Master Thesis

SUSTAINABILITY IN THE BUILT ENVIRONMENT:
GAMBOA SOCIAL HOUSING

ANNEX

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Master Thesis of
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2014
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<td>Drawing III-36 Blow-Up. Back Wall (backyard) Sample</td>
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<td>Drawing III-37 Blow-Up. Front Wall Sample</td>
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</table>
UNIT TYPOLOGY 01

**Quotes**

residential building
standard single family house for 04 people + private terrace

**Legend**

- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09

ZONING

Architectural Project
Plan, Sections and Facades.
UNIT TYPOLOGY 01

Quotes
residential building
standard single family house for 04 people + private terrace

Legend
- red: typology 01
- yellow: typology 02
- green: typology 03
- blue: typology 04
- red: typology 05
- purple: typology 07
- orange: typology 08
- blue: typology 09

Architectural Project
Plan, Sections and Facades.
UNIT TYPOLOGY 01

**Quotes**

*residential building*

*standard single family house for 04 people + private terrace*

**Legend**

- Red: typology 01
- Yellow: typology 02
- Green: typology 03
- Cyan: typology 04
- Black: typology 05
- Purple: typology 07
- Orange: typology 08
- Blue: typology 09

**Architectural Project**

Plan, Sections and Facades. 1:75
UNIT TYPOLOGY 02

Quotes
residential building
private garden + single family house for 04 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09

ZONING

Architectural Project
Plan, Sections and Facades.

1:1500
1:75
UNIT TYPOLOGY 02

Quotes
residential building
private garden + single family house for 04 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09
UNIT TYPOLOGY 02

ZONING

FRONTAL FACADE

BACKYARD FACADE

Architectural Project
Plan, Sections and Facades.

Quotes

residential building
private garden + single family house for 04 people + private terrace

Legend

- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09
UNIT TYPOLOGY 03

Quotes
residential building
private garden + single family house for 06 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09

ZONING

Architectural Project
Plan, Sections and Facades.
1:1500

III-14
1:75
UNIT TYPOLOGY 03

Quotes

residential building
private garden + single family house for 06 people + private terrace

Legend

- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09
UNIT TYPOLOGY 04

Quotes
residential building
garden + single family house for 08 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09

Architectural Project
Plan, Sections and Facades.
UNIT TYPOLOGY 04

Quotes
residential building
private garden + single family house for 08 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09
UNIT TYPOLOGY 05

Quotes
residential building
private garden + multifamily housing for 06 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09
ZONING

UNIT TYPOLOGY 05

Architectural Project
Plan, Sections and Facades.

Legend

- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09

Quotes

residential building
private garden + multifamily housing for 06 people + private terrace
UNIT TYPOLOGY 06

Quotes
services building
private garden + hostel accommodation for 12 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09

ZONING

Architectural Project
Plan, Sections and Facades.
UNIT TYPOLOGY 06

Quotes
services building
private garden + hostel accommodation for 12 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09

Architectural Project
Plan, Sections and Facades.
services building
private garden + hostel accommodation for 12 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09

Architectural Project
Plan, Sections and Facades.
UNIT TYPOLOGY 07

Quotes
mix use building
private garden + small business space + single family house for 04 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09
UNIT TYPOLOGY 07

mix use building
private garden + small business space + single family house for 04 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09

Architectural Project
Plan, Sections and Facades.
mix use building
private garden + small business space + single family house for 04 people + private terrace
UNIT TYPOLOGY 08

Quotes
mix use building
public garden + store on the ground floor + single family house for 06 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09
mix use building
public garden + store on the ground floor + single family house for 06 people + private terrace

UNIT TYPOLOGY 08

Quotes

mix use building
public garden + store on the ground floor + single family house for 06 people + private terrace

Legend

- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09

Architectural Project
Plan, Sections and Facades.
mix use building
public garden + store on the ground floor + single family house for 08 people + private terrace

UNIT TYPOLOGY 09

- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09

ZONING

Architectural Project
Plan, Sections and Facades.
UNIT TYPOLOGY 09

mix use building
public garden + store on the ground floor + single family house for 08 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09

Architectural Project
Plan, Sections and Facades.
mix use building
public garden + store on the ground floor + single family house for 08 people + private terrace

UNIT TYPOLOGY 09

Quotes
mix use building
public garden + store on the ground floor + single family house for 08 people + private terrace

Legend
- typology 01
- typology 02
- typology 03
- typology 04
- typology 05
- typology 06
- typology 07
- typology 08
- typology 09

Architectural Project
Plan, Sections and Facades.
SUMMER STRATEGY

- Solar water heating systems on the roof can remain the underground water tanks.
- Using of energy-efficient lighting system.
- Special high trees to direct the air flow into the building.
- Permeable pavement for rainwater collection along all the square area.
- There is a special air pipe in the middle of the building - help to air ventilation.
- Rainwater collection tank - using of water for watering the flowers.

Average precipitation during summer season 57% RH=80%

It is sunny 51.3% of daylight hours.

- Optional application of Photovoltaic solar panels help to reduce electricity consumption.
- Light color material on the roof reflect solar heat.
- White fabric material as a canopy to protect to horizontal surfaces from solar rays.
- Shading system against direct solar rays.
- Foliage trees provide additional shadow in the envelope against direct solar rays.
- Natural ventilation.
- Water filtering system and a pump to water supply.
WINTER STRATEGY

- Average precipitation during winter season: 32%, RH=90%
- It is sunny 67% of daylight hours.
- Winter noon, Angle 34°

- Optional application of Photovoltaic solar panels help to reduce electricity consumption.
- Using of energy-efficient lighting system.
- White fabric material as a canopy to protect horizontal surfaces from solar rays.
- Permeable pavement for rain water collection along all the square area.
- Rainwater collection tank - using of water for watering the flowers.
- Light color material on the roof reflect solar heat.
- There is a special air pipe in the middle of the building - help to air ventilation.
- Foliage trees provide additional shadow in the envelope against direct solar rays.
- Shading system against direct solar rays - angle is also suitable for winter.
- Natural ventilation.
- Water filtering system and a pump to water supply.

Technological Design
Strategy: Winter Season
1. The basis of the foundation is 9.7 m of soft organic dark gray clay soil. The type and characteristics of the soils of the construction site are shown in the report;

2. Foundations designed are made of monolithic reinforced concrete: strip footing - under load-bearing and self-supporting walls;

3. Under the foundation the layer of coarse sand thickness of 100 mm has to be performed, with plan dimensions 100 mm greater than the dimensions of foundations in each direction;

4. The lateral surfaces of the concrete structures in contact with soil, should have the bitumen coating of 2 layers;

5. The horizontal isolation of the foundation is a double-layer of waterproof coating material on the bitumen mastic.

### Structural Design
Plan of Footings. 1:100

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>NAME</th>
<th>MATERIAL</th>
<th>Ø</th>
<th>AMOUNT</th>
<th>LENGTH (M)</th>
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<td>STRIP FOUNDATION F-1</td>
<td>NET N-1 for 1 m run</td>
<td>CONCRETE M35</td>
<td>Ø 12 mm</td>
<td>10.12</td>
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<td>STRIP FOUNDATION F-1</td>
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<td>3.16</td>
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<td>NET N-3 for 1 m run</td>
<td>CONCRETE M35</td>
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<td>0.79</td>
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<td>CONCRETE M35</td>
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<td>5.214</td>
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<td>NET N-2 for 1 m run</td>
<td>CONCRETE M35</td>
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<td>1.975</td>
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<td>NET N-3 for 1 m run</td>
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<td>NET N-1 for 1 m run</td>
<td>CONCRETE M35</td>
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<td>1.975</td>
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<td>NET N-3 for 1 m run</td>
<td>CONCRETE M35</td>
<td>Ø 8 mm</td>
<td>1.975</td>
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<td>NET N-1 for 1 m run</td>
<td>CONCRETE M35</td>
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<td>Ø 8 mm</td>
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<td>CONCRETE M35</td>
<td>Ø 8 mm</td>
<td>1.975</td>
<td>400 M</td>
</tr>
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### Notes.
1. The basis of the foundation is 9.7 m of soft organic dark gray clay soil. The type and characteristics of the soils of the construction site are shown in the report;
2. Foundations designed are made of monolithic reinforced concrete: strip footing - under load-bearing and self-supporting walls;
3. Under the foundation the layer of coarse sand thickness of 100 mm has to be performed, with plan dimensions 100 mm greater than the dimensions of foundations in each direction;
4. The lateral surfaces of the concrete structures in contact with soil, should have the bitumen coating of 2 layers;
5. The horizontal isolation of the foundation is a double-layer of waterproof coating material on the bitumen mastic.
Structural Design

### Slab Plan at the ground level. 1:75

### Slab Plan at the first floor level. 1:75

### Slab Plan at the second floor level. 1:75

### Specification of Reinforced Concrete Covering + Prefabricated Grinder Slab/Ceramic Interjoist (40+80)

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<td>1</td>
<td>NBR 14898-1</td>
<td>NBR 14898-1</td>
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<tr>
<td>2</td>
<td>Interjoist VT 8 L=4200MM</td>
<td>Interjoist VT 8 L=4200MM</td>
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<td>3</td>
<td>Interjoist VT 8 L=3600MM</td>
<td>Interjoist VT 8 L=3600MM</td>
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<td>Ceramic filling element N (60)</td>
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<td>6</td>
<td>Ceramic M35</td>
<td>Ceramic M35</td>
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<td>7</td>
<td>Ceramic M35</td>
<td>Ceramic M35</td>
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