AFFORDABLE, DURABLE, MODULAR AND EXTENDABLE "NUBIAN VAULT" HOUSING

A catalogue for actors of the NV eco-construction sector in the Sahel
INTRODUCTION

This catalogue presents the principle features of a housing model which is affordable, durable, modular and extendable, based on the Nubian Vault (NV) technical concept of construction. Its purpose is to help actors of the NV sector in the Sahel, especially NV artisans and entrepreneurs and their clients, to take decisions on the choice of different NV housing plans and associated materials requirements.

The FIRST SECTION of the catalogue is a comprehensive description of the housing model, each sub-section corresponding to a phase of a NV construction project: understanding the technical concept > choice of the quality of finish > choice of specific housing plans and layout options.

The SECOND SECTION provides an opportunity, case by case, to think about the layout of a construction plot and the ways in which future extensions of a NV house can be anticipated. A specific example is provided for a 300 m² plot (15 X 20 m), growing from an initial 20 m² house, in six successive stages, to one with 112 m² of floor space.

Finally, the THIRD SECTION looks at the potential of using the NV model in pilot housing estates, eco-villages and neighbourhood projects.

BE AWARE!

Note that this document illustrates outlines of a range of possible NV house designs. An actual construction project requires not only a team of qualified specialist NV masons but also access to the available complementary technical documentation, including:

• technical dossiers corresponding to each type of module, covering the implementation process and calculation of materials quantities;

Ownership of a solid, comfortable "green" home at a competitive price is possible with the popular, durable, modular and extendable Nubian Vault housing.
THE MODULES, LAYOUT OPTIONS AND FINISHES

1. Basic principles
   1.1 - The different modules
   1.2 - Different layout options
   1.3 - Upper storey extensions
   1.4 - Staircases and balustrades

2. Choice of quality of finish
   2.1 - Low cost version
   2.2 - Basic version
   2.3 - Comfort version

3. Choice of modules and layouts
   3.1 - Half Module / Option 1
   3.2 - Half Module / Option 2
   3.3 - Half Module / Quantities
   3.4 - Single Module / Option 1
   3.5 - Single Module / Option 2
   3.6 - Single Module / Option 3
   3.7 - Single Module / Option 4
   3.8 - Single Module / Option 5
   3.9 - Single Module / Option 6
   3.10 - Single Module / Quantities
   3.11 - Double Module / Option 1
   3.12 - Double Module / Option 2
   3.13 - Double Module / Option 3
   3.14 - Double Module / Option 4
   3.15 - Double Module / Quantities
   3.16 - Triple Module / Option 1
   3.17 - Triple Module / Option 2
   3.18 - Triple Module / Option 3
   3.19 - Triple Module / Quantities
   3.20 - Quadruple Module / Option 1
   3.21 - Quadruple Module / Option 2
   3.22 - Quadruple Module / Option 3
   3.23 - Quadruple Module / Quantities

PROGRESSIVE EXTENSIONS WITHIN A PLOT

4. An example of a plot size of 15 x 20 m
   4.1 - Main principles
   4.2 - Stage 1 : Single Module / 20 m2
   4.3 - Stage 2 : Double Module / 40 m2
   4.4 - Stage 3 : Triple Module / 60 m2
   4.5 - Stage 4 : Triple Module + Half Module + Staircase / 72 m2
   4.6 - Stage 5 : Triple Module + Half Module + Staircase + Single Module / 92 m2
   4.7 - Stage 6 : Triple Module + Half Module + Staircase + Single Module + Single 1st Floor Module + Balustrade / 112 m2

NEIGHBOURHOOD INTERVENTIONS

5. Housing estates, eco-villages...
THE MODULES, LAYOUT OPTIONS AND FINISHES
1.1 BASIC PRINCIPLES
THE DIFFERENT MODULES

HALF MODULE - OPTION 1
HABITABLE SPACE = 12 m²

SINGLE MODULE - OPTION 1
HABITABLE SPACE = 20 m²

DOUBLE MODULE - OPTION 1
HABITABLE SPACE = 40 m²

TRIPLE MODULE - OPTION 1
HABITABLE SPACE = 60 m²

QUADRUPLE MODULE - OPTION 1
HABITABLE SPACE = 80 m²
1.2 BASIC PRINCIPLES
THE DIFFERENT LAYOUT OPTIONS

These do not include all the layout options. They cover the main requirements, but other options are possible...

HALF MODULE - OPTION 2

SINGLE MODULE - OPTIONS

DOUBLE MODULE - OPTIONS

TRIPLE MODULE - OPTIONS

QUADRUPLE MODULE - OPTIONS
1.3
BASIC PRINCIPLES
UPPER STOREY EXTENSIONS

Floor partitions > lightweight partitions required !!!

TRIPLE MODULE + STAIRCASE + SINGLE MODULE
HABITABLE SPACE = 80 m²

QUADRUPLE MODULE + STAIRCASE + SINGLE MODULE
HABITABLE SPACE = 100 m²

QUADRUPLE MODULE + STAIRCASE + DOUBLE MODULE
HABITABLE SPACE = 120 m²
1.4 BASIC PRINCIPLES
STAIRCASES AND BALUSTRADES

MASTERY EXTERNAL STAIRCASE
The staircase gives access to the roof.
It is made with mud bricks.
The steps and risers are reinforced with concrete.
Its shape should be adapted to the specific situation, as advised by the NV artisan in charge.

MASTERY BALUSTRADE
The balustrade provides safety for an accessible roof space.
It is made from mud bricks topped with concrete slabs.
Its form and style should be adapted to the specific situation, as advised by the NV artisan in charge.
2.1

CHOICE OF QUALITY OF FINISH

LOW COST VERSION

WALL FOOTINGS AND HEADERS
> Foundations of rocks and earth mortar+ damp proofing + rammed earth periphery
> Rampart of adobes + concrete slabs

FLOOR
> Backfill: earth or compacted rubble
> Finish: sand

EXTERNAL RENDERS
> Walls: sand - cement tyrolean finish or mud - sand - bitumen with paint finish
> Roof: mud - sand - gravel - bitumen

INTÉRIOR RENDERS
> Walls and vaults: Mud - sand - lime wash finish

EXTERNAL DOORS AND WINDOWS
> Doors: iron, flush to outside of wall
> Windows: iron, flush to outside of wall, with adjustable louvres

INTERNAL DOORS
> Iron
2.2
CHOICE OF QUALITY OF FINISH
BASIC VERSION

WALL FOOTINGS AND HEADERS
> Foundations of rocks and earth mortar + damp proofing
  + half course of rocks and cement + rammed earth
  periphery
> Rampart 15cm concrete blocks + top slabs

FLOOR
> Backfill: earth or compacted rubble
> Finish: reinforced concrete slab

EXTERNAL RENDERS
> Walls: sand - cement tyrolean finish
  or mud - sand - bitumen with paint finish
> Roof: mud - sand - gravel - bitumen

INTERNAL RENDERS
> Walls and vaults: mud - sand - lime wash finish

EXTERNAL DOORS AND WINDOWS
> Doors: iron, flush to outside of wall
> Windows: iron, flush to outside of wall
  with adjustable louvres

INTERNAL DOORS
> Iron
### 2.3
**CHOICE OF QUALITY OF FINISH**

**COMFORT VERSION**

#### WALL FOOTINGS AND HEADERS
- Foundations of rocks and earth mortar + damp proofing
  + rammed earth periphery
- Rampart of adobes + concrete slabs
- Rampart 15cm concrete blocks + top slabs

#### FLOOR
- Backfill: earth or compacted rubble
- Finish: reinforced concrete slab + floor tiles

#### EXTERNAL RENDERS
- Walls: sand - cement tyrolean finish
  or mud - sand - bitumen with paint finish
- Roof: mud - sand - gravel - bitumen

#### INTERIOR RENDERS
- Vaults: Mud - sand - lime wash finish
- Walls: sand - cement paint finish

#### EXTERNAL DOORS AND WINDOWS
- Doors: iron, flush to inside of wall
- Windows: iron frame, aluminium window, flush to inside of wall

#### INTERNAL DOORS
- Doors: frame and door iron, or iron frame with wooden door
3.1
CHOICE OF MODULES AND LAYOUTS
HALF MODULE / OPTION 1

Bedroom
12 m² habitable space (3m60 x 3m30)
3.2 CHOICE OF MODULES AND LAYOUTS
HALF MODULE / OPTION 2

External kitchen or veranda ..
12 m² habitable space (3m60 x 3m30)
### 3.3
CHOICE OF MODULES AND LAYOUTS
HALF MODULE / MATERIALS QUANTITIES

12 m² habitable space (3m60 x 3m30)

<table>
<thead>
<tr>
<th>Material</th>
<th>LOW COST bitumen render on walls</th>
<th>BASIC sand-cement render on walls</th>
<th>COMFORT sand-cement render on walls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocks</td>
<td>8,5 m³</td>
<td>9 m³</td>
<td>9,6 m³</td>
</tr>
<tr>
<td></td>
<td>48 carts</td>
<td>50 carts</td>
<td>54 carts</td>
</tr>
<tr>
<td>Gravel</td>
<td>0,7 m³</td>
<td>2 m³</td>
<td>3,4 m³</td>
</tr>
<tr>
<td></td>
<td>4 carts</td>
<td>11 carts</td>
<td>19 carts</td>
</tr>
<tr>
<td>Sand</td>
<td>3,75 m³</td>
<td>4,8 m³</td>
<td>6,3 m³</td>
</tr>
<tr>
<td></td>
<td>21 carts</td>
<td>27 carts</td>
<td>35 carts</td>
</tr>
<tr>
<td>Water</td>
<td>22 m³ 120 barrels (200L)</td>
<td>21 m³ 105 barrels (200L)</td>
<td>20,5 m³ 100 barrels (200L)</td>
</tr>
<tr>
<td>Earth for mortar</td>
<td>23 m³ 128 carts</td>
<td>22,5 m³ 125 carts</td>
<td>20 m³ 112 carts</td>
</tr>
<tr>
<td>Bricks 38x17x15</td>
<td>1 955</td>
<td>1 875</td>
<td>1 875</td>
</tr>
<tr>
<td>Bricks 28x17x15</td>
<td>345</td>
<td>330</td>
<td>330</td>
</tr>
<tr>
<td>Brickettes 25x15x5</td>
<td>1 800</td>
<td>1 800</td>
<td>1 800</td>
</tr>
<tr>
<td>Cement</td>
<td>70 kg 2 X 50 kg bags</td>
<td>1 800 kg 36 X 50 kg bags</td>
<td>2 400 kg 48 X 50 kg bags</td>
</tr>
<tr>
<td>Bitumen</td>
<td>82 kg</td>
<td>30 kg</td>
<td>30 kg</td>
</tr>
<tr>
<td>Plastic film</td>
<td>40 metres</td>
<td>40 metres</td>
<td>40 metres</td>
</tr>
<tr>
<td>15cm breeze blocks</td>
<td>-</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Claustros</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Wire mesh (if used for render)</td>
<td>-</td>
<td>45 metres</td>
<td>45 metres</td>
</tr>
<tr>
<td>Rebar - iron rods</td>
<td>12 kg</td>
<td>65 kg</td>
<td>65 kg</td>
</tr>
<tr>
<td>Floor tiles (30x30)</td>
<td>-</td>
<td>-</td>
<td>15 m²</td>
</tr>
</tbody>
</table>
3.4
CHOICE OF MODULES AND LAYOUTS
SINGLE MODULE / OPTION 1

Salon
20 m² habitable space  (6m x 3m30)

PLAN

CROSS SECTION

MAIN ELEVATION

REAR ELEVATION
3.5

CHOICE OF MODULES AND LAYOUTS
SINGLE MODULE / OPTION 2

Bedroom + salon
20 m² habitable space  (6m x 3m30)
3.6
CHOICE OF MODULES AND LAYOUTS
SINGLE MODULE / OPTION 3

Salon + veranda
20 m² habitable space  (6m x 3m30)
3.7
CHOICE OF MODULES AND LAYOUTS
SINGLE MODULE / OPTION 4

Veranda
20 m² habitable space  (6m x 3m30)
3.8
CHOICE OF MODULES AND LAYOUTS
SINGLE MODULE / OPTION 5

Entrance + bedroom + bathroom
20 m² habitable space  (6m x 3m30)
3.9
CHOICE OF MODULES AND LAYOUTS
SINGLE MODULE / OPTION 6

Bedroom + bathroom
20 m² habitable space  (6m x 3m30)
3.10
CHOICE OF MODULES AND LAYOUTS
SINGLE MODULE / MATERIALS QUANTITIES

20 m² habitable space (6m x 3m30)

<table>
<thead>
<tr>
<th></th>
<th>LOW COST bitumen render on walls</th>
<th>BASIC sand-cement render on walls</th>
<th>COMFORT sand-cement render on walls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocks</td>
<td>11.5 m³ 64 carts</td>
<td>12.5 m³ 70 carts</td>
<td>13 m³ / 73 carts</td>
</tr>
<tr>
<td>Gravel</td>
<td>1 m³ 6 carts</td>
<td>4 m³ 22 carts</td>
<td>5.8 m³ / 33 carts</td>
</tr>
<tr>
<td>Sand</td>
<td>5.5 m³ 31 carts</td>
<td>8 m³ 45 carts</td>
<td>10 m³ 56 carts</td>
</tr>
<tr>
<td>Water</td>
<td>31 m³ 155 barrels (200L)</td>
<td>30.5 m³ 153 barrels (200L)</td>
<td>30 m³ 150 barrels (200L)</td>
</tr>
<tr>
<td>Earth for mortar</td>
<td>33 m³ 184 carts</td>
<td>32 m³ 178 carts</td>
<td>27.5 m³ 153 carts</td>
</tr>
<tr>
<td>Bricks 38x17x15</td>
<td>2790</td>
<td>2590</td>
<td>2470</td>
</tr>
<tr>
<td>Bricks 28x17x15</td>
<td>495</td>
<td>460</td>
<td>435</td>
</tr>
<tr>
<td>Brickettes 25x15x5</td>
<td>2970</td>
<td>2970</td>
<td>2970</td>
</tr>
<tr>
<td>Cement</td>
<td>80 kg 2 X 50kg bags</td>
<td>3050 kg 61 X 50kg bags</td>
<td>3900 kg 78 X 50kg bags</td>
</tr>
<tr>
<td>Bitumen</td>
<td>110 kg</td>
<td>45 kg</td>
<td>45 kg</td>
</tr>
<tr>
<td>Plastic film</td>
<td>60 metres</td>
<td>60 metres</td>
<td>60 metres</td>
</tr>
<tr>
<td>15cm breeze blocks</td>
<td>-</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td>Claustras</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Wire mesh (if used for render)</td>
<td>-</td>
<td>56 metres</td>
<td>56 metres</td>
</tr>
<tr>
<td>Rebar - iron rods</td>
<td>15 kg</td>
<td>102 kg</td>
<td>102 kg</td>
</tr>
<tr>
<td>Floor tiles (30x30)</td>
<td>-</td>
<td>-</td>
<td>23 m²</td>
</tr>
</tbody>
</table>
3.11
CHOICE OF MODULES AND LAYOUTS
DOUBLE MODULE / OPTION 1

Entrance + bedroom + salon
40 m² habitable space (6m x 3m30 x 2)
3.12
CHOICE OF MODULES AND LAYOUTS
DOUBLE MODULE / OPTION 2

2 verandas + 2 bedrooms
40 m² habitable space (6m x 3m30 x 2)
3.13
CHOICE OF MODULES AND LAYOUTS
DOUBLE MODULE / OPTION 3
Entrance + bedroom + salon + bathroom
40 m² habitable space (6m x 3m30 x 2)
3.14
CHOICE OF MODULES AND LAYOUTS
DOUBLE MODULE / OPTION 4
Veranda + bedroom + salon + bathroom
40 m² habitable space  (6m x 3m30 x 2)
### 3.15

**CHOICE OF MODULES AND LAYOUTS**

**DOUBLE MODULE / MATERIALS QUANTITIES**

40 m² habitable space (6m x 3m30 x 2)

<table>
<thead>
<tr>
<th></th>
<th>LOW COST bitumen render on walls</th>
<th>BASIC sand-cement render on walls</th>
<th>COMFORT sand-cement render on walls</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rocks</strong></td>
<td>18.7 m³ / 104 carts</td>
<td>19.5 m³ / 109 carts</td>
<td>23.5 m³ / 131 carts</td>
</tr>
<tr>
<td><strong>Gravel</strong></td>
<td>1.8 m³ / 10 carts</td>
<td>5.7 m³ / 32 carts</td>
<td>9.2 m³ / 53 carts</td>
</tr>
<tr>
<td><strong>Sand</strong></td>
<td>9.2 m³ / 51 carts</td>
<td>11.8 m³ / 66 carts</td>
<td>15.8 m³ / 89 carts</td>
</tr>
<tr>
<td><strong>Water</strong></td>
<td>55 m³ / 285 barrels (220L)</td>
<td>54 m³ / 270 barrels (220L)</td>
<td>53.5 m³ / 265 barrels (220L)</td>
</tr>
<tr>
<td>Earth for mortar</td>
<td>57.5 m³ / 320 carts</td>
<td>55.5 m³ / 309 carts</td>
<td>49 m³ / 273 carts</td>
</tr>
<tr>
<td><strong>Bricks 38x17x15</strong></td>
<td>4.725</td>
<td>4.485</td>
<td>4.285</td>
</tr>
<tr>
<td><strong>Bricks 28x17x15</strong></td>
<td>8.35</td>
<td>7.95</td>
<td>7.55</td>
</tr>
<tr>
<td><strong>Brickettes 25x15x5</strong></td>
<td>5.895</td>
<td>5.895</td>
<td>5.895</td>
</tr>
<tr>
<td><strong>Cement</strong></td>
<td>120 kg / 3 x 50 kg bags</td>
<td>4300 kg / 86 x 50 kg bags</td>
<td>6,050 kg / 121 x 50 kg bags</td>
</tr>
<tr>
<td><strong>Bitumen</strong></td>
<td>175 kg</td>
<td>85 kg</td>
<td>85 kg</td>
</tr>
<tr>
<td><strong>Plastic film</strong></td>
<td>100 metres</td>
<td>100 metres</td>
<td>100 metres</td>
</tr>
<tr>
<td><strong>15cm breeze blocks</strong></td>
<td>-</td>
<td>285</td>
<td>285</td>
</tr>
<tr>
<td><strong>Claustres</strong></td>
<td>28</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td><strong>Wire mesh</strong></td>
<td>-</td>
<td>75 metres</td>
<td>75 metres</td>
</tr>
<tr>
<td>(if used for render)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Rebar - iron rods</strong></td>
<td>22 kg</td>
<td>195 kg</td>
<td>195 kg</td>
</tr>
<tr>
<td><strong>Floor tiles (30x30)</strong></td>
<td>-</td>
<td>-</td>
<td>46 m²</td>
</tr>
</tbody>
</table>
3.16
CHOICE OF MODULES AND LAYOUTS
TRIPLE MODULE / OPTION 1

Entrance + 2 bedrooms + salon + bathroom
60 m² habitable space (6m x 3m30 x 3)
3.17
CHOICE OF MODULES AND LAYOUTS
TRIPLE MODULE / OPTION 2

Veranda + bedroom + salon + bathroom
60 m² habitable space (6m x 3m30 x 3)
CHOICE OF MODULES AND LAYOUTS
TRIPLE MODULE / OPTION 3

Veranda + bedroom + salon + kitchen + bathroom
60 m² habitable space (6m × 3m30 × 3)
### 3.19

**CHOICE OF MODULES AND LAYOUTS**  
**TRIPLE MODULE / MATERIALS QUANTITIES**  

60 m² habitable space (6m x 3m30 x 3)

<table>
<thead>
<tr>
<th>Material</th>
<th>LOW COST bitumen render on walls</th>
<th>BASIC sand-cement render on walls</th>
<th>COMFORT sand-cement render on walls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocks</td>
<td>25.8 m³</td>
<td>27 m³</td>
<td>32.8 m³</td>
</tr>
<tr>
<td></td>
<td>144 carts</td>
<td>150 carts</td>
<td>183 carts</td>
</tr>
<tr>
<td>Gravel</td>
<td>2.6 m³</td>
<td>8.7 m³</td>
<td>13.5 m³</td>
</tr>
<tr>
<td></td>
<td>1.5 carts</td>
<td>49 carts</td>
<td>75 carts</td>
</tr>
<tr>
<td>Sand</td>
<td>13.2 m³</td>
<td>17.5 m³</td>
<td>23.2 m³</td>
</tr>
<tr>
<td></td>
<td>74 carts</td>
<td>98 carts</td>
<td>129 carts</td>
</tr>
<tr>
<td>Water</td>
<td>78 m³ / 390 barrels (200L)</td>
<td>76.5 m³ / 390 barrels (200L)</td>
<td>75 m³ / 375 barrels (200L)</td>
</tr>
<tr>
<td>Earth for mortar</td>
<td>81.5 m³</td>
<td>78.5 m³</td>
<td>69.2 m³</td>
</tr>
<tr>
<td></td>
<td>453 carts</td>
<td>436 carts</td>
<td>385 carts</td>
</tr>
<tr>
<td>Bricks 38x17x15</td>
<td>6 m³ / 650 barrels</td>
<td>6.150</td>
<td>5.870</td>
</tr>
<tr>
<td>Bricks 28x17x15</td>
<td>1.16 m³</td>
<td>1.085</td>
<td>1.040</td>
</tr>
<tr>
<td>Brickettes 25x15x5</td>
<td>8.865 m³</td>
<td>8.865 m³</td>
<td>8.865 m³</td>
</tr>
<tr>
<td>Cement</td>
<td>180 kg / 4 x 50 kg bags</td>
<td>6400 kg / 128 x 50 kg bags</td>
<td>8600 kg / 172 x 50 kg bags</td>
</tr>
<tr>
<td>Bitumen</td>
<td>235 kg</td>
<td>120 kg</td>
<td>120 kg</td>
</tr>
<tr>
<td>Plastic film</td>
<td>150 metres</td>
<td>150 metres</td>
<td>150 metres</td>
</tr>
<tr>
<td>15cm breeze blocks</td>
<td>-</td>
<td>455</td>
<td>455</td>
</tr>
<tr>
<td>Claustros</td>
<td>48</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>Wire mesh (if used for render)</td>
<td>-</td>
<td>95 metres</td>
<td>95 metres</td>
</tr>
<tr>
<td>Rebar - iron rods</td>
<td>27 kg</td>
<td>290 kg</td>
<td>290 kg</td>
</tr>
<tr>
<td>Floor tiles (30x30)</td>
<td>-</td>
<td>-</td>
<td>70 m²</td>
</tr>
</tbody>
</table>

*Could be collected by the client or beneficiary*

*Could be made by the client or beneficiary*

*Obligatory purchase*
3.20

CHOICE OF MODULES AND LAYOUTS

QUADRUPLE MODULE / OPTION 1

Entrance + salon + 3 bedrooms + 2 bathrooms
80 m² habitable space (6m x 3m30 x 4)
3.21
CHOICE OF MODULES AND LAYOUTS
QUADRUPLE MODULE / OPTION 2

Veranda + salon + 2 bedrooms + 2 bathrooms
80 m² habitable space (6m x 3m30 x 4)
3.22

CHOICE OF MODULES AND LAYOUTS

MODULE QUADRUPLE / OPTION 3

Veranda + salon + 2 bedrooms + 2 bathrooms + kitchen
80 m² habitable space (6m x 3m30 x 4)
# 3.23
## CHOICE OF MODULES AND LAYOUTS
### QUADRUPLE MODULE / MATERIALS QUANTITIES

80 m² habitable space (6m x 3m30 x 4)

<table>
<thead>
<tr>
<th></th>
<th>LOW COST bitumen render on walls</th>
<th>BASIC sand-cement render on walls</th>
<th>COMFORT sand-cement render on walls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocks</td>
<td>33 m³ 184 carts</td>
<td>34.5 m³ 192 carts</td>
<td>42 m³ 234 carts</td>
</tr>
<tr>
<td>Gravel</td>
<td>3.4 m³ 19 carts</td>
<td>11.3 m³ 63 carts</td>
<td>17.6 m³ 98 carts</td>
</tr>
<tr>
<td>Sand</td>
<td>17 m³ 95 carts</td>
<td>22.8 m³ 127 carts</td>
<td>30.2 m³ 168 carts</td>
</tr>
<tr>
<td>Water</td>
<td>100 m³ 510 barrels (200L)</td>
<td>98 m³ 495 barrels (200L)</td>
<td>97 m³ 490 barrels (200L)</td>
</tr>
<tr>
<td>Earth for mortar</td>
<td>105 m³ 584 carts</td>
<td>101 m³ 562 carts</td>
<td>89 m³ 495 carts</td>
</tr>
<tr>
<td>Bricks 38x17x15</td>
<td>8 360</td>
<td>7 810</td>
<td>7 460</td>
</tr>
<tr>
<td>Bricks 28x17x15</td>
<td>1 475</td>
<td>1 380</td>
<td>1 320</td>
</tr>
<tr>
<td>Brickettes 25x15x5</td>
<td>11 785</td>
<td>11 785</td>
<td>11 785</td>
</tr>
<tr>
<td>Cement</td>
<td>210 kg 5 X 50 kg bags</td>
<td>8 300 kg 166 X 50 kg bags</td>
<td>11 250 kg 225 X 50 kg bags</td>
</tr>
<tr>
<td>Bitumen</td>
<td>295 kg</td>
<td>160 kg</td>
<td>160 kg</td>
</tr>
<tr>
<td>Plastic film</td>
<td>185 metres</td>
<td>185 metres</td>
<td>185 metres</td>
</tr>
<tr>
<td>15cm breeze blocks</td>
<td>-</td>
<td>595</td>
<td>595</td>
</tr>
<tr>
<td>Claustres</td>
<td>67</td>
<td>67</td>
<td>67</td>
</tr>
<tr>
<td>Wire mesh (if used for render)</td>
<td>-</td>
<td>115 metres</td>
<td>115 metres</td>
</tr>
<tr>
<td>Rebar - iron rods</td>
<td>33 kg</td>
<td>380 kg</td>
<td>380 kg</td>
</tr>
<tr>
<td>Floor tiles (30x30)</td>
<td>-</td>
<td>-</td>
<td>92 m²</td>
</tr>
</tbody>
</table>
PROGRESSIVE EXTENSIONS
WITHIN A PLOT : AN EXAMPLE
4.1
PROGRESSIVE EXTENSIONS FOR A PLOT OF 15 x 20 m

PRINCIPAL RULES TO RESPECT

- distance from neighbours: 1m35 minimum
- alignment to street possible
- natural light and ventilation
- sewage

plot of 15 x 20 m (300 m²) = average plot size outside capitals
4.2
PROGRESSIVE EXTENSIONS FOR A PLOT OF 15 x 20 m

PHASE 1 : SINGLE MODULE / 20 m2
4.3
PROGRESSIVE EXTENSIONS FOR A PLOT OF 15 x 20 m

PHASE 2: DOUBLE MODULE / 40 m²
4.4
PROGRESSIVE EXTENSIONS FOR A PLOT OF 15 x 20 m

PHASE 3: TRIPLE MODULE / 60 m²
4.5
PROGRESSIVE EXTENSIONS FOR A PLOT OF 15 x 20 m

PHASE 4: TRIPLE MODULE + HALF MODULE
+ STAIRCASE / 72 m²
PHASE 5: TRIPLE MODULE + HALF MODULE + STAIRCASE + SINGLE MODULE / 92 m²
4.7
PROGRESSIVE EXTENSIONS FOR A PLOT OF 15 x 20 m

PHASE 6: TRIPLE MODULE + HALF MODULE + STAIRCASE + SINGLE MODULE + 1st FLOOR
SINGLE MODULE + BALUSTRADE / 112 m²
NEIGHBOURHOOD INTERVENTIONS
The NV model of affordable, durable and climate-adapted housing was originally developed in response to the needs of rural families in the Sahel to obtain decent, extendable, housing using locally sourced materials and labour (including unskilled labour from family members).

However, it is also possible to use the same model as a basis for projects such as housing estates and eco-villages. Such projects would require complementary operations covering issues such as street access, public space, plot sizes, sanitation, land rights, planning permissions etc.

Such projects would also require the inclusion of innovatory financial and operational tools and systems to ensure that the concerned families are actually able to access, afford and maintain their homes.
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