

# NUBIAN VAULT TECHNICAL SOLUTIONS FOR THE HEALTH SECTOR

BUILDINGS THAT ARE:

**SOLID  
COMFORTABLE  
LONG LASTING  
AFFORDABLE**



« An appropriate and sustainable response to the housing challenge in Africa »



Local materials and green jobs

Improving living conditions



Climate change adaptation and mitigation

Strengthening local economies





## WHY ADOPT THE NUBIAN VAULT SOLUTION?

The Nubian Vault (NV) is an affordable and appropriate technical solution for the construction of thousands of healthcare buildings: patients will be more at ease in buildings that have better insulation from heat, cold, and rain.

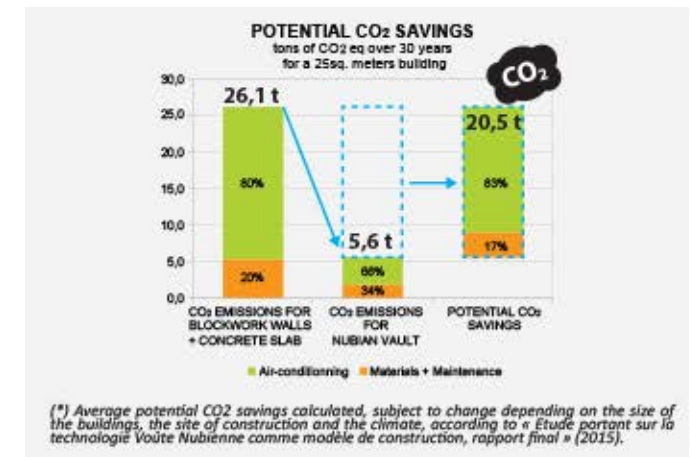
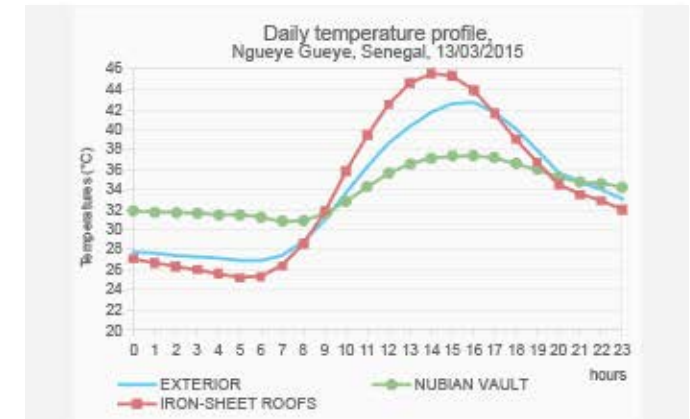
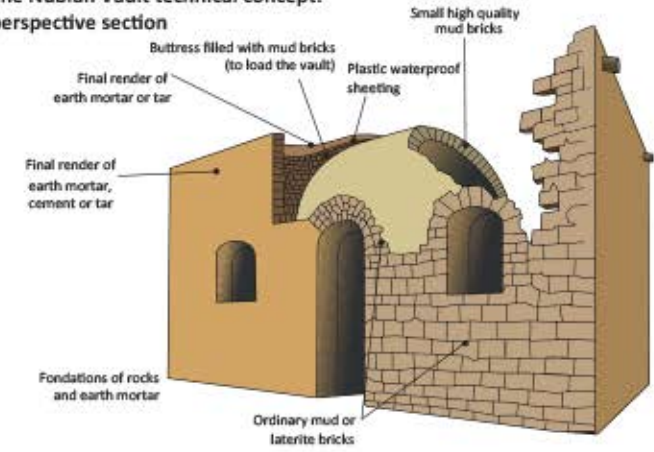
The NV concept can also be used for the construction of comfortable and less costly accommodation for healthcare staff.

**Environmental features:** those responsible for financing healthcare buildings are also particularly interested in the environmental impacts of the construction technique adopted. The NV technique, with its low carbon footprint, responds well to current concerns over climate change and the preservation of the environment; it allows for the adaptations needed to adjust to climate change (for example, elimination of the need for air conditioning).

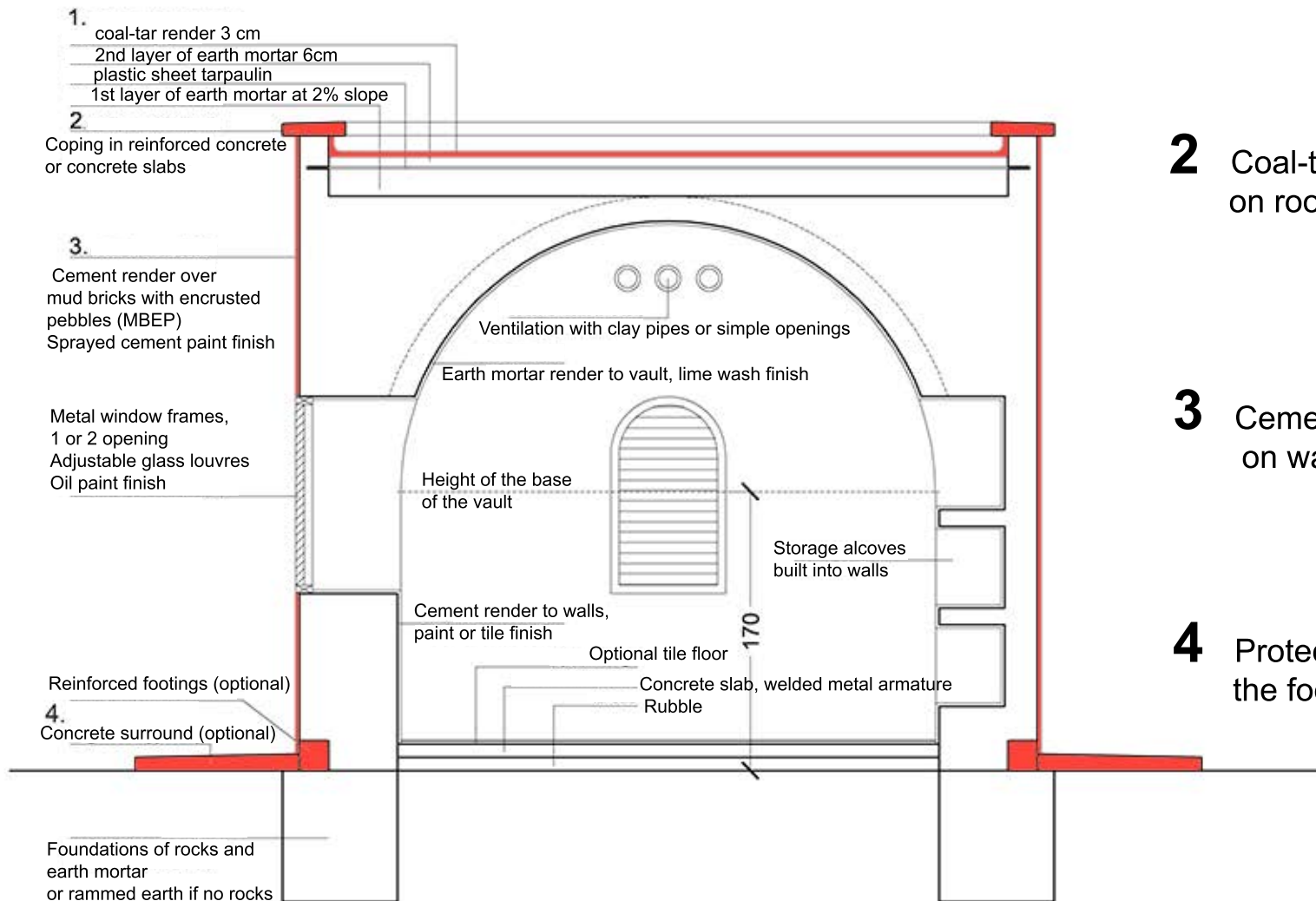
**Economic features:** the NV technique can involve the beneficiaries through the use of local unskilled labour, thus significantly reducing the cash costs of the construction work.

**Durability:** finally, if properly maintained and/or protected from rain erosion, earth as a construction material does not degrade over time. In Egypt, the oldest Nubian Vault structures are still standing after more than 3000 years!

The Nubian Vault technical concept: perspective section



# THE NV TECHNICAL CONCEPT AND THE ANTI-EROSION SOLUTIONS



**1** Concrete coping



**2** Coal-tar render on roof



**3** Cement render on walls



**4** Protection of the footings



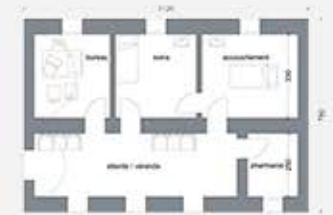
## NUBIAN VAULT DISPENSARIES AND MATERNITY CLINICS

The Nubian Vault dispensaries and maternity clinics conform to the norms and standards defined by Senegal's Health Services and offer excellent conditions of comfort and usage.



## NUBIAN VAULT HEALTH CENTRES / CHIP COMPOUNDS

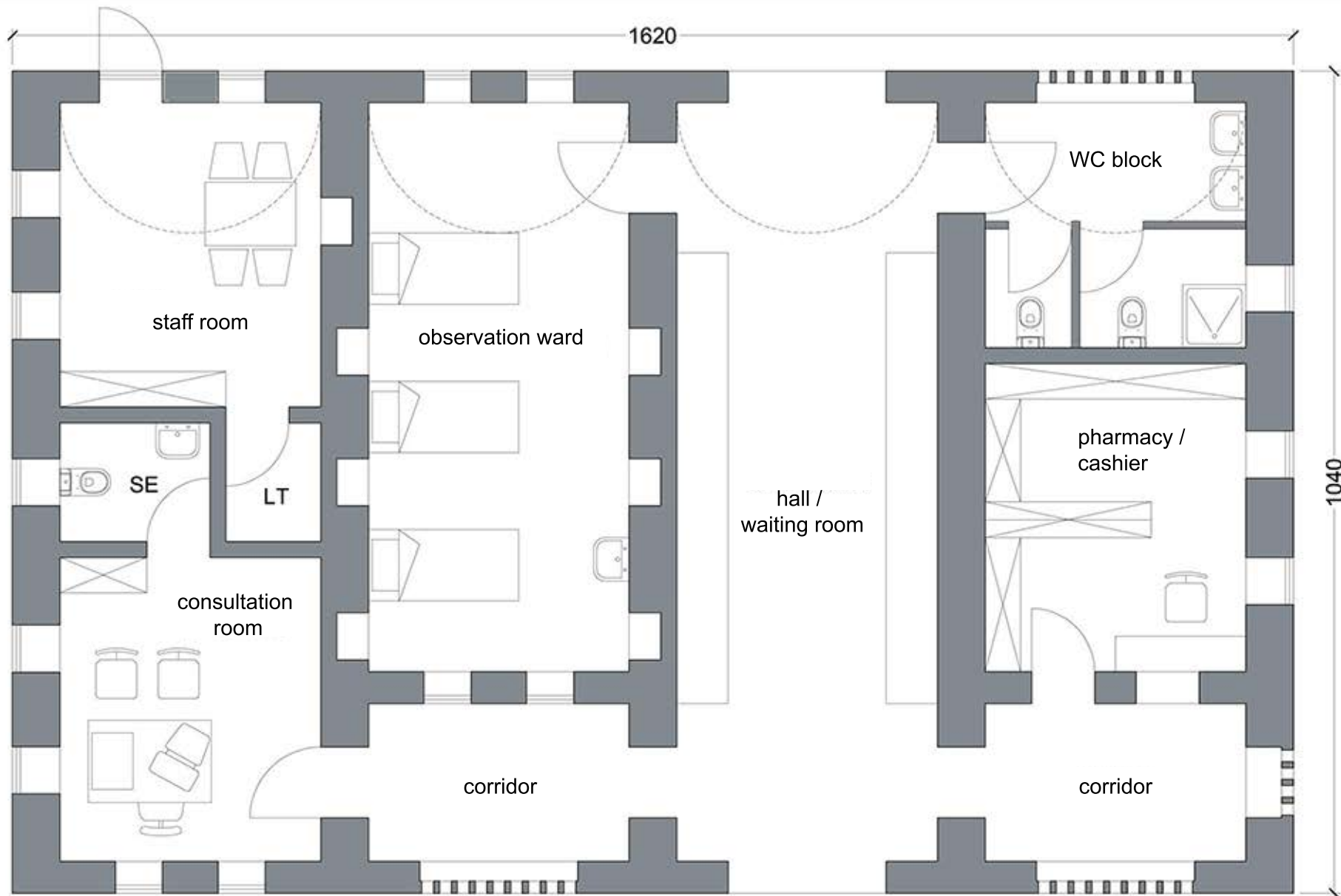
The Nubian Vault 'mini' health centres conform to the norms and standards defined by Senegal's Health Services and offer excellent conditions of comfort and usage.



## HOUSING FOR HEALTHCARE STAFF

Affordable and comfortable staff housing





PLAN TYPE

DISPENSARE

PL01

COM

1/50

JANV 16

ECHELLE



PLAN FOR NUBIAN VAULT DISPENSARIES

0 1 3 m

Table of surface area and linear metres of vaults

Net area	122 m2
Linear metres	38,4 ml

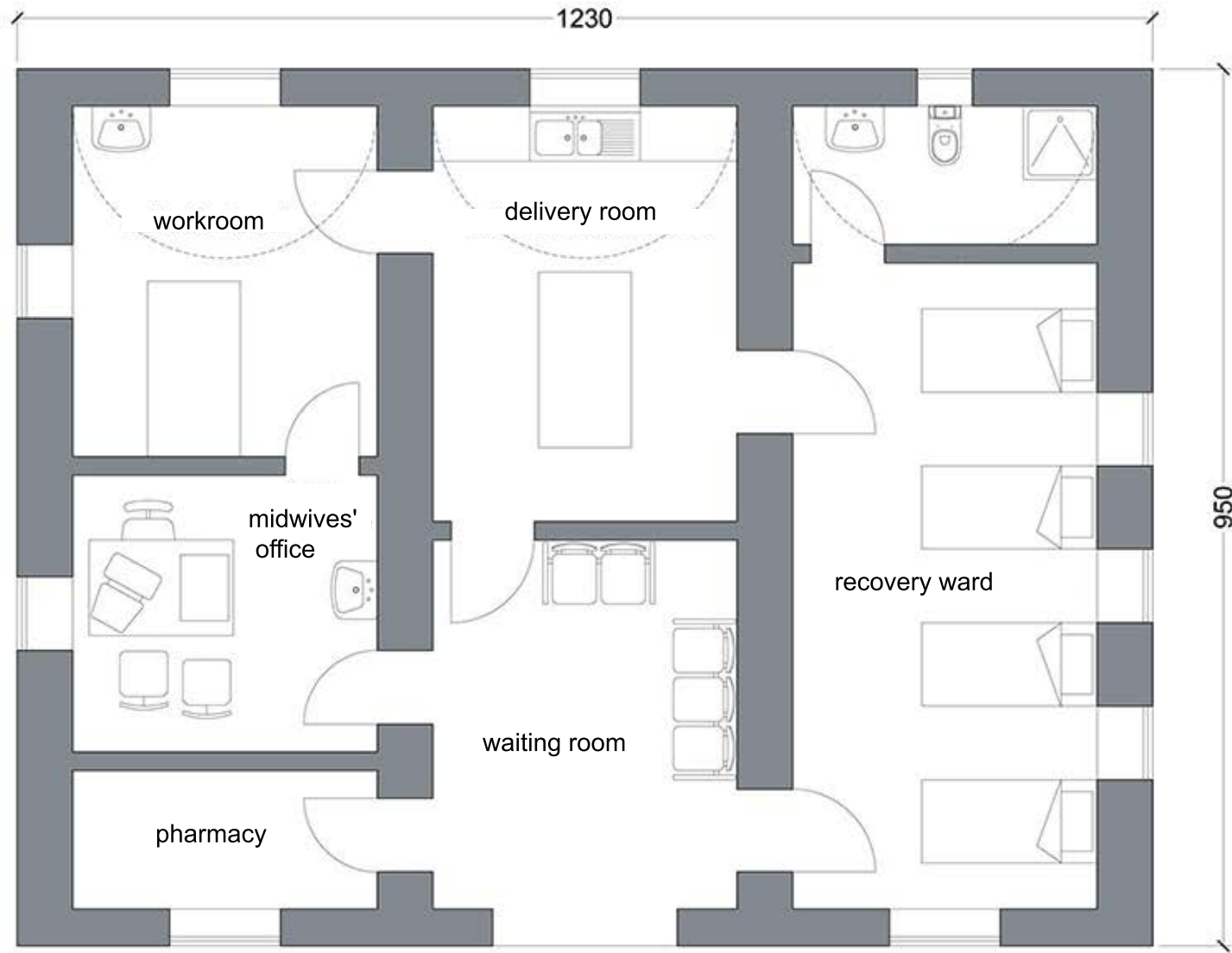


Table of surface area and linear metres of vaults	
Net area	83,5 m <sup>2</sup>
Linear metres	26,1 ml



PLAN FOR NUBIAN VAULT MATERNITY CLINICS

PLAN TYPE

PL01

MATERNITE

COM

1/50

JANV 16

ECHELLE

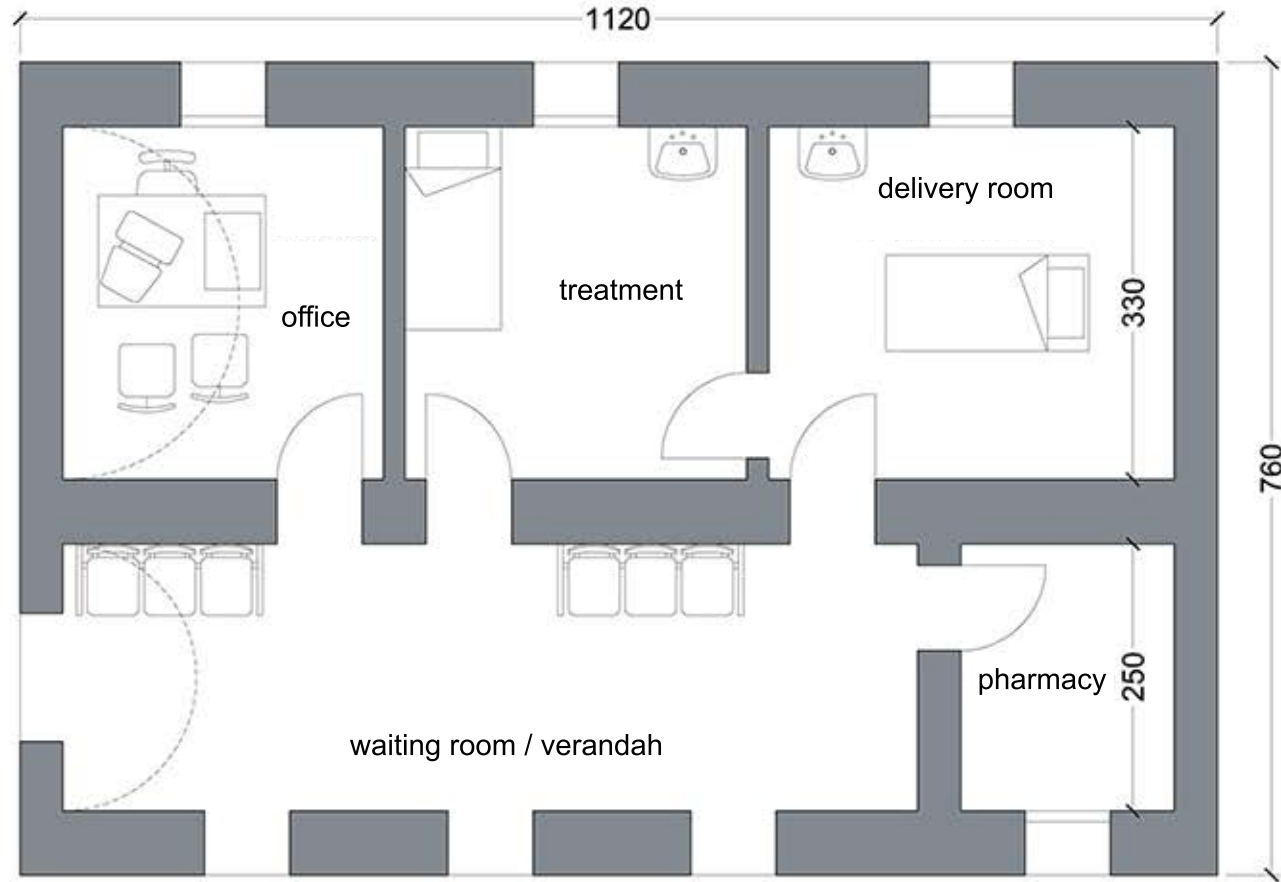


Table of surface area and linear metres of vaults	
Net area	58 m <sup>2</sup>
Linear metres	20,5 ml



PLAN FOR NUBIAN VAULT HEALTH CENTRES

PLAN TYPE

CASE DE SANTE

JANV 16 COM PL01  
 ECHELLE 1/50



NUBIAN VAULT HEALTHCARE BUILDINGS: MATERNITY CLINIC,  
NGUENDAR, SENEGAL





NUBIAN VAULT HEALTHCARE BUILDINGS: CSCOM HEALTH CENTRE,  
PELENGANA, MALI

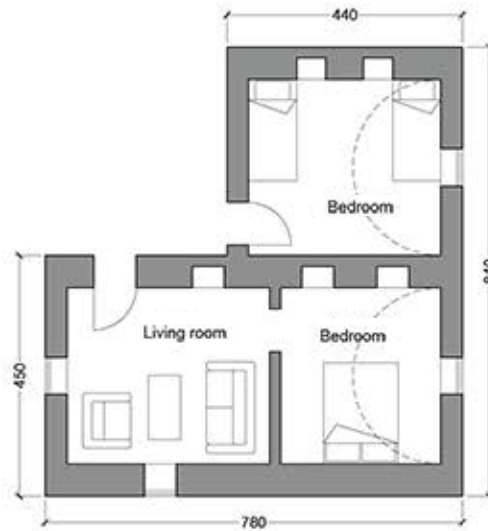


NUBIAN VAULT HEALTHCARE BUILDINGS: CSCOM HEALTH CENTRE,  
NGOLOFALA, MALI

MODEL 1	
Net area	25 m <sup>2</sup>
Linear metres	7,6 ml
Capacity	single teacher



MODEL 2	
Net area	35 m <sup>2</sup>
Linear metres	10,6 ml
Capacity	family



MODEL 3	
Net area	50 m <sup>2</sup>
Linear metres	15 ml
Capacity	family or several teachers



PLANS TYPES - 3 MODELES

LOGEMENTS DE MAITRES VN

NOV 15 COM

ECHELLE 1/100

PL01



PLANS FOR NUBIAN VAULT HOUSING FOR HEALTHCARE STAFF



NUBIAN VAULT HOUSING FOR HEALTHCARE STAFF AND TEACHERS:  
STAFF HOUSING FOR TEACHERS, NGUEYE NGUEYE, SENEGAL



## AVERAGE COSTS AND CONSTRUCTION SCHEDULES

The cost of a Nubian Vault building depends on several variables:

- the context (closeness of the site to suitable construction materials for the main structure, level of involvement of local beneficiaries...)
- the specific details of the building itself (size, complexity, quality of fittings and finishes...).

The main point to bear in mind is that, compared to the available alternative techniques, and for equivalent levels of fittings and finishes, the Nubian Vault technical concept is:

1. A competitive solution, and even very competitive if suitable earth and rocks are available on-site, or close to the site, and/or if the beneficiaries help with the construction; this also entails very positive benefits for local economies.
2. A solution with high added value in terms of comfort, durability, and environmental protection.

In terms of scheduling, a typical NV construction team (7-8 people) can complete the basic structure of a NV building of 50 m<sup>2</sup> net area in less than one month (provided all the necessary materials are available on-site); the time needed for fittings and finishes is equivalent to that for any other construction technique.

Depending on the size of the project and the deadlines for completion, one might consider using more than one NV team of masons in parallel.

*NB The need to accompany construction teams in this emerging market (for example, on-site training of apprentices...) may involve some additional ancillary costs.*



### NV-RC CLASSROOM, KODITH, SENEGAL, 2103-14

Anti-erosion measures: cement footings / cement render on walls and tar render on roof / parapets with cast reinforced concrete copings

Two pillars + post crossbars in reinforced concrete

Cost estimation for the Ghanaian context: 11,000 USD = 186 USD / m<sup>2</sup> (net area 59 m<sup>2</sup>)



### LITERACY CENTRE WITH CORRIDORS, THIALMA, SENEGAL, 2102-13

Anti-erosion measures: cement footings / cement render on walls and coal-tar render on roof / earth parapets with cement render

Cost estimation for the Ghanaian context: 10,200 USD = 157 USD / m<sup>2</sup> (net area 65 m<sup>2</sup>)



### TWO-VAULT LITERACY CENTRE WITHOUT CORRIDORS, DEGUEMBRE, SENEGAL, 2014-15

Anti-erosion measures: cement footings / cement render on walls and coal-tar render on roof / parapets with cast reinforced concrete copings

Cost estimation for the Ghanaian context: 10,800 USD = 180 USD / m<sup>2</sup> (net area 60 m<sup>2</sup>)



### TEACHERS' HOUSING, NGUEYE NGUEYE, SENEGAL, 2014-15

Anti-erosion measures: cement footings / cement render on walls and tar render on roof / parapets with concrete block copings

Cost estimation for the Ghanaian context: 4,700 USD = 93 USD / m<sup>2</sup> (net area 50 m<sup>2</sup>)

NB: lower cost because suitable earth available close to site.





**INTERESTED?  
WHY NOT WORK WITH AVN  
AS AN AGENT FOR CHANGE**

The results and impacts generated by AVN's Programme (A Roof, A Skill, A Market) demonstrate convincingly the the relevance and vigour of our offer.

Nevertheless, we must bear in mind that, at the moment, it is essential that the actors of the emerging NV market need to be accompanied and supported in their activities.

It is through the commitment of this wide range of actors (artisans, enterprises, technical and service contractors, project managers ...) on the one hand, and their accompaniment (technical training, contractor and project support and assistance...) on the other hand, that quality building programmes in the education sector will be devised, managed and successfully completed.

**This is the challenge we hope to meet. Alongside our teams, help to bring about these changes!**

**RESULTS, EFFECTS AND IMPACTS**

Towards the resolution of the problem

	2015	2030 *
Building sites	1500	70 000
Surface area (sqm)	68 000	2,1 M
Locations	700	25 000
Masons trained	380	13 000
Apprentices in training	300	10 000
Direct beneficiaries	20 000	600 000
Potential CO <sub>2</sub> saving (tonnes) <i>(basic structure and energy efficiency)</i>	55 000	1,7 M
Savings on basic structure	2 M€	64 M€
Market growth rate	31 %	36 %

\* Figures calculated considering 30% of annual growth

Figures for June 2015

**The Nubian Vault is also:**

- 5 national teams
- 14 regional teams in 5 countries
- 65 salaried staff (inc. 55 local staff)
- 135 volunteers (inc. 120 in Africa)
- A Board of Directors
- More than 400 social investors





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