Earth-ship based home

graduation design for a modified earthship to encourage the method of building with soil-based materials

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- TECHNICAL DETAILS -

R.L.M. LAFLEUR
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Introduction

This booklet contains the technical details regarding the Earth-Ship Based Home design. Part A of this booklet includes the plans and sections of the design, in which the elaborated details from part B are designated. The technical details are divided in vertical and horizontal details. \textit{V01} means vertical detail 01 and \textit{H02} means horizontal detail 02. To make clear where each detail is located in the design, a three dimensional impression on each page shows where the related element is sectioned.

The thermal resistance performance per element is given in each detail. All elements (except for windows) meet the minimum required thermal resistance of 5.0 m².k/W.

The details cannot be compared with standard details. This due to the used materials, especially the Compressed Earth Blocks. It is a fragile material in case of attaching elements to. This can also be seen in the drawn details.
A  DRAWINGS
B DETAILS
- curved terracotta panels; 30mm.
- trasslime mortar; 20mm.
- synthetic reinforcement mesh
- curved triplex; 8mm.
- air cavity; 16mm.
- battens of curved triplex; 16*33mm.
- water retaining & diffusion open foil
- perforated curved triplex; 16 mm.
- wood fibreboard insulation; 85mm.
- wood fibreboard insulation; 100mm.
- compressed earth blocks, 210mm.
- jute reinforcement mesh
- loam finishing with expanded perlite; 15mm.
Section of detail V01

Properties of vault structure

- $R_c$ value: 5.00 m².K/W
- Damp open
- Hydrophobic finishing material

Properties of glass façade

- $R_c$ value: 1.32 m².K/W
- LTA: 72%

Additional notes

- The water drain is needed to discharge water which is collected on the horizontal glass. The drain must be checked from time to time for blockages due to leaves for example.
- Water drain in window frame is equipped with aluminum bottom to prevent the rot of wood.
- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.
- The window frames need to be finished with a white coloured damp open paint.
- Terracotta panels in this detail are unglazed.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- trasslime mortar; 23mm.
- synthetic reinforcement mesh
- compression resistant wood fibreboard; 22mm.
- wooden beams, 38*160mm.
- biofoam insulation; 160mm.
- compressed earth blocks; 280mm.
- jute reinforcement mesh
- loam finishing; 15mm.
Section of detail V02

Properties of **exterior wall structure**

- **R**\(_c\) value: 5.25 m\(^2\).K/W
- Damp open
- Hydrophobed finishing material

Properties of **glass façade**

- **R**\(_c\) value: 1.32 m\(^2\).K/W
- LTA 72%

Properties of **floor structure**

- **R**\(_c\) value: 1.87 m\(^2\).K/W

**Additional notes**

- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.
- The window frames need to be finished with a white coloured damp open paint.
- In consultation with future inhabitants, it must be considered to apply an additional floor heating in the top layers (compression resistant wood fibreboard layers) of the floor structure. This is also explained in paragraph 10.1 of the booklet *Master thesis*.
- Wooden framework must be connected to the Compressed Earth Blocks wall by means of steel anchors.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- The gutter is properly sloped.
wall structure; $R_c = 5.25 \text{ m}^2 \text{K/W}$
- trasslime mortar; 23mm.
- synthetic reinforcement mesh
- compression resistant wood fibreboard; 22mm.
- wooden beams; 38*160mm.
- biofoam insulation; 160mm.
- compressed earth blocks; 280mm.
- jute reinforcement mesh
- loam finishing; 15mm.

floor structure
- slite tiles, 8mm.
- trasslime mortar, 12mm.
- compression pressure resistant wood fibreboard; 22mm.
- compression resistant wood fibreboard; 22mm.
- ecoboard, 18mm.
- wooden beams; 71*246mm / 300mm. c.t.c.
- pressure resistant wood fibreboard; 22mm.
- jute reinforcement mesh
- loam finishing; 15mm.
Detail: Bottom detail glass façade  
Section: Section A, upper storey  
Related details: V01, V02, H01

Section of detail V03

Properties of **exterior wall structure**

- **R\text{c} value**  
  \[
  \text{5.25 m}^2\text{K/W}
  \]
- **damp open**
- **hydrophobic finishing material**

Properties of **glass façade**

- **R\text{c} value**  
  \[
  \text{1.32 m}^2\text{K/W}
  \]
- **LTA 72%**

Properties of **floor structure**

- **R\text{c} value**  
  \[
  \text{1.87 m}^2\text{K/W}
  \]

**Additional notes**

- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.
- The window frames need to be finished with a white coloured damp open paint.
- In consultation with future inhabitants, it must be considered to apply an additional floor heating in the top layers (compression resistant wood fibreboard layers) of the floor structure. This is also explained in paragraph 10.1 of the booklet ‘Master thesis’.
- Wooden framework must be connected to the Compressed Earth Blocks wall by means of steel anchors.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- The gutter is properly sloped.
retaining wall structure
- sloped wooden tongue and groove boards; 18*125mm.
- wooden battens; 59*112mm.
- compressed earth blocks; 280mm.
- compression resistant wood fibreboard; 22mm.
- derbipure membrane; 3mm.
- gravel; 120mm.
- geotextile
Additional notes

- Wooden tongue and groove boards (larchwood) are exposed to climatic conditions and need to be pickled.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- By means of appendix G from the booklet ‘Master thesis’, it is assumed that the wooden battens do not fall out of the wall due to shrinkage and expansion of both the Compressed Earth Blocks as the pinewood itself. It is important though how the battens are pressed in the wall structure.
foundation wall structure
- gravel
- derbipure membrane; 3mm.
- compression resistant wood fibreboard; 22mm.
- wooden beams, 38*160mm.
- biofoam insulation, 160mm.
- compressed earth blocks, 280mm.
- biofoam insulation; 100mm.
- waterproof layer
- expanded clay granules.

passive house window frame
Section of detail V05

Properties of ground floor structure

- **R\text{ value}**
  - 5.54 m\(^2\).K/W
  - damp proof

Properties of window

- **R\text{ value}**
  - 1.38 m\(^2\).K/W
  - LTA 72%

Additional notes

- Wooden tongue and groove boards (larchwood) are exposed to climatic conditions and need to be pickled.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
vault structure; $R_c = 5.0 \text{ m}^2\text{K/W}$
- curved terracotta panels; 30mm.
- trasslime mortar; 20mm.
- synthetic reinforcement mesh
- curved triplex; 8mm.
- air cavity; 16mm.
- battens of curved triplex; 16*33mm.
- water retaining & diffusion open foil
- perforated curved triplex; 16 mm.
- wood fibreboard insulation; 85mm.
- wood fibreboard insulation; 100mm.
- compressed earth blocks, 210mm.
- jute reinforcement mesh
- loam finishing with expanded perlite; 15mm.
Additional notes

- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.
- The window frames need to be finished with a white coloured damp open paint.
- Terracotta panels in this detail are unglazed.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- The glass on top must be slightly tilted for water run-off.
vault structure; $R_c = 5.0 \text{ m}^2.K/W$
- curved terracotta panels; 30mm.
- trasslime mortar; 20mm.
- synthetic reinforcement mesh
- curved triplex; 8mm.
- air cavity; 16mm.
- battens of curved triplex; 16*33mm.
- water retaining & diffusion open foil
- perforated curved triplex; 16 mm.
- wood fibreboard insulation; 85mm.
- wood fibreboard insulation; 100mm.
- compressed earth blocks, 210mm.
- jute reinforcement mesh
- loam finishing with expanded perlite; 15mm.

bended triplex plate material, 16mm.

additional jute reinforcement mesh

wooden pivotal window

HR++ glazing

water retaining foil
Detail: Round pivotal window of vault structure
Section: Section B, upper storey
Related details: -

Section of detail V07

Properties of vault structure
- $R_c$ value: 5.00 m².K/W
- damp open
- hydrophobic finishing material

Properties of round pivotal window
- $R_c$ value: 0.71 m².K/W
- LTA 72%

Additional notes
- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.
- The window frames need to be finished with a white coloured damp open paint.
- Terracotta panels in this detail are glazed.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
wall structure; $R_c = 5.25 \text{ m}^2 \text{K/W}$
- trasslime mortar; 23mm.
- synthetic reinforcement mesh
- compression resistant wood fibre-board; 22mm.
- wooden beams, 38*160mm.
- biofoam insulation; 160mm.
- compressed earth blocks; 280mm.
- jute reinforcement mesh
- loam finishing; 15mm.

vault structure; $R_c = 5.0 \text{ m}^2 \text{K/W}$
- curved terracotta panels; 30mm.
- trasslime mortar; 20mm.
- synthetic reinforcement mesh
- curved triplex; 8mm.
- air cavity; 16mm.
- battens of curved triplex; 16*33mm.
- water retaining & diffusion open foil
- perforated curved triplex; 16 mm.
- wood fibreboard insulation; 85mm.
- wood fibreboard insulation; 100mm.
- compressed earth blocks, 210mm.
- jute reinforcement mesh
- loam finishing with expanded perlite; 15mm.

P=0.000

zinc profile
ecoboard, 8mm.

wooden battens; 22*33mm.

water discharge tube Ø80mm.

wood fibreboard insulation

wall structure; $R_c = 5.25 \text{ m}^2 \text{K/W}$
- trasslime mortar; 23mm.
- synthetic reinforcement mesh
- compression resistant wood fibre-board; 22mm.
- wooden beams, 38*160mm.
- biofoam insulation; 160mm.
- compressed earth blocks; 280mm.
- jute reinforcement mesh
- loam finishing; 15mm.

additional jute reinforcement mesh

passive house door element
**Detail:** Junction between vault, floor and passive door frame  
**Section:** Section B, upper storey  
**Related details:** -

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### Section of detail V08

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#### Properties of **vault structure**

- **R<sub>c</sub> value**: 5.00 m²·K/W  
- **damp open**  
- **hydrophobic finishing material**

#### Properties of **passive door element**

- **R<sub>c</sub> value**: 1.09 m²·K/W

#### Properties of **floor structure**

- **R<sub>c</sub> value**: 1.87 m²·K/W

#### Properties of **exterior wall structure**

- **R<sub>c</sub> value**: 5.25 m²·K/W  
- **damp open**  
- **hydrophobic finishing material**

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### Additional notes

- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.  
- Terracotta panels in this detail are unglazed.  
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.  
- The gutter is properly sloped.  
- In consultation with future inhabitants, it must be considered to apply an additional floor heating in the top layers (compression resistant wood fibreboard layers) of the floor structure. This is also explained in paragraph 10.1 of the booklet *Master thesis*.  
- Wooden framework must be connected to the Compressed Earth Blocks wall by means of steel anchors.  
- Wooden floor beams are tensile stress loaded.
floor structure - slate tiles; 8mm.
- trasslime mortar; 12mm.
- compression resistant wood fibreboard; 22mm.
- ecoboard; 18mm.
- wooden beams; 71*221mm / 600mm. c.t.c.
- compression resistant wood fibreboard; 22mm.
- jute reinforcement mesh
- loam finishing; 15mm.

vault structure $R_c = 5.0 \text{ m}^2\text{K/W}$
- curved terracotta panels; 30mm.
- trasslime mortar; 20mm.
- synthetic reinforcement mesh
- curved triplex; 8mm.
- air cavity; 16mm.
- battens of curved triplex; 16*33mm.
- water retaining & diffusion open foil
- perforated curved triplex; 16 mm.
- wood fibreboard insulation; 85mm.
- wood fibreboard insulation; 100mm.
- compressed earth blocks, 210mm.
- jute reinforcement mesh
- loam finishing with expanded profile; 15mm.

water retaining & diffusion open foil
- wooden cover cap

laminated wooden beam 71*221 / 1363 c.t.c.

illmond

glazed terracotta panels; 30mm.
trasslime mortar; 15mm.
laminated wooden beam 71*221mm.
stuc-stop profile
Section of detail V09

Properties of vault structure

- **R** value: 5.00 m².K/W
- Damp open
- Hydrophobic finishing material

Properties of glass roof

- **R** value: 0.77 m².K/W
- LTA 79%

Properties of floor structure

- **R** value: 1.87 m².K/W

Additional notes

- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.
- In consultation with future inhabitants, it must be considered to apply an additional floor heating in the top layers (compression resistant wood fibreboard layers) of the floor structure. This is also explained in paragraph 10.1 of the booklet ‘Master thesis’.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- Terracotta panels in this detail are glazed.
- Laminated beams are sloped with 6 mm/m¹.
- Wooden floor beams are tensile stress loaded.
3050+P

mesh attached to wooden blocks

wooden beams 21*221mm, 300mm. c.t.c.
wooden blocks 34*135mm; 88mm. c.t.c.

wooden cover cap
Section of detail V10

Properties of glass roof

- $R_p$ value: 0.77 m².K/W
- LTA: 79%

Additional notes

- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- Terracotta panels in this detail are unglazed.
- Laminated beams are sloped with 6 mm/m¹.
- Rain gutter needs to be checked regularly, to avoid water and soil from flowing over the edge.
balustrade, steel

tempered glass, 6mm.

illmond

compression resistant wood fibreboard, 20mm.

slate tiles, 8mm.

tramslime mortar, 12mm.

sand-lime bricks, 214mm.

expanded clay granules, 230 mm.

soil as infill
- Plywood between slate tiles is needed to avoid cracks due to deformation of the substrate materials (sand-lime bricks and wood fibreboard).
glass layer, 6mm.

vaulted wooden beams; 71*221mm / 840mm. c.t.c.

multiplex, 21mm.

white DerbiPure membrane material

4805+P

assembled wooden frame
**Detail:** Top of glass vault structure  
**Section:** Section C, upper storey  
**Related details:** V13, V14

**Section of detail V12**

**Properties of glass façade vault structure**

- **Rₜ value:** 0.05 m².K/W  
- **LTA:** 90%

**Additional notes**

- Wooden vaulted beams and board material are exposed to climatic conditions and need to be pickled.  
- The window frames need to be finished with a white coloured damp open paint.
- vaulted wooden beams: 71x221mm / 840mm c.t.e.
- compression resistant wooden fibreboard, 52mm.
- vault structure; \( R_c = 5.0 \text{ m}^2\text{K/W} \)
- curved terracotta panels; 30mm.
- trasslime mortar; 20mm.
- synthetic reinforcement mesh
- curved triplex; 8mm.
- air cavity; 16mm.
- battens of curved triplex; 16*33mm.
- water retaining & diffusion open foil
- perforated curved triplex; 16 mm.
- wood fibreboard insulation; 85mm.
- wood fibreboard insulation; 100mm.
- compressed earth blocks, 210mm.
- jute reinforcement mesh
- loam finishing with expanded perlite; 15mm.
Detail: Connection between vault structures
Section: Section C, upper storey
Related details: V12

Properties of vault structure
- $R_c$ value: 5.00 m$^2$.K/W
- Damp
- Open
- Hydrophobic finishing material

Additional notes
- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.
- Terracotta panels in this detail are unglazed.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- Wooden vaulted beams are exposed to climatic conditions and need to be pickled.
wall structure; $R_c = 5.25 \text{ m}^2\text{K}/\text{W}$
- trasslime mortar; 23mm.
- synthetic reinforcement mesh
- compression resistant wood fibreboard; 22mm.
- wooden beams, 38*160mm.
- biofoam insulation; 160mm.
- compressed earth blocks; 280mm.
- jute reinforcement mesh
- loam finishing; 15mm.

floor structure; $R_c = 5.14 \text{ m}^2\text{K}/\text{W}$
- top soil; 400mm.
- derbipure roofing; 3mm.
- compression resistant wood fibreboard; 22mm.
- compression resistant wood fibreboard; 22mm.
- ecoboard, 18mm.
- wooden beams; 71*246mm / 300mm. c.t.c.
- wood fibreboard insulation, 120mm
- compression resistant wood fibreboard; 22mm.
- wooden battens, 20*33mm.
- ecoboard, 18mm.
- jute reinforcement mesh
- loam finishing; 15mm.

vapor proof foil
ecoboard; 18mm.
Section of detail V14

Properties of **exterior wall structure**

- \[ R_c \text{ value} = 5.25 \text{ m}^2\text{.K/W}\]
- **damp open**
- hydrophobic finishing material

Properties of **glass façade vault structure**

- \[ R_c \text{ value} = 0.05 \text{ m}^2\text{.K/W}\]
- **LTA = 90\%**

Properties of **tilt and turn window**

- \[ R_c \text{ value} = 1.27 \text{ m}^2\text{.K/W}\]
- **LTA = 72\%**

Properties of **floor structure**

- \[ R_c \text{ value} = 5.18 \text{ m}^2\text{.K/W}\]

**Additional notes**

- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.
- The window frames need to be finished with a white colored damp open paint.
- Wooden framework must be connected to the Compressed Earth Blocks wall by means of steel anchors.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- The gutter is properly sloped.
- Vaulted wooden beams are attached to steel anchors (fixed connection), which are fixed to horizontal wooden beams.
- top soil; 400mm.
- derbipure roofing; 3mm.
- compression resistant wood fibreboard; 22mm.
- compression resistant wood fibreboard; 22mm.
- ecoboard, 18mm.
- wooden beams; 71*246mm / 300mm. c.t.c.
- wood fibreboard insulation, 120mm
- compression resistant wood fibreboard; 22mm.
- wooden battens, 20*33mm.
- ecoboard, 18mm.
- jute reinforcement mesh
- loam finishing; 15mm.

floor structure = 5.14 m².K/W
Section of detail V15

Properties of **floor structure**

- \( R_\text{c} \) value: 5.18 m\(^2\).K/W

Properties of **horizontal pivotal window**

- \( R_\text{c} \) value: 0.54 m\(^2\).K/W
- LTA: 72%

Additional notes

- The window frames need to be finished with a white coloured damp open paint.
vault structure; $R_c = 5.0 \text{ m}^2\text{K/W}$
- curved terracotta panels; 30mm.
- trasslime mortar; 20mm.
- synthetic reinforcement mesh
- curved triplex; 8mm.
- air cavity; 16mm.
- battens of curved triplex; 16*33mm.
- water retaining & diffusion open foil
- perforated curved triplex; 16 mm.
- wood fibreboard insulation; 85mm.
- wood fibreboard insulation; 100mm.
- compressed earth blocks, 210mm.
- jute reinforcement mesh
- loam finishing with expanded perlite; 15mm.

aluminum sealing profile
aluminum corner line
tempered glass
laminated glass

water discharge
tube $\varnothing 80\text{mm.}$

trasslime mortar; 15mm.
laminated wooden beam 71*385 / 1363 c.t.c.
ecoboard, 18mm.

indoor window frame
Section of detail V16

Properties of vault structure
- $R_c$ value: 5.00 m²·K/W
- damp, open
- hydrophobic finishing material

Properties of glass roof
- $R_c$ value: 0.77 m²·K/W
- LTA: 79%

Properties of floor structure
- $R_c$ value: 1.87 m²·K/W

Properties of indoor window
- $R_c$ value: 0.68 m²·K/W
- LTA: 79%
- LTA*: 62%

Additional notes
- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- Terracotta panels in this detail are glazed.
- Laminated beams are sloped with 6 mm/m.
- Aluminum sealing profile is meant to keep leaves from getting into the sink. However, clogging may happen. The sink must be checked regularly in order to avoid damage to the structure due to water overflow.
- The window frames need to be finished with a white coloured damp open paint.
- Wooden floor beams are tensile loaded.
- The gutter is properly sloped.

* The percentage of daylight that goes through the glass is only 62%, because it was already filtered by the glass roof.
vault structure; $R_c = 5.0 \text{ m}^2\text{K}/\text{W}$
- curved terracotta panels; 30mm.
- trasslime mortar; 20mm.
- synthetic reinforcement mesh
- curved triplex; 8mm.
- air cavity; 16mm.
- battens of curved triplex; 16*33mm.
- water retaining & diffusion open foil
- perforated curved triplex; 16 mm.
- wood fibreboard insulation; 85mm.
- wood fibreboard insulation; 100mm.
- compressed earth blocks, 210mm.
- jute reinforcement mesh
- loam finishing with expanded perlite; 15mm.

floor structure
- slite tiles, 8mm.
- trasslime mortar, 12mm.
- compression resistant wood fibreboard; 22mm.
- compression resistant wood fibreboard; 22mm.
- ecoboard, 18mm.
- wooden beams; 71*246mm / 300mm. c.t.c.
- compression resistant wood fibreboard; 22mm.
- jute reinforcement mesh
- loam finishing; 15mm.
Properties of vault structure

- **Rc value**: 5.00 m².K/W
- **Damp**: open
- **Hydrophobic finishing material**

Properties of glass roof

- **Rc value**: 0.77 m².K/W
- **LTA**: 79%

Properties of floor structure

- **Rc value**: 1.87 m².K/W

Additional notes

- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- Terracotta panels in this detail are glazed.
- Laminated beams are sloped with 6 mm/m¹.
- Wooden floor beams are tensile stress loaded.
ground floor structure; \( R_c = 5.54 \text{ m}^2 \text{ K/W} \)
- slate tiles, 8mm.
- trasslime mortar, 12mm.
- compression resistant wood fibreboard, 20mm.
- vapor control layer.
- biofoam insulation, 100mm.
- water retaining layer.
- trasslime mortar, 30mm.
- expanded clay granulates, 250mm.
- gravel 320mm.

wooden beams 71*114mm.
trasslime mortar, 25mm.
glazed terracotta panels, 30mm.

loam finishing, 15mm.
ecoboard, 22mm.
Properties of indoor window

- **Rₜ value**: 0.68 m²·K/W
- **LTA**: 79%
- **LTA⁺**: 62%

Properties of floor structure

- **Rₜ value**: 5.54 m²·K/W
- **damp proof**

Additional notes

- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- Terracotta panels in this detail are glazed.
- Laminated beams are sloped with 6 mm/m¹.
- The window frames need to be finished with a white coloured damp open paint.
- Creep of the biofoam insulation - due to compressive forces of the indoor window - is prevented by applying a wooden beam beneath the bottom frame, which transfers the forces towards the foundation.

* The percentage of daylight that goes through the glass is only 62%, because it was already filtered by the glass roof.
ground floor structure; $R_c = 5.54 \text{ m}^2\text{K/W}$
- slate tiles, 8mm.
- trasslime mortar, 12mm.
- vapor control layer.
- wood fibreboard insulation, 20mm.
- biofoam insulation, 100mm.
- water retaining layer.
- trasslime mortar, 30mm.
- expanded clay granules, 250mm.
- gravel 320mm.

wall structure; $R_c = 3.34 \text{ m}^2\text{K/W}$
- wooden cladding of larch hardwood; 16*67mm.
- wooden battens; 22*33mm.
- compression resistant wood fibreboard; 18mm.
- vapor control layer
- wooden beams, 38*100mm.
- wood fibreboard insulation; 100mm.
- compression resistant wood fibreboard; 18mm.
- jute reinforcement mesh
- loam finishing; 15mm.

HR++ glazing

corner element of wooden cladding; 67*118mm.

wooden strip to support corner element; 22*34mm.
**Detail:** Window frame of indoor wall in bathroom  
**Section:** Section D, lower storey  
**Related details:** -

### Section of detail V19

#### Properties of indoor window
- $R_c$ value: **1.41 m$^2$.K/W**  
- LTA: **72%**

#### Properties of floor structure
- $R_c$ value: **5.54 m$^2$.K/W**  
- Damp proof

#### Properties of indoor wall structure
- $R_c$ value: **3.34 m$^2$.K/W**  
- Damp proof

#### Additional notes
- Creep of the biofoam insulation - due to compressive forces of the indoor wall structure - is prevented by applying a wooden beam beneath the structure, which transfers the forces towards the foundation.
vault structure; $R_c = 5.0 \text{ m}^2\text{.K/W}$
- curved terracotta panels; 30mm.
- trasslime mortar; 20mm.
- synthetic reinforcement mesh
- curved triplex; 8mm.
- air cavity; 16mm.
- battens of curved triplex; 16*33mm.
- water retaining & diffusion open foil
- perforated curved triplex; 16 mm.
- wood fibreboard insulation; 80mm.
- wood fibreboard insulation; 100mm.
- compressed earth blocks, 210mm.
- jute reinforcement mesh
- loam finishing with expanded perlite; 15mm.

wooden fibreboard insulation, 52mm.
water retaining & diffusion open foil
Section of detail H01

Properties of vault structure

- $R_c$ value: 5.00 m$^2$.K/W
- DAMP-OPEN
- Hydrophobic finishing material

Properties of glass façade

- $R_c$ value: 1.32 m$^2$.K/W
- LTA: 72%

Additional notes

- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.
- The window frames need to be finished with a white coloured damp open paint.
- Terracotta panels in this detail are unglazed.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- Wooden framework must be connected to the Compressed Earth Blocks wall by means of steel anchors.
Detail: Bottom detail glass façade

Section: Section A, upper storey

Related details: V01, V03, H01

- 505+P wall structure; $R_c = 5.25 \text{ m}^2\text{K/W}$
- trasslime mortar; 23mm.
- synthetic reinforcement mesh
- compression resistant wood fibreboard; 22mm.
- wooden beams, 38*160mm.
- biofoam insulation; 160mm.
- compressed earth blocks; 280mm.
- jute reinforcement mesh
- loam finishing; 15mm.
- water retaining & diffusion open foil
- stuc-stop profile
- P=0.000 water retaining & diffusion open foil

- passive window frame
- sloped wooden tongue and groove boards; 18*125mm.
- wooden battens; 59*112mm.
- compressed earth blocks; 280mm.
- compression resistant wood fibreboard; 22mm.
- derbipure membrane; 3mm.

- retaining wall structure
- loam finishing, 15mm.
- compressed earth blocks; 280mm.
- biofoam insulation, 160mm.
- wooden beams 38*160mm.
- compression resistant wood fibreboard; 22mm.
- derbipure membrane; 3mm.

- wood fibreboard, 18mm.
- additional jute reinforcement mesh
Section of detail H02

Properties of **tilt and turn window**

- **R\text{\textsubscript{c}} value**
  - 1.27 m\textsuperscript{2}.K/W
  - LTA 72%

Properties of **retaining wall structure**

- **R\text{\textsubscript{c}} value**
  - 5.27 m\textsuperscript{2}.K/W
  - **damp proof**

Additional notes

- Wooden tongue and groove boards (larchwood) are exposed to climatic conditions and need to be pickled.
- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- By means of appendix G from the booklet 'Master thesis', it is assumed that the wooden battens do not fall out as a result of the way the battens are inserted in the wall structure.
- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.
- The window frames need to be finished with a white coloured damp open paint.
- Wooden framework must be connected to the Compressed Earth Blocks wall by means of steel anchors.
Section: Section A, upper storey

Related details: V01, V02, H01

Detail: Bottom detail glass façade

wall structure; $R_c = 5.25 \text{ m}^2 \cdot \text{K/W}$
- trasslime mortar; 23mm.
- pressure resistant wood fibreboard; 22mm.
- wooden beams, 38*160mm.
- biofoam insulation; 160mm.
- compressed earth blocks; 280mm.
  equipped with wall heating system.
- jute reinforcement mesh
- loam finishing; 15mm.

wood fibreboard, 18mm.
- synthetic reinforcement mesh
- compression resistant wood fibreboard; 22mm.
- wooden beams, 38*160mm.
- biofoam insulation; 160mm.
- compressed earth blocks; 280mm.
  equipped with wall heating system.
- jute reinforcement mesh
- loam finishing; 15mm.

water retaining foil

passive window frame

wood fibreboard, 18mm.
- additional jute reinforcement mesh

steel anchor
- additional jute reinforcement mesh

wooden mounting frame, 57*114mm.

water discharge tube

Ø80mm.

illmond
- wooden mounting frame, 57*114mm.
- additional jute reinforcement mesh
- jute reinforcement mesh
- steel anchor
- loam finishing; 15mm.
Section of detail **H03**

**Properties of tilt and turn window**

- Rₜ value: 1.38 m².K/W
- LTA: 72%

**Properties of exterior wall structure**

- Rₜ value: 5.25 m².K/W
- Damp open
- Hydrophobed finishing material

**Additional notes**

- It is important to protect the Compressed Earth Blocks from any form of precipitation during construction.
- Hydrophobization of finishing materials must be done each three years and must be done on a dry surface.
- The window frames need to be finished with a white coloured damp open paint.
- Wooden framework must be connected to the Compressed Earth Blocks wall by means of steel anchors.
- retained wall with wood finishing
- section: }
- related details: H02

**Detail:**
- retaining wall structure; Rc = 3.34 m².K/W
- steel anchor
- compression resistant wood fibreboard 52mm.
- trasslime mortar, 12mm.
- wall heating system
- slate tiles, 8mm.

**Retaining wall structure:**
- compressed earth blocks, 228mm.
- wooden cladding of larchwood; 16*67mm.
- wooden battens; 22*33mm.
- compression resistant wood fibreboard; 18mm.
- vapor control layer
- wooden beams, 38*100mm.
- wood fibreboard insulation; 100mm.
- compression resistant wood fibreboard; 18mm.
- loam finishing; 15mm.

**Passive window frame:**
- HR++ glazing
- steel anchor
- compression resistant wood fibreboard 52mm.
- trasslime mortar, 12mm.
- wall heating system
- slate tiles, 8mm.
Section of detail H04

Properties of indoor window

- **Rc value**: 1.29 m².K/W
- **LTA**: 72%

Properties of indoor wall structure with CEBs

- **Rc value**: 1.38 m².K/W

Properties of indoor wall structure with framework

- **Rc value**: 3.34 m².K/W
- **Damp proof**

Additional notes

- The window frames need to be finished with a white coloured damp open paint.
- Creep of the biofoam insulation - due to compressive forces of the indoor wall structure - is prevented by applying a wooden beam beneath the structure, which transfers the forces towards the foundation.
- The indoor CEB wall is insulated to heat transmission from the bathroom to the laundry room.
- Indoor walls are connected by means of steel anchors.