



PRIMARY SCHOOL BALAGUINA

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Project	Primary school and housing for teachers
Architects	Prof. Joop van Stigt, ir. Jurriaan van Stigt
Client	Foundation Dogon Education
Contractor	Amatigue Dara, in collaboration with students of the Technical School in Severe and the local community of Balaguina
Commission	2011
Construction	2011-2012
Occupancy	October 2012
Site	7.500 m ²
Gross Floor Area	420 m ²
Costs	School 28.000 Euro Houses 13.000 Euro Other 1.500 Euro

Introduction

The project site is situated in the rural village Balaguina, in the Dogon region in Mali (declared Unesco World Heritage site in 1986), in the West African Sahel. The Dogon region is underdeveloped, as the government hardly invests in this remote region of the country. An important key to improve living conditions of the Dogon people is the development of education.

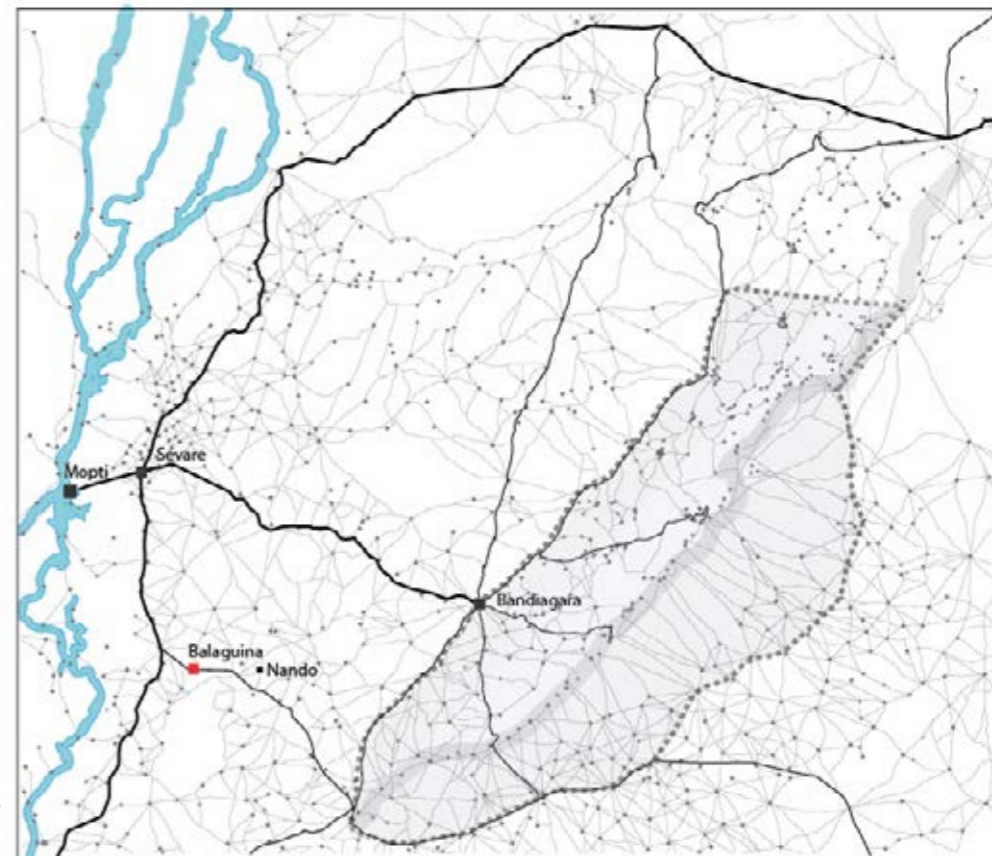
The former school in Balaguina was housed in a poorly constructed hangar which had deteriorated a lot . A new school building which meets the needs of the growing number of students had to be constructed.

The project doesn't only concern the construction of a new school building. The organization of education and the realization of supportive functions like wells and housing for teachers are essential to make this project successful.





Left
The former schoolclass.



Right
Balaguina lies on the Pinari plateau,
about 40 km south east of Mopti.
The Unesco area is hatched.



Context

The village Balaguina lies on the Pinari plateau, about 40 kilometers south east of Mopti and 500 kilometers from Bamako, the capital.

This area is situated in the Sahel zone, and characterized by the alternation of a dry and a rainy season. The rainy season lasts about five months between May and September. In this period, the area is green and flourishing and temperature reaches 40-45 C. The area turns into an arid landscape in the dry season. Although building activities continue year-round, the best period for construction work is after the rainy season. During the harvest period, which runs until October, the availability of workers is low as they work on the land.

The school is situated along the road to Nando and other surrounding villages.

The location was carefully chosen together with the inhabitants of the village.

Various aspects played a role in the determination of the exact location of the school.

Left

View from the road towards the village Balaguina.

Next page

The construction site.



There was already a well near the terrain, which could be used during the building process and by the children of the school.

The school serves not only children from the village of Balaguina, but also from three villages in the surrounding area. Therefore, the school should be easily attainable for 180-200 pupils from different villages.

By placing the school outside of the village Balaguina, on the road to surrounding villages, the school “belongs” to all of them. Another reason for this location outside of the village is that a school building doesn’t fit in the organization of traditional Dogon villages, which consist of family houses, men- and women houses and altars.



Top
The village Balaguina and the construction site on the north east.



Basic principles

Use of local materials/basic technologies

One of the main criteria was the use of local resources and materials to realize an economical and sustainable building which integrates in the landscape and suits the local traditional building methods. With the use of basic technology and the existing local knowledge traditional building techniques are innovated step by step. These developments have already inspired similar efforts elsewhere; the use of the compressed earth blocks and innovative building techniques are adopted in other projects in the region. In this sense, the project fits very well in the AKTC's Rehabilitation of Earth Architecture Program.

Right

The red earth for the compressed earth blocks is gained next to the building.

Next page left

Constructor Amatigue Dara and mason L'Homyaye check the roof construction.

Next page right

The teachers homes and the school on the right.





**Educational process/involvement of the community**

The goal of this project is not only a well functioning school building, the project also offers students and local people an opportunity to learn about construction work. The building process itself plays an important role in the sustainable development of building locally and traditional building techniques.

The local contractor and craftsmen work closely together with students of the Technical School in Severe to involve them in all stages of the building process. Steps are taken carefully to improve and refine building methods in continuation on existing methods, traditions and knowledge. Besides this, involvement of the whole community in the project is important, not only because building together is part of the Dogon tradition, also to create a communal responsibility for the maintenance of the school building. Also, the masons acquire knowledge and experience, so they can build more and more independently and develop their own architectural language based on the compressed earth blocks.

Left
Experienced workers cooperate with students from the Technical School.

Comfortable inside climate

As the temperature easily reaches 40 C and higher, a comfortable inside climate is essential. This criterion asks for Intelligent design solutions and choice of materials. The roof of compressed earth blocks, instead of corrugated sheeting, veranda's on both sides and ventilation pipes contribute to a comfortable inside climate.



Right

Use of hydraulic compressed earth blocks in walls and roof, veranda's and ventilation pipes provide for a comfortable inside climate.





Design

Ensemble

The project is an ensemble of the school building, houses for teachers, sanitation blocks, a well and communal outdoor space. The terrain will be enclosed by *Jatropha* plants to offer some protection against animals. The oil from the plants is also used for making biodiesel fuel. The school needs to meet the requirements prescribed by the government and the CAP (Centre d'Animation Pédagogique). Schools usually consist of clusters of three classrooms. Classrooms should be 7 x 9 meters and serve about 60 pupils.

The school in Balaguina is built in two phases, to be able to cope with the growing number of pupils. The first phase consists of a school building of three classrooms with veranda's on both sides. The second phase comprises another building of three classrooms, placed closer to the road. In between these buildings arises a schoolyard with trees to provide shadow.

The housing block for teachers are placed on the edge of the terrain and each has its own courtyard enclosed

by traditional parapets of cut stones, made by inhabitants of Balaguina. The housing block comprises three homes, each with its own orientation. The office of the schools director is oriented to the school, to have a good overview. The houses for teachers are not located in the village, because the village is based on families. Teachers often come from other villages and have no family in Balaguina.

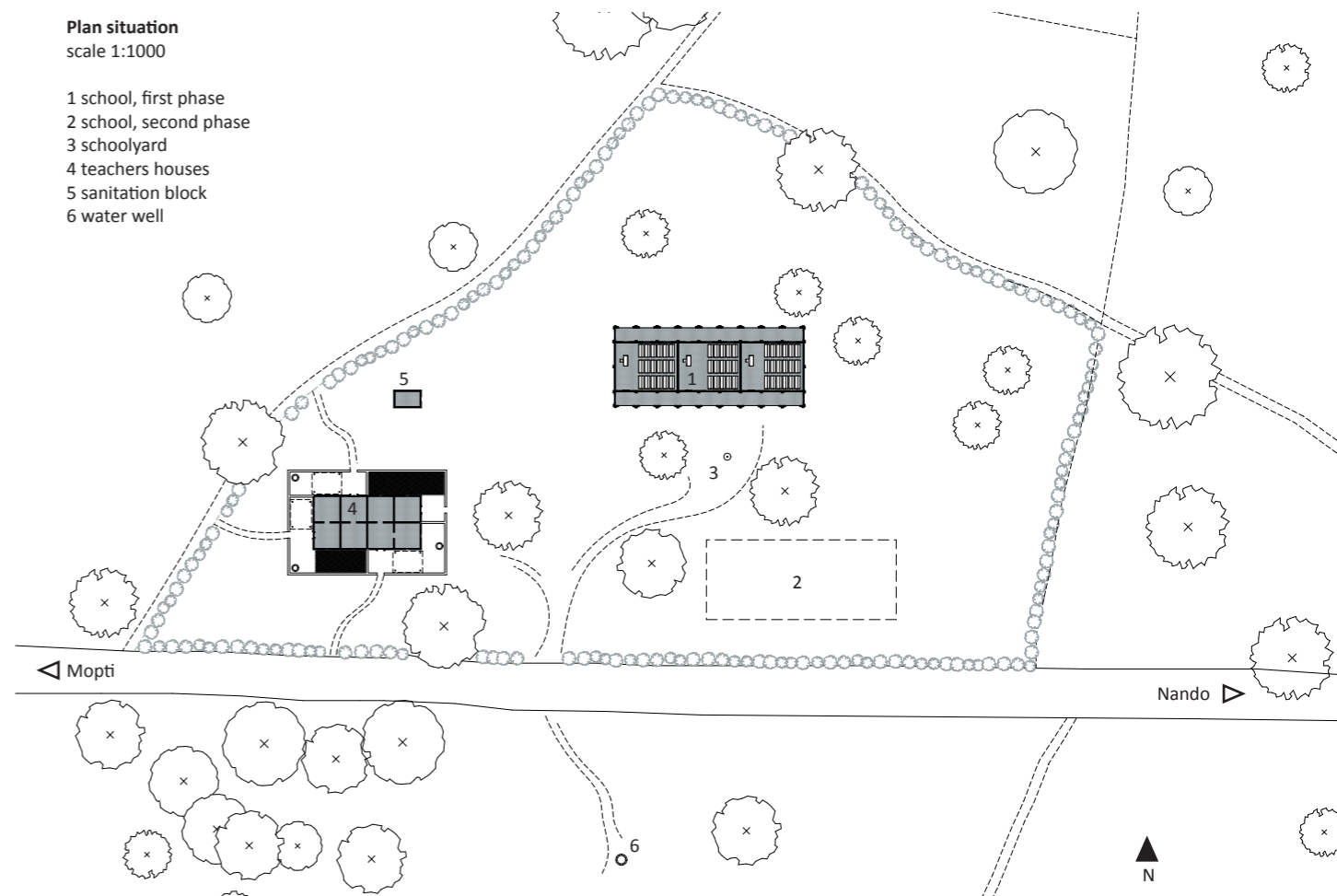


The sanitation block is located in the corner of the terrain, easily accessible for both pupils and teachers. The well for the school was constructed on the other side of the road so that it can also be used by the inhabitants of the village and the school terrain remains for the pupils. The position of the school, houses and sanitation block has also been determined by the trees which had to be preserved.

PRIMARY SCHOOL BALAGUINA

Plan situation
scale 1:1000

- 1 school, first phase
- 2 school, second phase
- 3 schoolyard
- 4 teachers houses
- 5 sanitation block
- 6 water well



School

The architecture of the school and the houses for teachers has a close connection with the local building and housing traditions. The use of locally compressed earth blocks results in a fluent integration with the surroundings, like almost all Dogon villages which merge into the landscape.

The formal language is a clear result of functional requirements.

The structure of the school is unique with two veranda's along the classrooms. Both veranda's function as buttresses to catch the load of the barrel vault roof of the classrooms. Besides this, the veranda's offer comfortable outside space for the pupils. The veranda's are brick-laid in alternating stapled blocks with ribs which determine the rhythm in the façade. In the passages, the blocks follow the pressure arch and this way form the characteristic openings. 12th

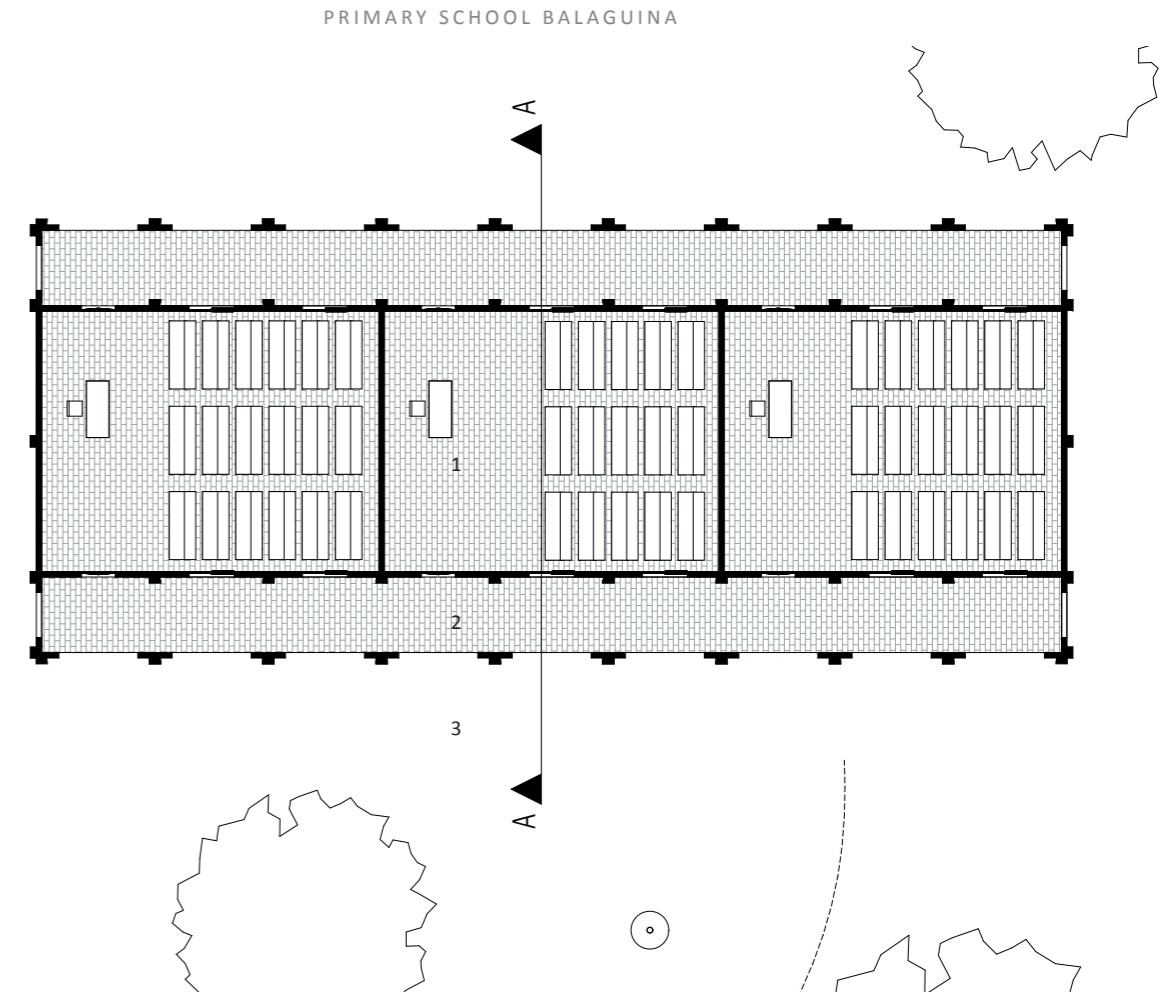
The roof and the eaves are accentuated by extra stone layers and dilatation stones which divide the arches.

The roof of compressed earth blocks is smeared with a



Plan school
scale 1:200

- 1 classrooms
- 2 veranda's
- 3 schoolyard



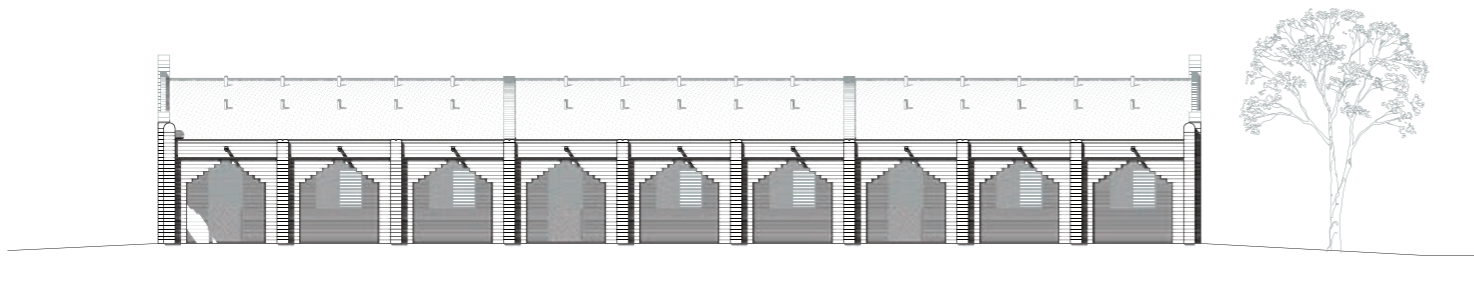


20-30mm thick layer of red earth mixed with cement to achieve a waterproof layer.

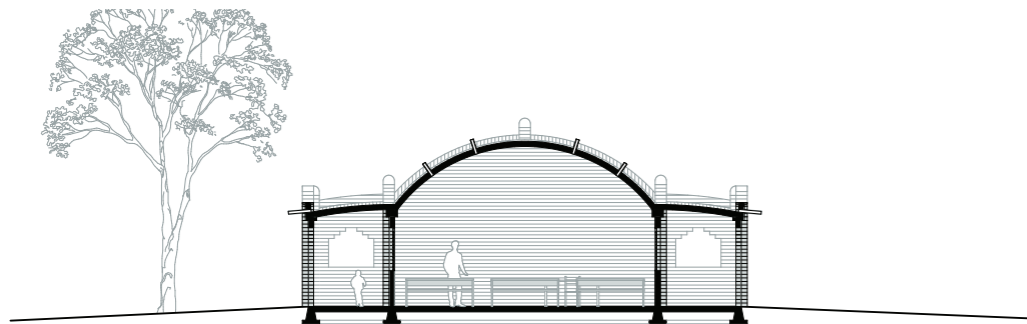
Handmade ceramic gargoyles abduct the rainwater quickly. These gargoyles, made by the Bozo people, are also applied in the roof for ventilation and daylight.

Left

The ventilation pipes in the roof are made of ceramic gargoyles, hand-made by the Bozo people.



Facade school
scale 1:200



Section AA school
scale 1:200

Right
The school is surrounded by onion fields.



Houses for teachers

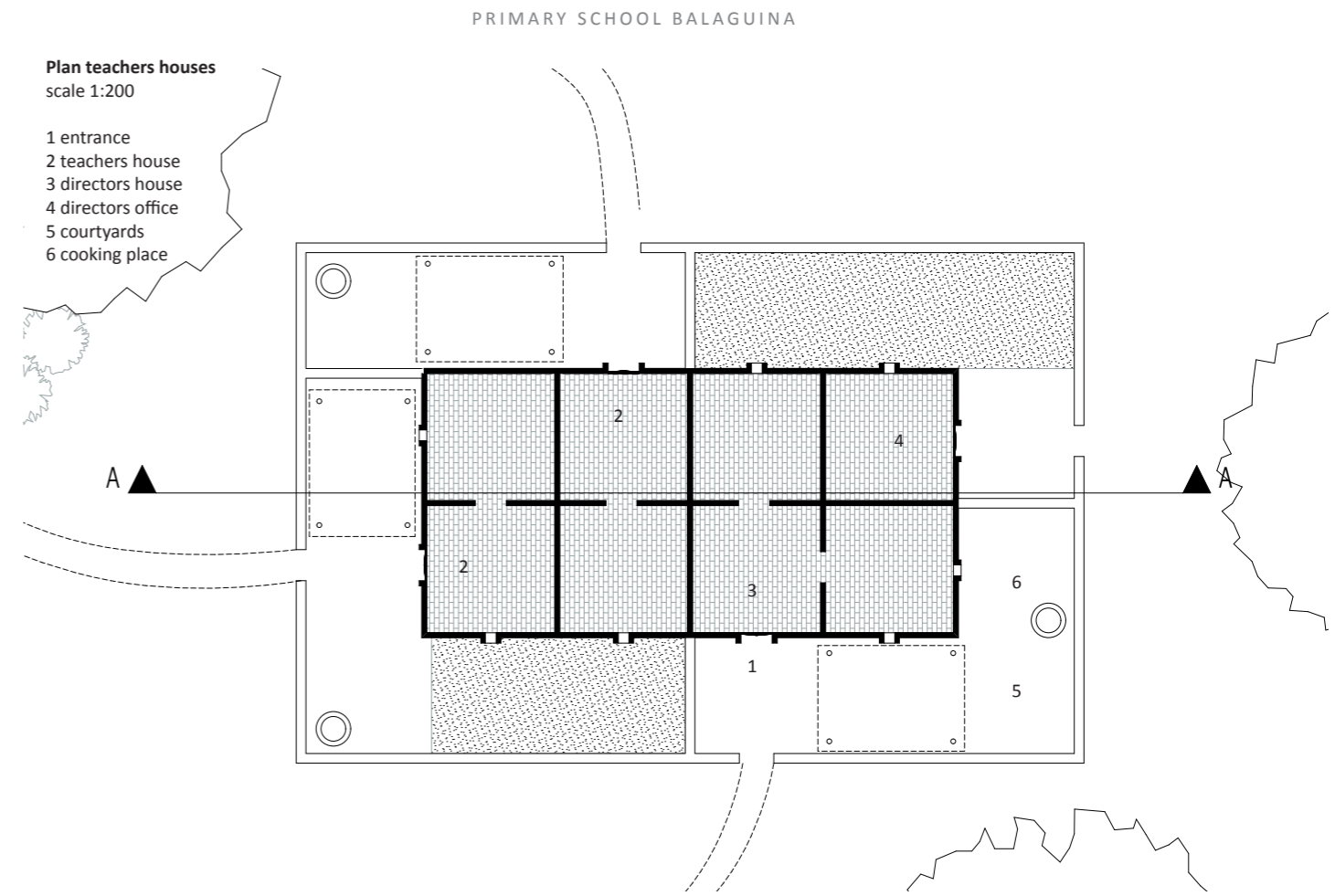
To encourage teachers to come to the remote Dogon region, houses have been built next to the school. The housing block comprises three homes and office space for the schools director. The block is formed by four barrel vaults next to each other. Each home includes a courtyard, the entrance living room and a sleeping room. To create privacy in this housing block, each home has its own orientation.

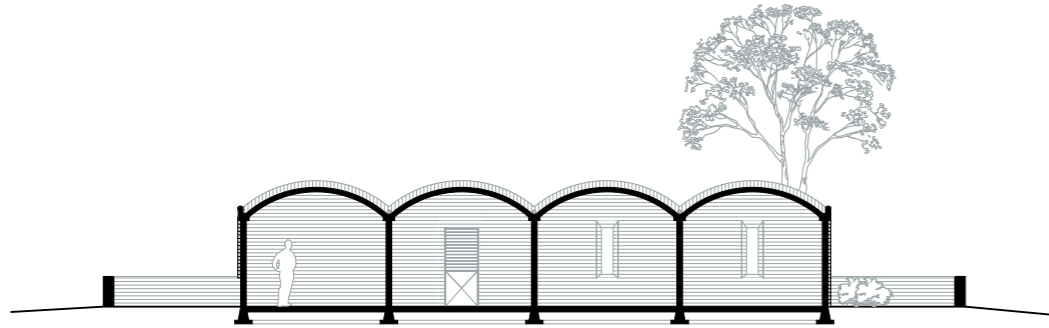
The window- and door openings are accentuated with a wide brim of masonry. This reinforces the construction, blocks the sun and results in a nice shading and rhythm in the façade which is characteristic for the Dogon architecture.

The schools director has an extra sleeping room for his family. In general the houses are only used during the school year, during holidays teachers often go to their families elsewhere.

Both in the school and the houses, the floors are made of compressed earth blocks of 4 kilos, half thickness. To prevent termites for damaging the building, the ground is sprinkled with salt.







Section AA teachers houses
scale 1:200



Top
Jatropha plants will surround the terrain.



Top right
The sanitation block.



Bottom right
Simple clay ovens reduce the use of wood to 25%. The ovens are part of the project.



Construction

In the Dogon region different types of building methods and materials are applied, depending on the exact location. Clay is the most common building material, as various types of clay can be found throughout the whole Dogon region. In Balaguina, clay was the most obvious choice too.

It is very important to build with locally available materials as much as possible. This is economically more interesting than importing materials, a sustainable solution and easily workable. The complete building; the bearing walls, the curved roof and the floors are realized with hydraulically compressed earth blocks.

The earth block pressing machine is mobile, so the blocks could be made on the construction site and jointed by an earth mortar. The blocks weigh 8,5 kilo each and can bear a pressure of 15 N/mm². About 3-4% cement is added to the blocks to make the blocks waterproof. The foundation are made of poured concrete.

Because the use of local materials was an important



Left
The earth block compressing machine is used on the construction site.









criterion, no supporting constructions are applied. This doesn't only results in a unique loam construction, it leads to design solutions which increase the quality of the building, like the veranda's on both sides of the building. Besides this, the use of loam in walls, roof and floors results in a very comfortable inside climate. The unique ventilation pipes in the roof, made of traditional gargoyles, achieve a perfect ventilation and make a double roof construction unnecessary.

The use of wood was rejected because native hardwood is scarce, laborious and demanding in terms of maintenance. The steel window frames are made by craftsmen in Mopti who are familiar with the technique. Another reason not to use wood is the threat of termites, who eat it away.

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The temporary support construction for the roof.

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The concrete foundation for the teachers houses.

Right

Ornaments for rain protection.



Background information

The Dogon in Mali

Mali is a country situated in the heart of West Africa, a former French colony more than twice as large as France. The country exists for 70% of desert and has a population of 14,5 million, divided over about 10 different tribes, of which one is the Dogon people.

The Dogon people live in an area south of the Niger, east of Mopti. The area consists of three characteristic landscapes, the Bandiagara escarpment, cliffs of 200 meters high which stretch over 200 kilometers, the plateau (Pinarari) and the plain (Seno). The Dogon villages are situated in between the rocks at the foot of the cliff, on the plateau and spread over the plain.

The Dogon population numbers between 400.000 and 500.000, divided over four tribes; Dyon, Ono, Arou and Dommo. The Dogon region was declared Unesco World Heritage in 1989 and since 1995, the "Mission Culturelle de Bandiagara" develops active policies for the region.

Foundation Dogon Education (Stichting Dogon Onderwijs, SDO)

The Foundation has been active in Mali since 1995. The purpose of the foundation is to support and encourage education in the Dogon region. The foundation works in collaboration with local entrepreneurs and the local com-

munity to realize school buildings, houses and wells. Proper water supply is the essential start in the development of education.

The government is closely involved to achieve a durable education system with good teachers. By involving the local community and students of the Technical School in Sèvre in the building process, this becomes part of the educational system.

The foundation works closely together with the Dogon Women Initiative (DVI) and the local Malinese foundation Association Dogon Initiative (ADI). Besides the building activities, the "green desert initiative" has been launched as part of the agriculture and nutrition education. To achieve successful projects, there is a frequent consultation with various governments, the mission culturelle Bandiagara and the CAP (organization responsible for the planning of education).

www.dogononderwijs.nl

Primary schools in Mali

Schools in Mali usually consist of clusters with three classrooms. Each classroom measures 7x9 meters and serves about 60 pupils. Sometimes a second cluster is needed and will be placed opposite the first one. The space in between the buildings serves as schoolyard. The school terrain includes houses for teachers, sanitation and a water well. Good supportive functions are essential to realize education.

The foundation also provides for furniture and school books. Since 1995, the foundation has built 20 schools in the Dogon region.

Construction technologies in development

The Foundation Dogon Education has used four different construction technologies in the various schools they built in the Dogon region. The first schools are built with traditional blocks made of banco (Amani). The second series are built with the well known African concrete blocks, plastered with a mortar mix based on loam. The third series of schools is built with locally cut natural stone blocks. The most recent school are built with hydraulic compressed earth blocks, produced with the mobile compressing machine. This last construction method is the most convenient for future projects, as it has many advantages. It results in sustainable buildings of high quality, constructed with locally available materials by local workers. About 1300 students attend the Technical School in Sèvre, built by the foundation in 2005. The mason students work with the compressed earth blocks and are involved in various ongoing projects.

Architects

Architect Joop van Stigt (1934-2011) worked with Alexander Bodon and Aldo van Eyck, and won in 1962 the Prix de Rome. After this he began a practice himself. In his projects, he succeeded in achieving high quality with

extremely limited budgets by combining craftsmanship with his characteristic no-nonsense approach. His thorough knowledge and experience of the entire design and construction process meant he was often called on for projects considered impossible by others. He made successful designs for the Twente University, town hall Ter Aar, dwelling towers in the Bijlmermeer, Almere Harbor and the University of Leiden. He was always involved and very critical on the building policies in "his" Amsterdam, in particular projects concerning preservation and renovation. Since 1987, he taught as professor at the Technical University Delft. Joop won various prizes for his work, like the BNA cube and the National Prize for Renovation.

Besides his work as architect in the Netherlands, he used his professional knowledge to "return" something to the Dogon in Mali, the people who inspired him so much. In 1995 he erected the Foundation Dogon Education together with his wife Gonny van Stigt-Amesz. Since then he has always been involved in the development of education in the Dogon region.

Jurriaan van Stigt (1962, Amsterdam) gained his degree with distinction in Delft in 1989, on Weesper-Wibautstraat, the most beautiful street in Amsterdam. He then began a firm with Marianne Loof under the name Loof en van Stigt Architecten and has since 2005 for-

med a three-person collaborative partnership with Adriaan Mout, called LEVS Architecten. Besides realizing many notable projects, he is also responsible for the new development of a young offender institution in Den Helder and the renovation of the Ignatius Gymnasium in Amsterdam. Jurriaan is a board member of AetA, editor-in-chief of Forum magazine, honorary member of the Daw'an Foundation by Salma Damluji and chairman of the Dogon Education foundation.

Colofon

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Occasionally there are pictures used which are made by people who have joined on one of the many trips. SDO manages an archive of nearly 50.000 pictures from the period 1972 to present.

Sponsored by LEVS architects Amsterdam.

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