concrete and reinforcement in a 20 mm shell construction. The 2 meter high vault is chosen because it is the strongest configuration, but the shell thickness is increased to 40 mm which is the thinnest possible concrete construction with reinforcement buildable. The idea is that the inhabitants of the Ourika valley can produce the shells on site, therefore fibre concrete, that eliminates the need for reinforcement, is not used.

To summarise: A 2 meter high vault with a thickness of 40 mm is chosen for further development in the project. This vault thickness will contrast strongly to the 500 mm thick earthen wall rest upon. The next step is to detail the joint between the vault and the wall.

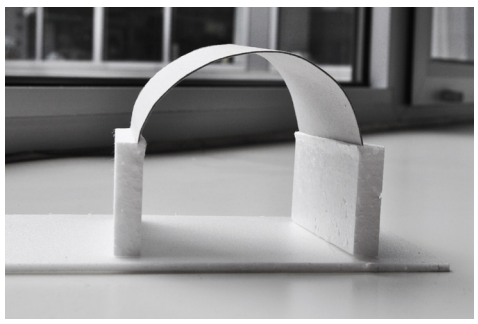
Roof/wall meeting

Roof and wall meeting



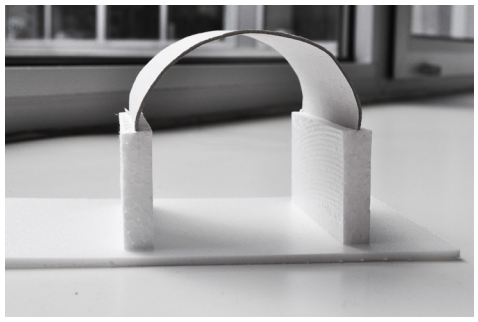
Ill 118

01 - Joint at the inside of the wall
With the joint on the inside or just at the edge of the wall, the joint is visible from the room. The roof seem like it is barely touching the wall. It is quite a dramatic composition. If another roof element rest on the same wall, there will be a space between the roof elements.



Ill 119

02 - Joint moved slightly onto the wall
This composition seem much more stable an less dramatic. It is clear that the walls are carrying the roof. If another roof element is added next to this one the space between the two elements are demised. The joint between the wall and the roof becomes harder to see when standing inside the room.



Ill 120

03 - Joint in the middle of the wall
Joint in the middle of the wall. In this composition the inside and the outside of the wall gains equal importance. Visually the construction seem very stable. There will be a large gap from the wall to where the roof starts when standing inside the vaulted room. This will make the joint between the wall and the roof difficult to see.

Earth to concrete

Two rammed earth walls with a thickness of 500 mm each carry the 40 mm thick concrete shell. The contrast between the thick wall and the thin shell will clearly show the juxtaposition of traditional building methods seen in the wall with more modern building techniques seen in the shell structure. The idea of the roof is, that it is used as a cover for the rooms of the hammam and gathering space. Where the roof meets the wall has a large impact on how the structure is experienced.

Conclusion

Example 01 where the joint is at the edge of the wall is chosen as the way the roof and the wall meet. The composition create a dramatic counterpart to the visually very stable wall. If two roof shells meet at one wall the two will be separated by a gap. This gap can be used as a gutter for removing water when in rains or a gap for letting light into the room. The joint of the wall and the roof element is also very visible from the inside in the chosen example.æp

Joint development

Introduction

The joint is an important part of the Utzon Academy. It is the joints that give the Utzon Academy a human scale. It needs to tell the story about how the building is constructed and how the forces move through the structure. The joint is also used for mediation between two materials: the traditional earth wall and the contemporary roof shell.

The idea of the Utzon Academy is that it is to be constructed by a combination of students and locals from the Ourika valley. Because of this, the joint should be as simple as possible, so the joint can be used in other buildings in the future. Another consideration concerning the simplicity of the joint is, that the parts of the building that will not dissolve in time can be easily removed.

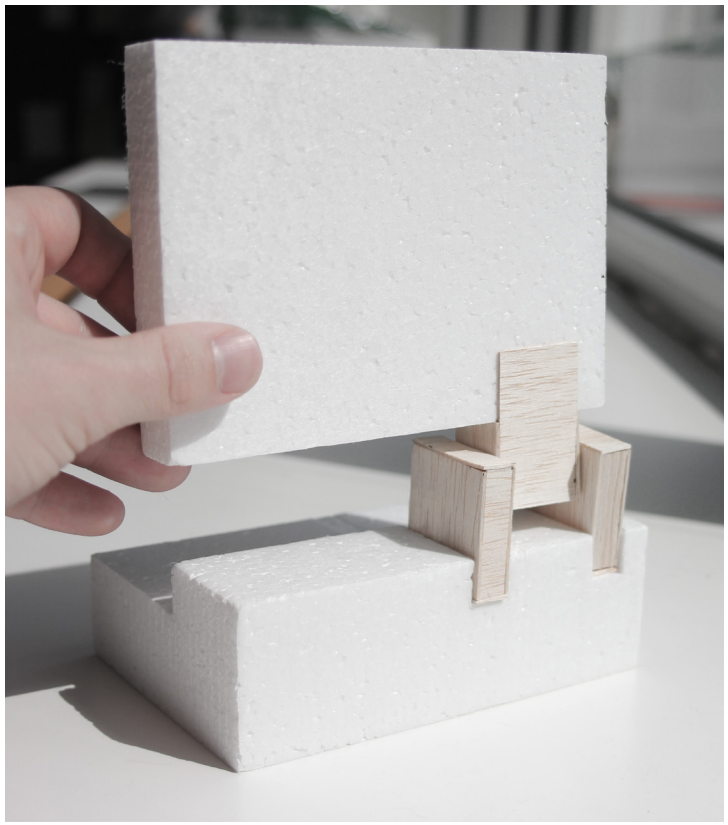
The development of the roof detail happened through the use of simple models to explore the functional principle and the and dimension of the joint. All the models are made in scale 1:2.

After the roof detail was designed the design of the door hinge was done in a manner so the two share a common design language.

Ill 121

04 - Joint concept
The joint is the mediator between two materials: the concrete shell and the earth wall. To show that the joint is a separate element than the other two it is decided to make the joint in another material. Steel is chosen as the joint material because of its structural properties. It can take the forces of the roof being a disproportional large element on the wall.

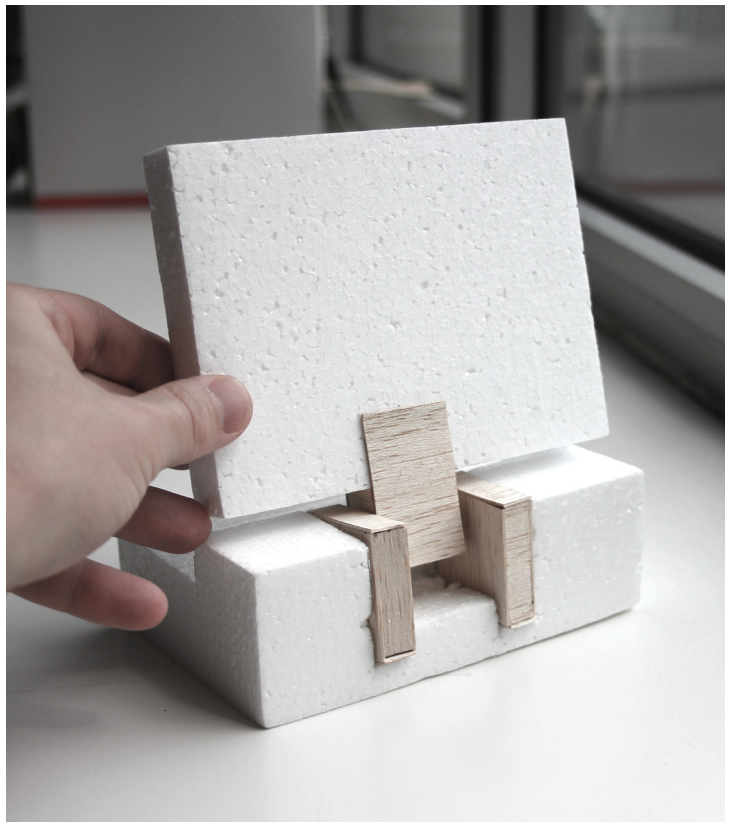
The concept of the joint is, that there is a clash of two different directions. The pinned joint should be free in a direction perpendicular to the wall. The clamp that hold the concrete shell should stabilise it in a direction along the wall. The clash of directions is clearly seen in the model.



05 - development of the concept
The clamp that hold the shell roof is moved in between the base parts of the joint. In this way the pinned joint is free in the direction perpendicular to the wall. Because the clamp and the base are separated by a gap it is clear that the joint can rotate.

The base of the joint is moves slightly into the wall. As the clamp wraps the roof, the wall wraps the base part of the joint. The forces are moved from one part to the next.

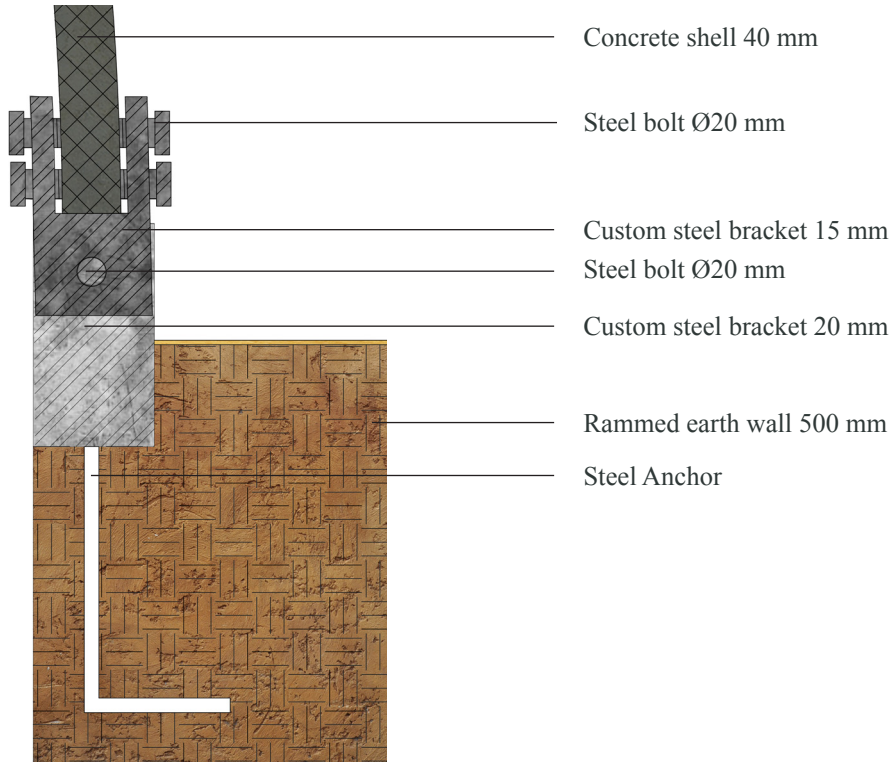
Ill 122

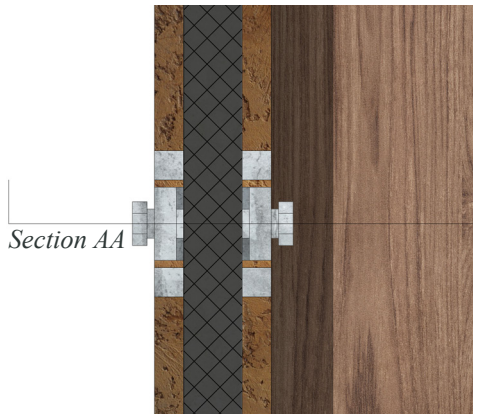


06 - Integration with the wall
The gap between the roof and the wall is experienced too large in model 05. With such a large gap too much dirt and wind will enter through the gap. The close the gap the base part of the joint is moved all the way into the wall. The connection between the wall and the joint become stronger as the two parts become more connected.

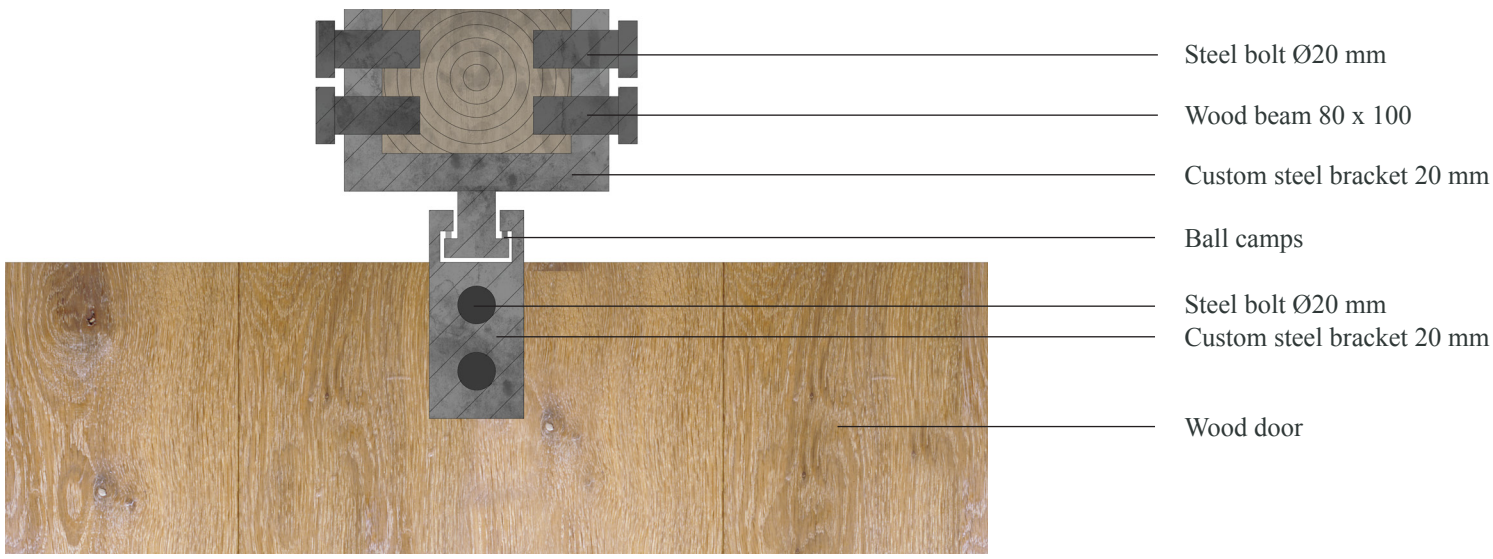
The joint is too close to the edge of the wall in model 05 and is moved towards the middle of the wall. The distance from the joint to the edge of the wall is 10 cm in the finished proposal.

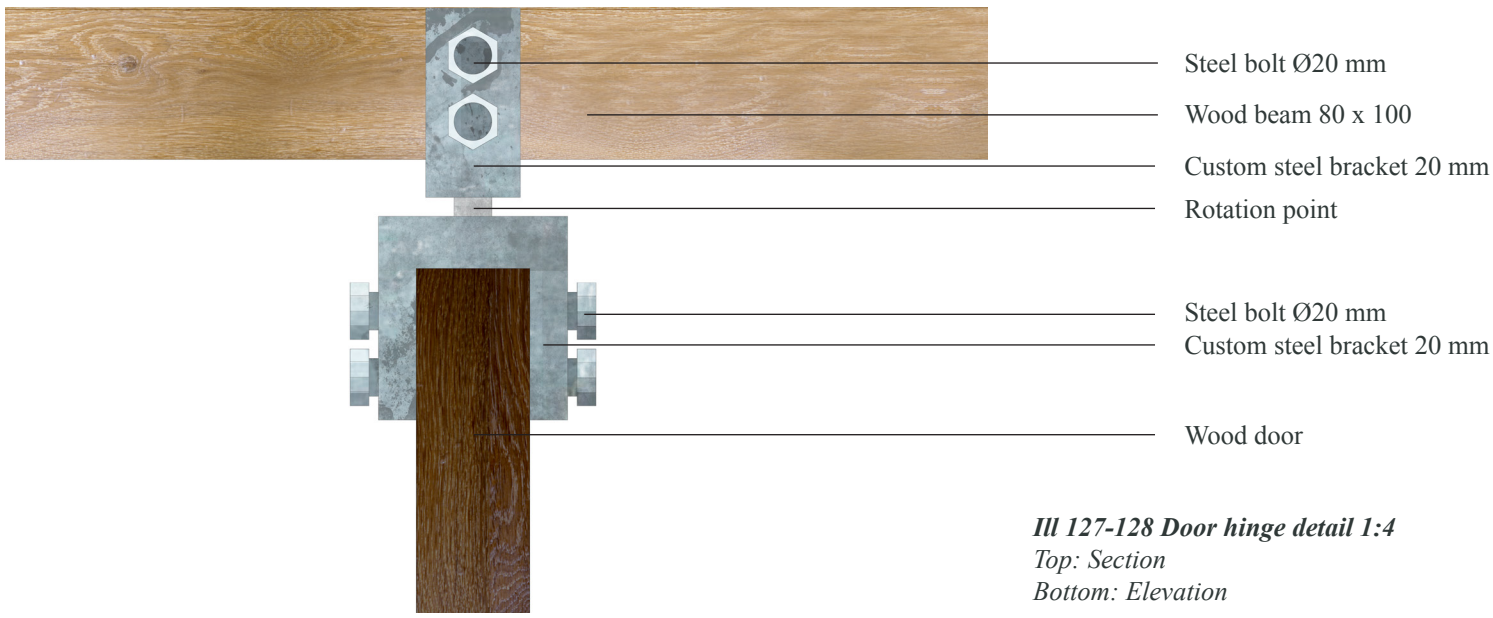
Ill 123





Ill 124-126 Joint detail 1:4
Top left: Joint elevation
Bottom left: Plan view
Top right: Section AA





Ill 127-128 Door hinge detail 1:4
Top: Section
Bottom: Elevation

Conclusion

The Utzon Academy is a place for students to learn about traditional Moroccan building methods but also a place where the local inhabitants can learn about modern construction methods. The construction of the Academy should be easy to assemble and understand for architects and the locals from the valley. To make the assembly and disassembly of the structure as simple and flexible as possible, the concrete shell is fastened by a clamp with bolts. The bolts does not to through the shell as there is a risk of the shell cracking in the process. Instead the bolts tighten around the shell holding it into place. Because of the clamp principle it is also possible to fasten the concrete shell roof, even though there might be some small imprecisions in the casting of the roof. The roof is cast on site by the people of the valley with very simple methods, so precision is not guaranteed.

The rotating door hinge for the dwellings is developed from the same principle as the roof joint: that it should be easily readable and easily to assemble. The idea of the clamp is used in the joint to fix the top part of the joint to a beam door frame. The bottom part of the joint is also a clamp holding the door in place. As the function of the joint changes so does the design. The door joint rotates around the z-axis, and the design is changed accordingly. The rotation happens in the joint where the are ball bearings.

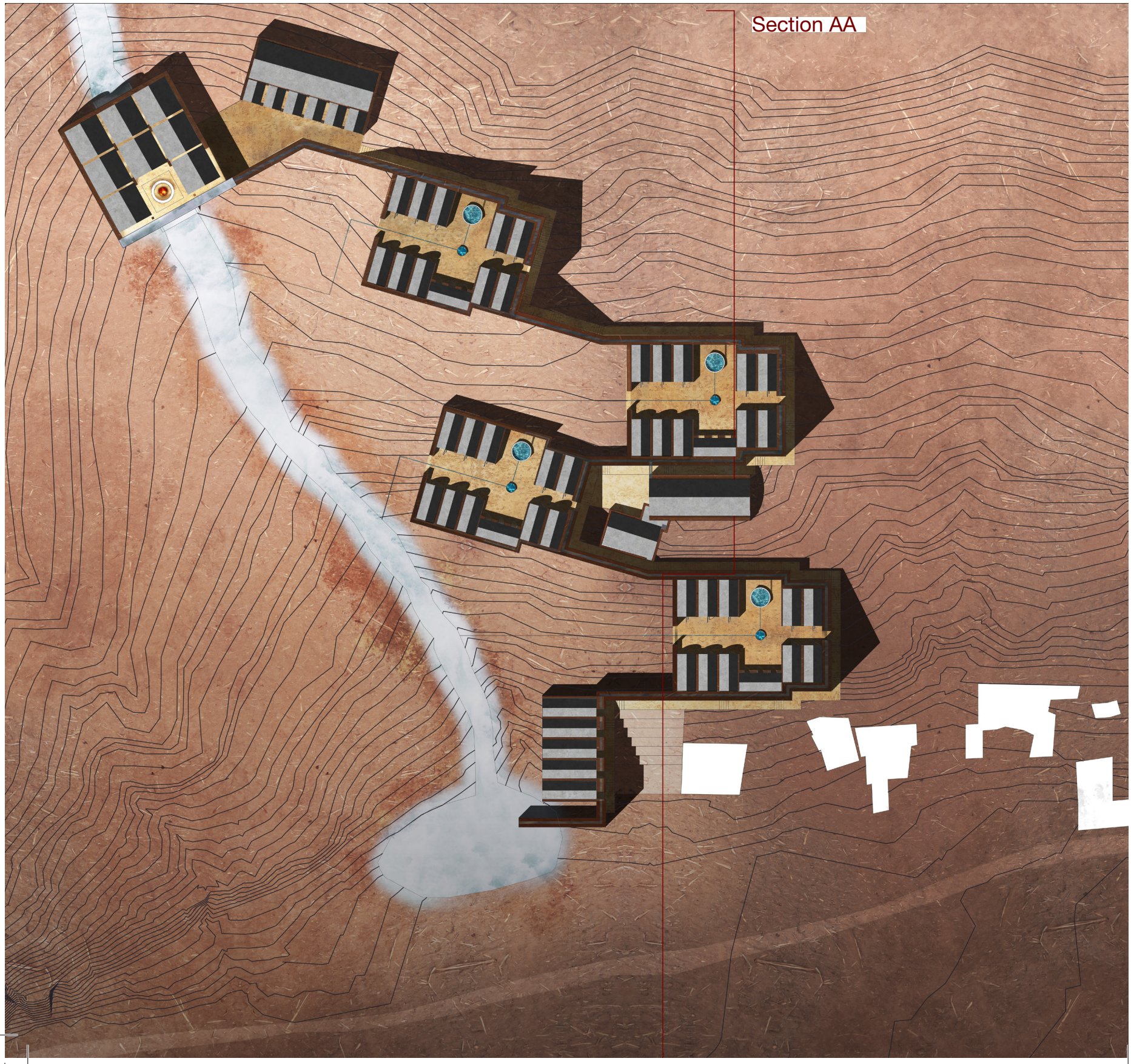
Presentation

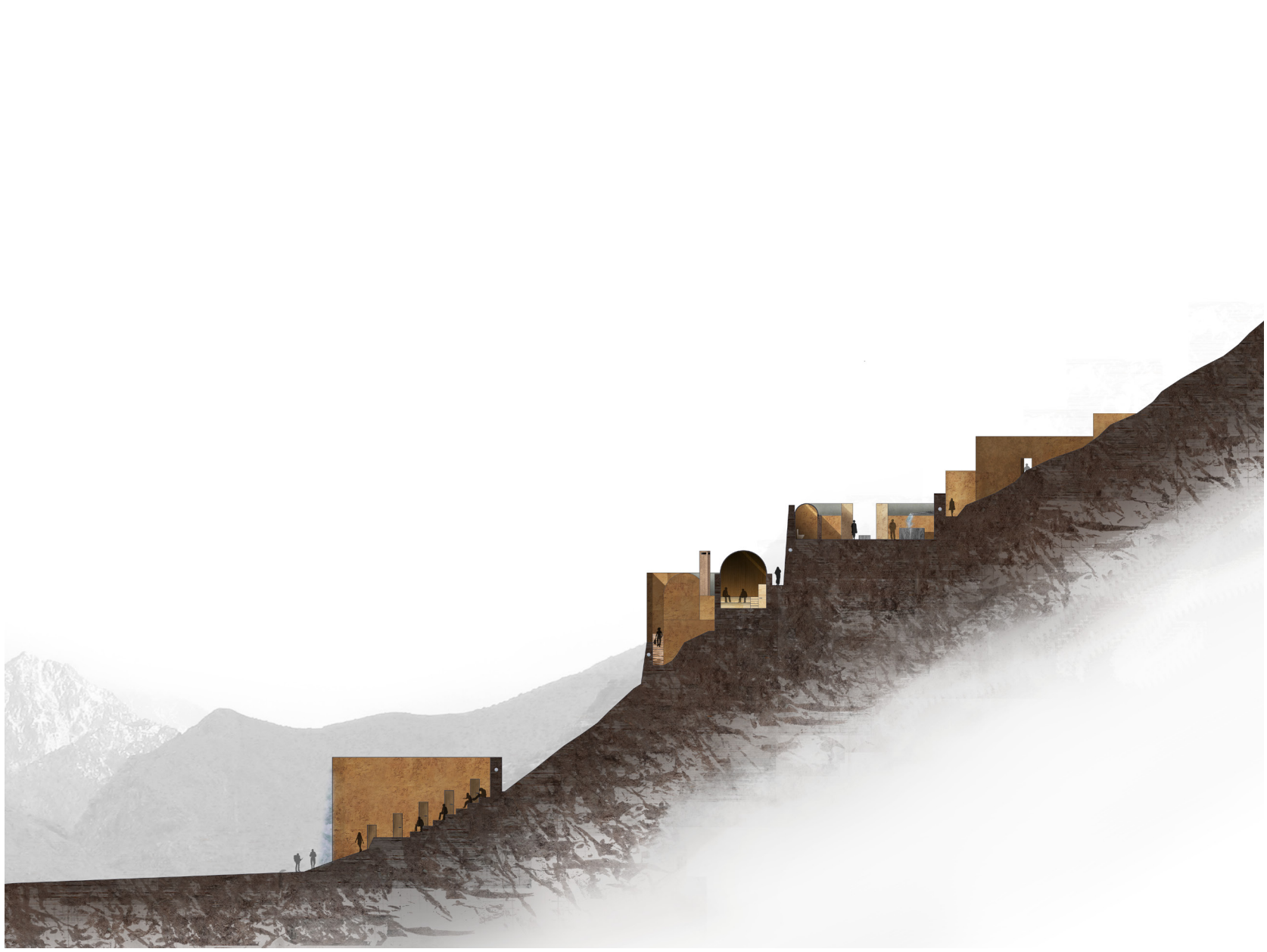
Representing water and fire

The presentation show the finished design result of the design process. The presentation will happen through plans and sections and through 3 dimensional visualisations.

“There is a zone between the plain’s earthen walls and the mountains. Wood constructions slips through in this belt, ant the trees are down to nearly the scale of a human, and you walk on top of the wall.”
- Sverre Fehn

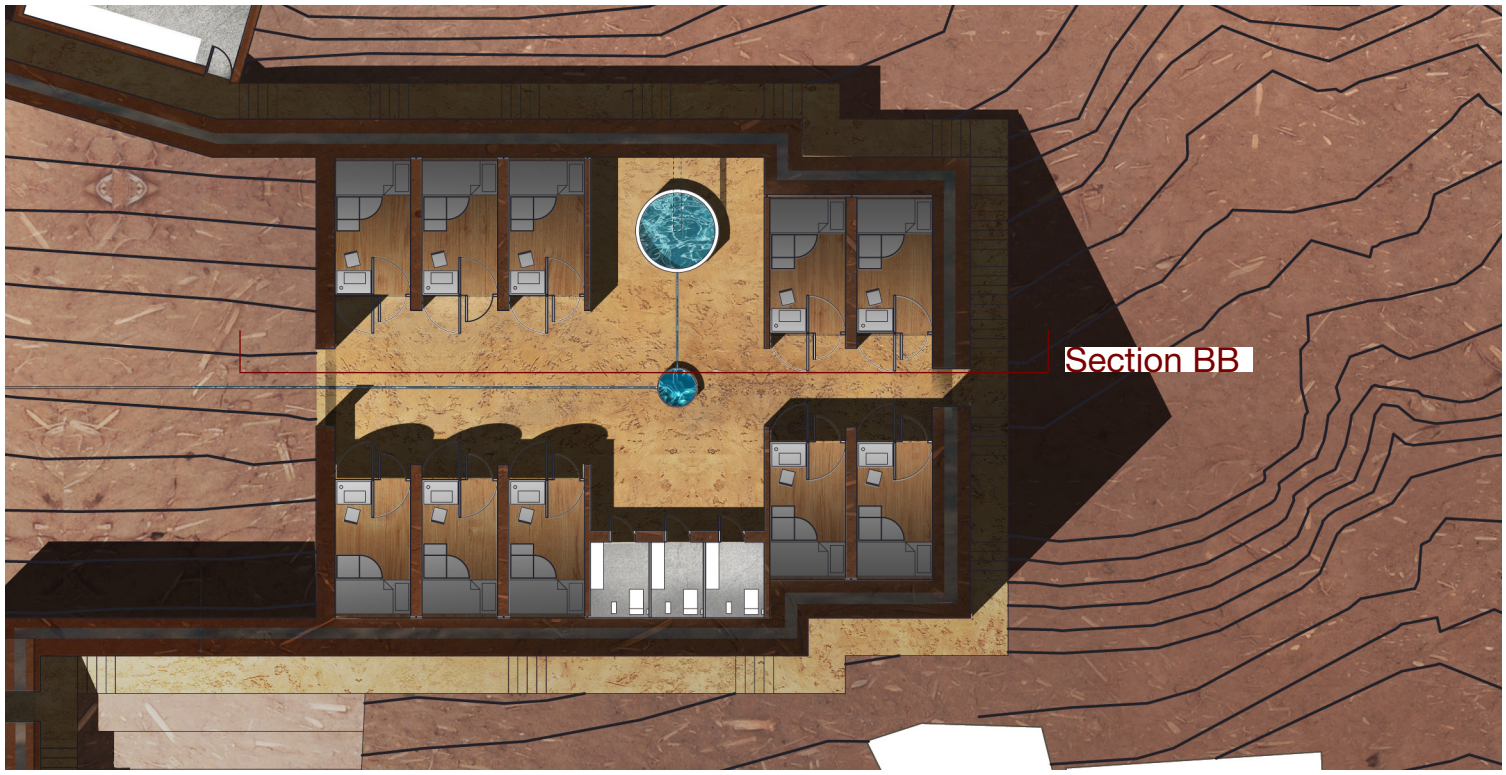
Site



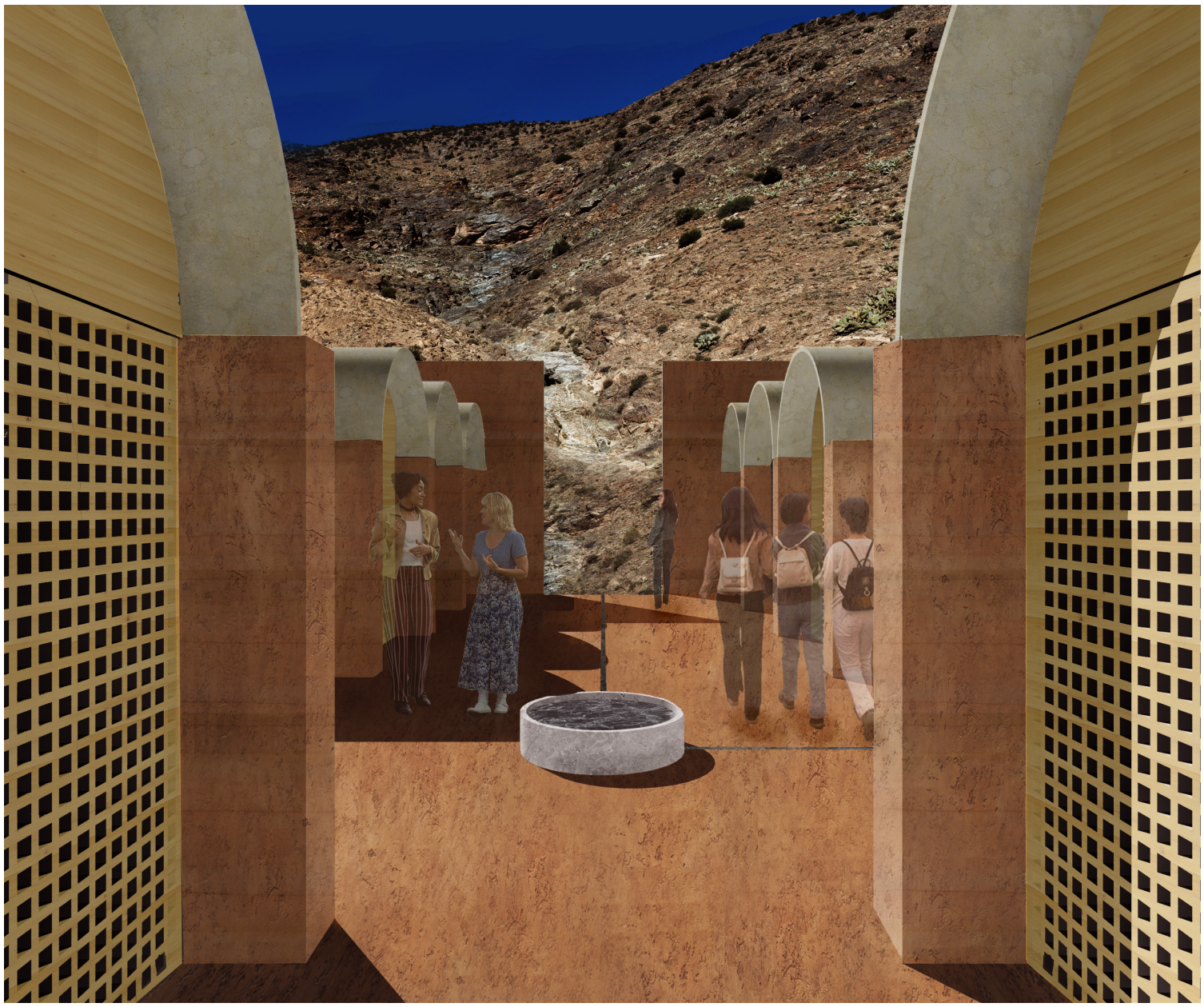


Ill 129-130: The site
Opposite page: Plan of the Utzon Academy 1:1000
This page: Section AA 1:1000

Dwelling cluster

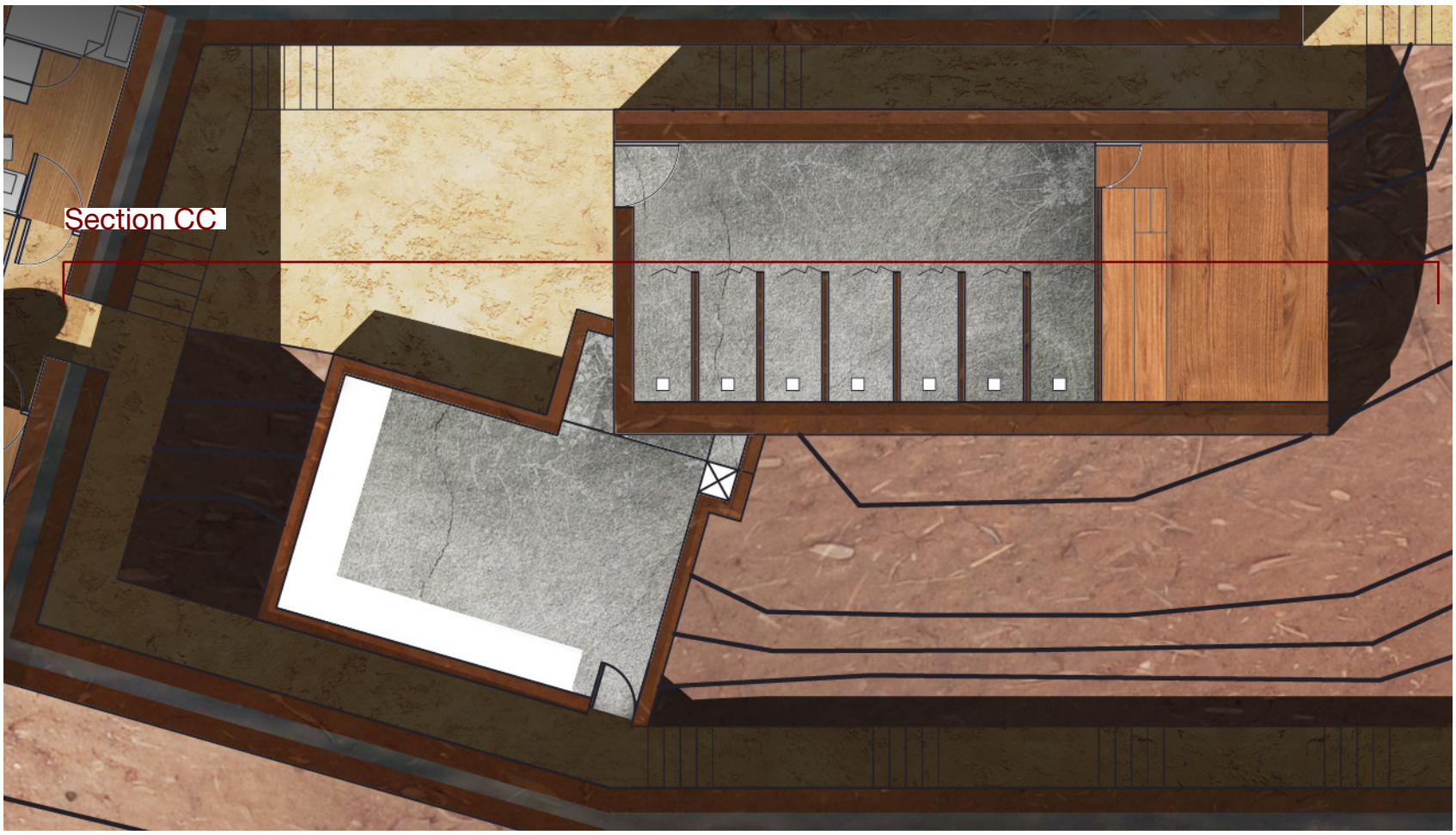


Ill 131-132: The dwelling cluster
Opposite page: Plan of the Dwelling cluster 1:200
This page: Section BB 1:100



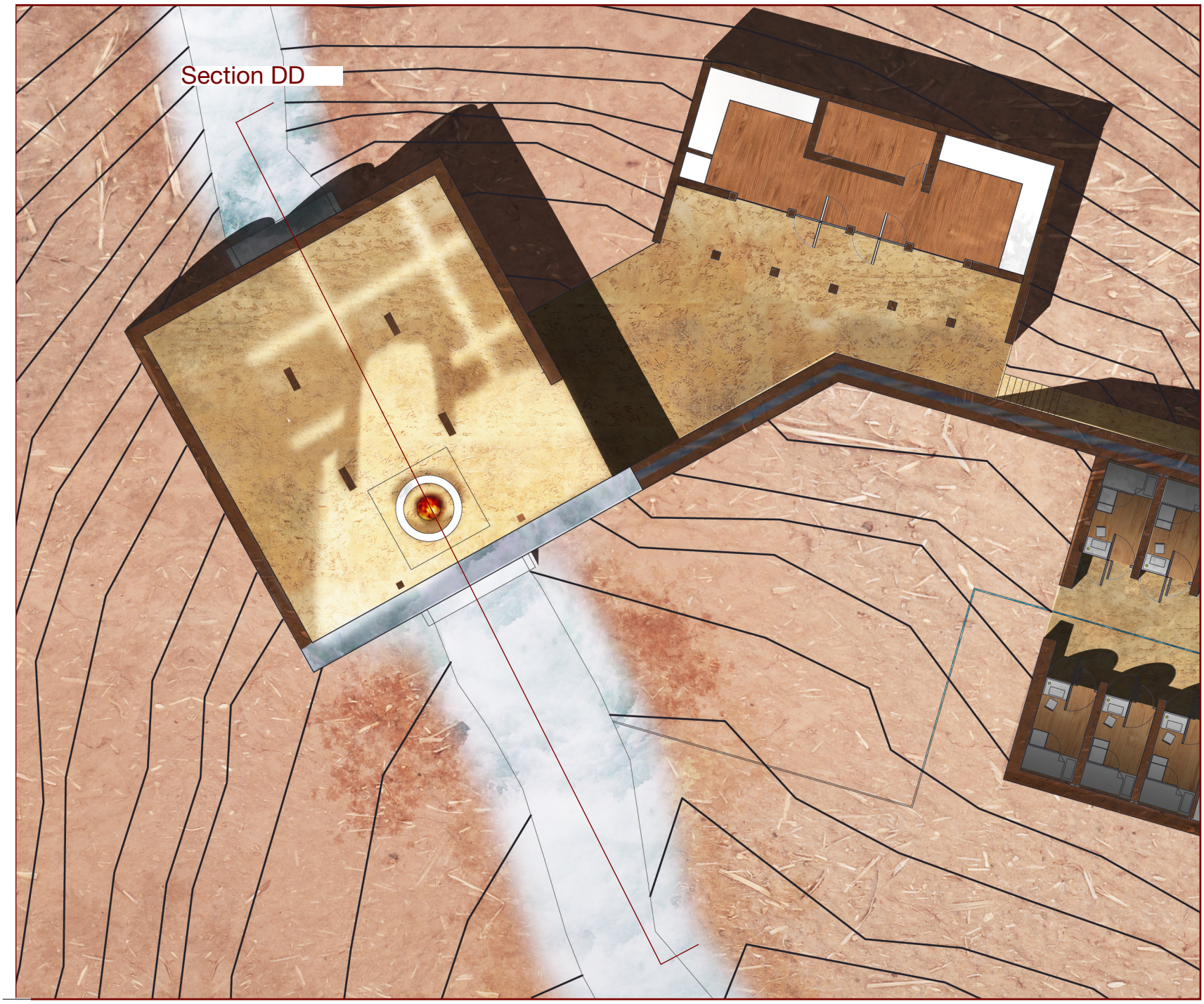
Ill 133-134: The dwelling cluster
Opposite page: Rendering of the large pool.
This page: Rendering in the axis.

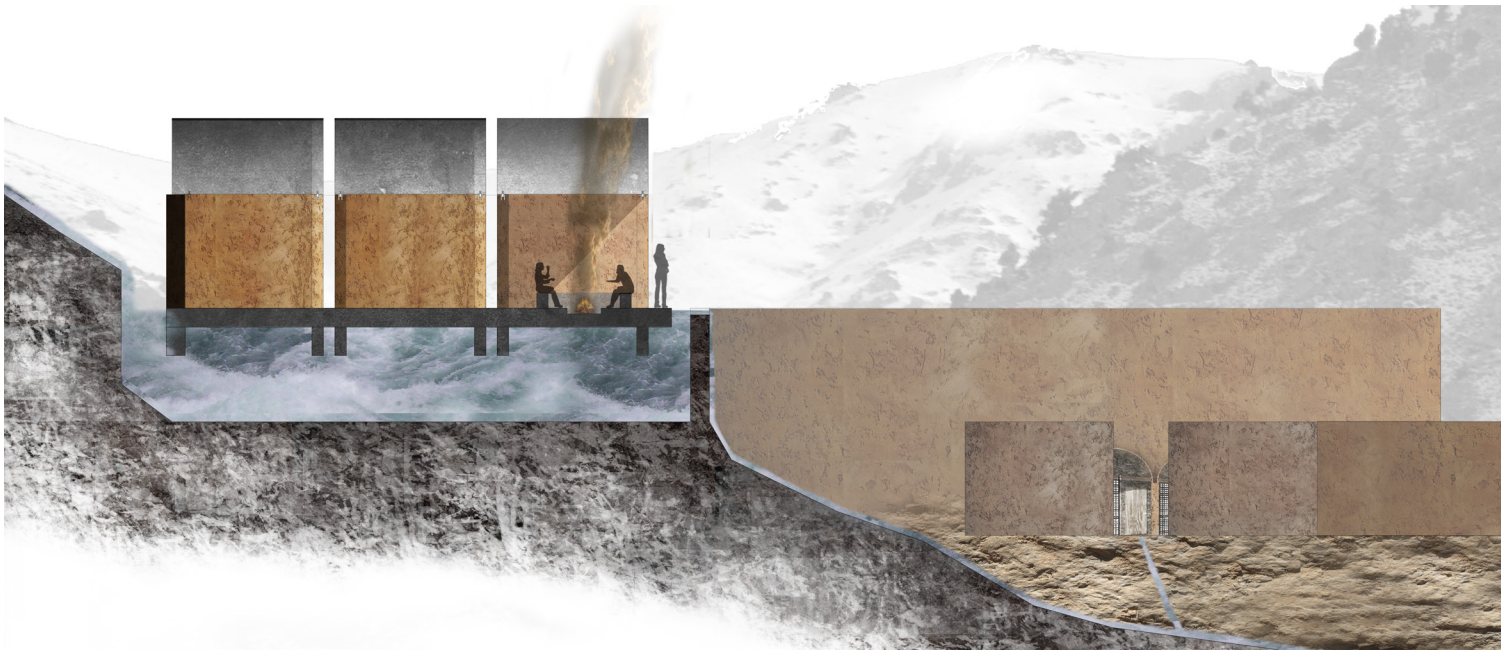
Hammam



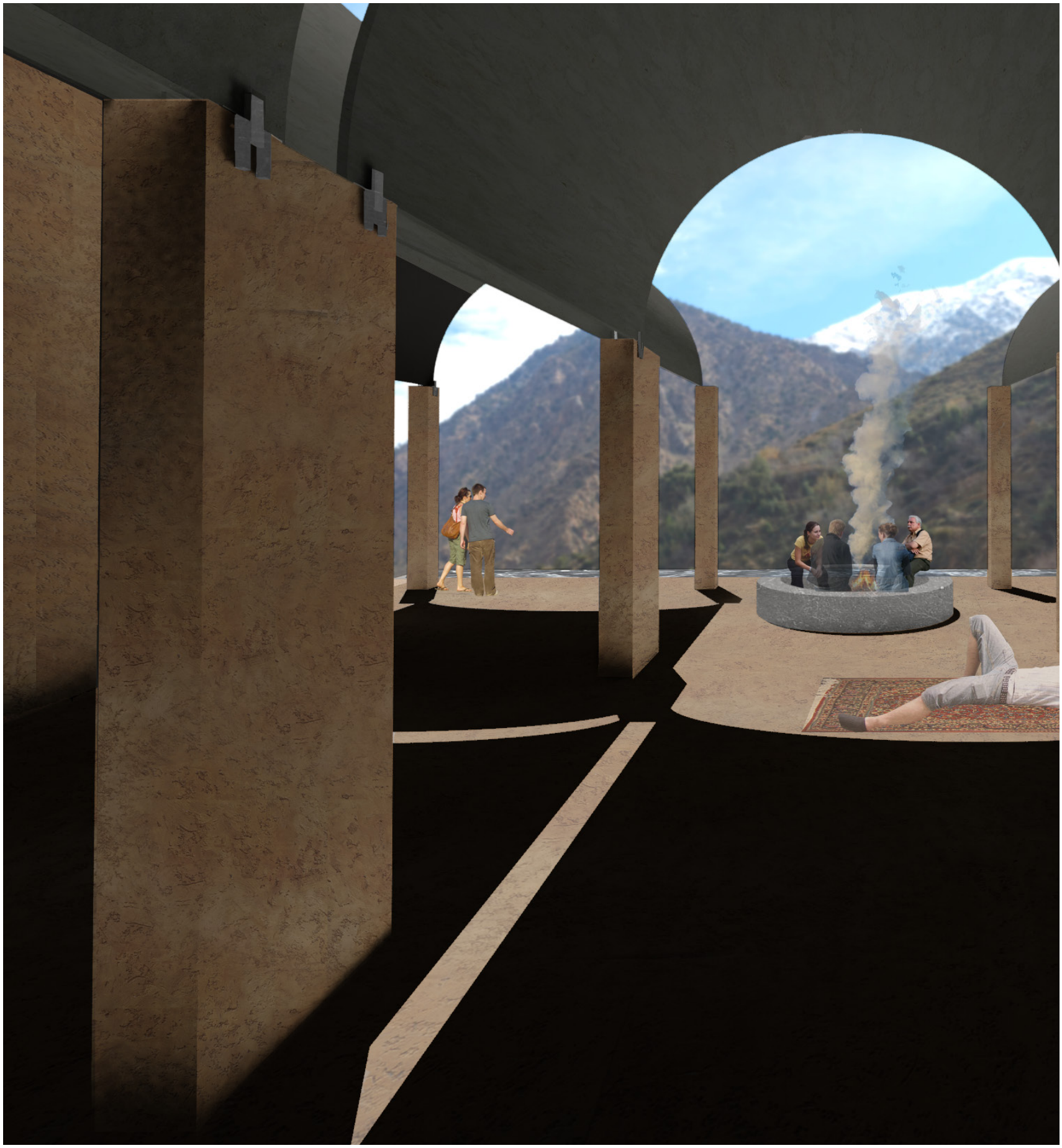
Ill 135-136: The hammam
Opposite page: Plan of the Hammam 1:100
This page: Section CC 1:100

Gathering space





Ill 137-138 The gathering space
Opposite page: Plan of the Gathering space 1:200
This page: Section DD 1:200



Ill. 139 The Gathering space
Rendering of the gathering space.

Conclusion

Introduction

In the design of the Utzon Academy three goals that have been dominant in guiding the design.

The first goal have been to design a place to where students can travel and learn about vernacular Moroccan architecture. This learning will happen through the studies of architectural principles like Jørn Utzon did it his travels.

The second goal have been to create the Utzon Academy as a building that is specific to the context for which it have been designed. The relation to the context is done by integrating the elements of water and fire in the project, elements that are essential for the survival of the valley. The water and fire are used as elements that promote learning in the academy.

The third focus have been to consider the use of materials in the building. This concerns how the materials are used and how the building is constructed in a relation to the community in which it is built.

This conclusion will discuss the final result in order to verify that the finished Utzon Academy correspond with the intended design goals.

A place for learning

The Utzon Academy is a place for learning about architecture. The learning happens through the study of the principles of vernacular architecture.

Jørn Utzon interpreted principles from Moroccan architecture in the Kingo Houses. The Utzon Academy interprets distilled architectural principles in the architectural composition.

The architectural elements that make up the Utzon Academy are the wall, the plateau and the cave. These are architectural principles that are derived from a study of Aït Ben Haddou. In the Utzon Academy the wall is the architectural element that tie the different parts of the building together. By following the wall up the mountain side the students can enter a series of plateaus on the hillside that contain building functions. The cluster plateaus are for resting, the hammam plateau is for cleansing and the gathering plateau at the top of the hill is for gathering and sharing ideas. In using architectural principles that are common themes in Moroccan architecture and using them in an abstract way to create a new are a way to use the whole academy as a learning tool.

Design for one place

Through the analysis of the Ourika valley it was discovered that the elements of water and fire are essential to the survival of the village in the Ourika valley. To understand the potential of the elements they were analysed through phenomenological writings by Gaston Bachelard. The potential of fire and water as phenomena was revealed to be to promote creativity and change the atmosphere of space.

Through case studies of works by Alvar Aalto, Glenn Murcutt and Rick Joy it was made clear how these master architects created architecture for specific places by enhancing the already existing. Aalto enhanced the spirit of the community that was already there by making a space for them. Glenn Murcutt enhanced the experience of the landscape by framing it and Rick Joy enhance the experience of landscape by placing different parts of the buildings away from each other.

In the Ourika valley it is fire and water that give the valley its importance. Therefore the fire and the water is the elements that should be enhanced. The potential of fire and water is, that they hold a great potential to create specific atmospheres and through that promote reverie and learning. By using the elements from the valley, fire and water, and enhancing the experience of space through these elements the Utzon Academy have become space specific. The spaces enhanced by fire and water are spaces for creating at the workshops, space for reflection in the dwellings and a space for gathering around the fire at the top of the path.

Material considerations

Considerations about the materials have been an important factor in the design of the Utzon Academy. The construction of the vernacular architecture of the Atlas mountains is very sustainable. By using the materials available, earth and wood, the buildings return to earth if they are abandoned. The Utzon Academy combine these traditional materials with concrete. The concrete is already used in the valley, but the Utzon Academy show how the material can be used in a tectonic way, so the material is used according to its potential. The vaulted roofs of the Utzon Academy are made of 40 mm. shells of concrete. The minimised shells are done to minimise the material use of concrete and to make the roofs as light as possible. As many modern building materials concrete have a very long life span. If the buildings are left the walls and wood parts will disappear while the roofs would be left on the ground and ruin the nature. To promote a sustainable way of building to the students, but also to the locals of the Ourika valley, the roofs can easily be dismounted and reused in other buildings if the Utzon Academy is no longer needed. Because the principle of the roof and joints of the Utzon is so simple that it is easy to reuse it in other buildings. In this way the Utzon academy will serve as an inspiration to the local community as well as the students that visit.

The community

The Ourika valley is a community. The Utzon Academy share functions and space with the community of the valley. The villagers of the Ourika valley 6gain something by having the Utzon Academy. Common functions like workshops, an amphitheatre, a bakery and the hammam are shared by the village and the academy.
The involvement of the local community in the Utzon Academy promote a sharing of knowledge between the Utzon Academy and the local community. Through this sharing the students can learn about vernacular Morocco and the local community can learn about sustainable architecture principles.

Thous the Architecture of the Utzon Academy is a place for learning, place specific and built with a sustainable approach to materials. It balances function (utilitas), a clear a simple structural system (firmitas) and aesthetics (venustas) to make an architectural proposal that is underline principles of Moroccan architecture.

Reflection

The Utzon Academy is placed in an area where the modern Morocco is starting to make a considerable impact on the society. Tourists are going there because of the scenery and authenticity of the area, but this authenticity will disappear with too much tourism. Tourism provide a large income and this is starting to change the valley from an artisan and self sufficient society to a society that rely on the income of tourism. A question is, if the Utzon Academy will be helpful in sustaining local traditions or it will be harmful because the students at the academy will be a foreign influence in the valley.

In my belief the positive or negative effect of the Utzon Academy will be determined on how involved the local society is in the construction and running of the Academy. The involvements of the locals in the construction of the Academy would mean that some locals would be paid for constructing the Utzon Academy instead of having to resort to harassing tourists. The knowledge gained would also be able to be utilised after the construction of the Utzon Academy was finished. The people of the valley could help to run the Utzon Academy, others could teach in the construction methods learned in the process of building it.

It is not possible to keep the tourists away from the Ourika valley, and as long as there is tourists with money, the locals will provide service industry for the tourists. By creating the Utzon Academy, the valley will have gained another way of income for the locals of the valley. Modern Morocco is not going to disappear, and it shouldn't, but it can be integrated into traditional Morocco in a way that do not destroy the traditional society but evolve it.

It has been a well considered choice to design the Utzon Academy in traditional materials. The rammed earth constructions has strengths and weaknesses as discussed in the 'Building with earth' paragraph. Adobe building are in need of a lot of maintenance compared to building with modern building materials. The idea of the Utzon Academy is, that the locals should repair the walls of the building as they are slowly destroyed by rain and wind. If the locals are responsible for the repairs, they will keep the building traditions alive. The repairs will only be done of the locals are paid for their work. The money for this should come from renting out the spaces of the Utzon Academy or from foundations that specialise in traditional building methods. In Morocco there is the organisation CERKAS[1] that work with the conservation of earth architecture. The Utzon Academy have a collaboration with this organisation to raise awareness of the importance of the architectural heritage of Morocco. The Academy could also be a training ground for conservation workers before they are sent out to do the work in other places of Morocco.

This raise the question if the Utzon Academy is only for architecture students, or if it could be used for other purposes. The Utzon Academy is simple in layout and function. Because of this simplicity it can be used in a multitude of ways.

The Utzon Academy has the character of retreat. As a retreat it could be used for all kinds of artists that need a quiet and simple working environment. The retreat of the dwellings are very small and it is therefore inevitable that a writer staying at the academy would meet a painter, an architect and family going out to trek in the mountains. This meetings would happen because all functions except sleeping and working in the dwellings are shared public spaces. The mixture of people in a learning environment should be enough to promote an exchange of differentiated knowledge and gain of knowledge for everyone staying at the Utzon Academy.

[1] Centre for Conservation and Rehabilitation of the Architectural Heritage of the Atlas and Sub Zones

Illustration references

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