



Sustainable post-disaster reconstruction.  
From recovery to risk reduction.

# PHI

# Prevention Heritage Identity

## 6th i-Rec Student Competition

### University:

Universidade Lusíada de Vila  
Nova de Famalicão

### Department:

Faculdade de Arquitectura e  
Artes

### Country:

Portugal

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### Name of the Students:

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Daniel Vaz Monteiro  
Jonathan Fernandes



# 01

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PRESENTATION  
CONTEXTUALIZATION  
ANALYSIS  
STRATEGY  
SOLUTIONS  
IDENTITY  
CONSTRUCTION  
RECOVERY



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# Where ? **Lisbon, Pombaline Downtown**

- Capital of Portugal;
- Country's center and financial engine;
- Portugal's historical and architectural heritage.

In 1755, Lisbon suffered the greatest disaster in the history of Portugal:

**Earthquake** Magnitude 9 in the Richter scale.

**Tsunami**

As a consequence of the earthquake, a tsunami submerged all of the downtown's drainage basin.

**City fire**

That lasted 6 days due to the city's desertification.

### Statistics about the disaster of 1755:

The incident victimized 35% of the population and damaged a total of 60% of all buildings. It was the greatest disaster registered in Portugal and of the biggest of all Europe.

According to the LNEC (National Laboratory of Civic Engineering), it is predicted a similar disaster in the near future.

### Characterization of the Pombaline's Downtown:

- Average age - mostly between the 25 and the 64 years old.
- A great center of commercial, governmental and financial activities.
- Most of the downtown workers don't live there.
- Population - 1175 inhabitants (4700 inh/km<sup>2</sup>)
- A considerable number of dwellings are empty.



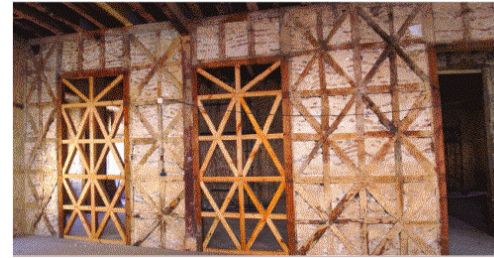
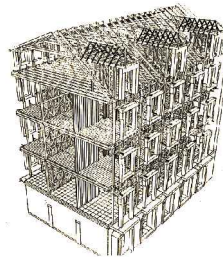
**02** Ana Luisa Gonçalves  
Daniel Vaz Monteiro  
Jonathan Fernandes





# Lisbon's Reconstruction

- The Pombaline's constructive system was innovative across the world, one of the greatest progresses of all time concerning anti-seismic architecture.



## GAIOLA POMBALINA

Composed by cross-shaped wooden structure, the Gaiola Pombalina managed to be one of the first seismic preventive building systems in the history. It composed most of the new building walls, and it had its empty spaces filled with the wreckage from the previous buildings, destroyed by the earthquake

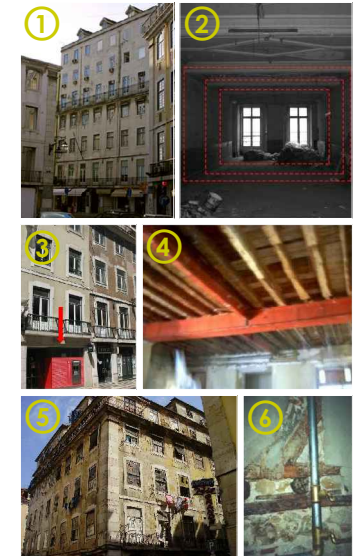
## DOWNTOWN'S PROBLEMS NOWADAYS:

- 1 - Uncontrolled floor addition in 70% of the buildings;
- 2 - Gaiola Pombalina removal, which is essential to seismic activity prevention;
- 3 - Pillars removal at ground floor level, to enlarge shop windows;
- 4 - New materials usage which no longer respect the original Pombaline' structure;
- 5 - Lack of concern about building rehabilitation;
- 6 - Introducing new infrastructures.

- About 35% of buildings are in a bad state of repair.



— Most important streets



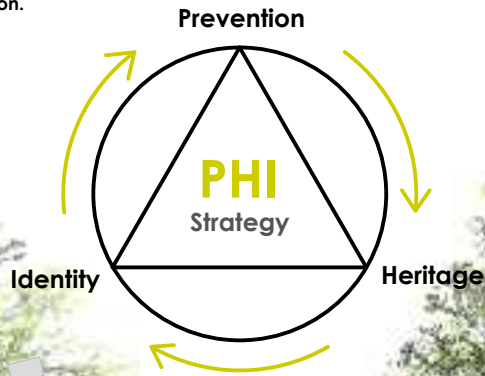
**03** Ana Luisa Gonçalves  
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# PHI Strategy



- Planned according to Lisbon's biggest social necessities;
- The 3 main points of strategy: Prevention, Heritage and Identity;
- As a pre-disaster measure, this symbolic building is erected and placed in one of the most important squares.
- This building uses the same constructive solution of the temporary units.
- Therefore, people have the opportunity to know the solution beforehand, being familiar with it.



## Square's Characteristics:

### Vehicle route

(To be unobstructed as soon as possible, for governmental services' access)

### Pedestrian route

(Maintaining the part of the square designated as public so that Lisbon's inhabitants can have their most familiar social space.)

### Shelter and housing spaces

(Defining spaces where people freely choose how to have their residence - oriented to family members, street, or even the most private spaces of all - their decision.)

● PHI Building

## Pre-Disaster



Prevention  
Heritage  
Identity

## Post-Disaster



Temporary  
Shelter



Temporary  
Housing

## Long Term Recovery



Recovery of the structure  
and materials to be used in  
the permanent housing.

### Prevention:

- Existent building rehabilitation;
- PHI building to sensitize people to the Pombaline Downtown's preservation.

### Heritage:

- Using the Gaiola Pombalina on temporary housing and re-using it on permanent buildings;
- PHI building, model of this structure, capable of honoring the system's historical and anti-seismic value, alongside with the assembling facility and adaptation versatility.

### Identity:

- Social concern about upholding same routines, habits and space usage - familiar environment;
- PHI building existent before and post catastrophe, recognized then as a support center.

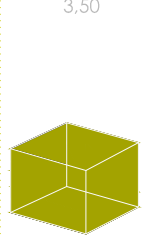
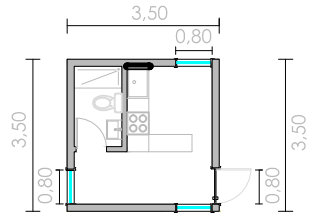
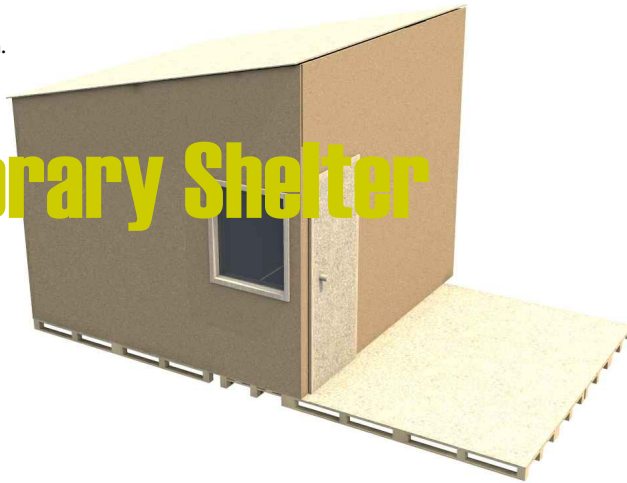
**04** Ana Luisa Gonçalves  
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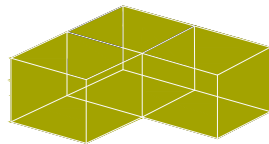


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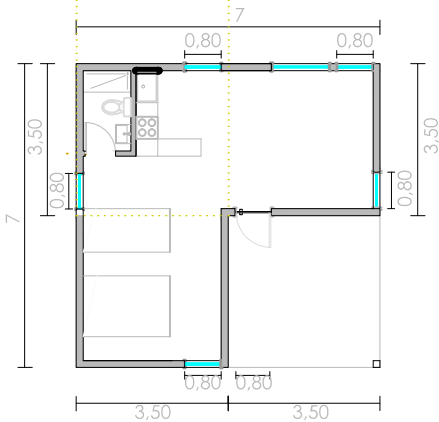
# Temporary Shelter



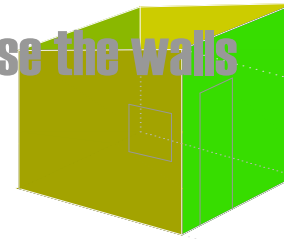
Modulate structure



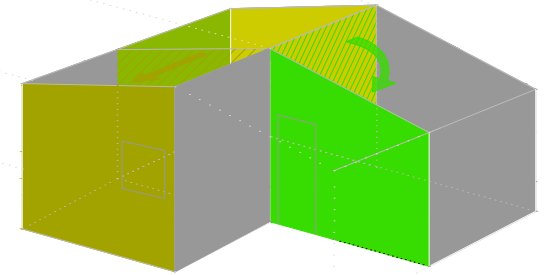
Versatile windows



Reuse the walls



# Solutions



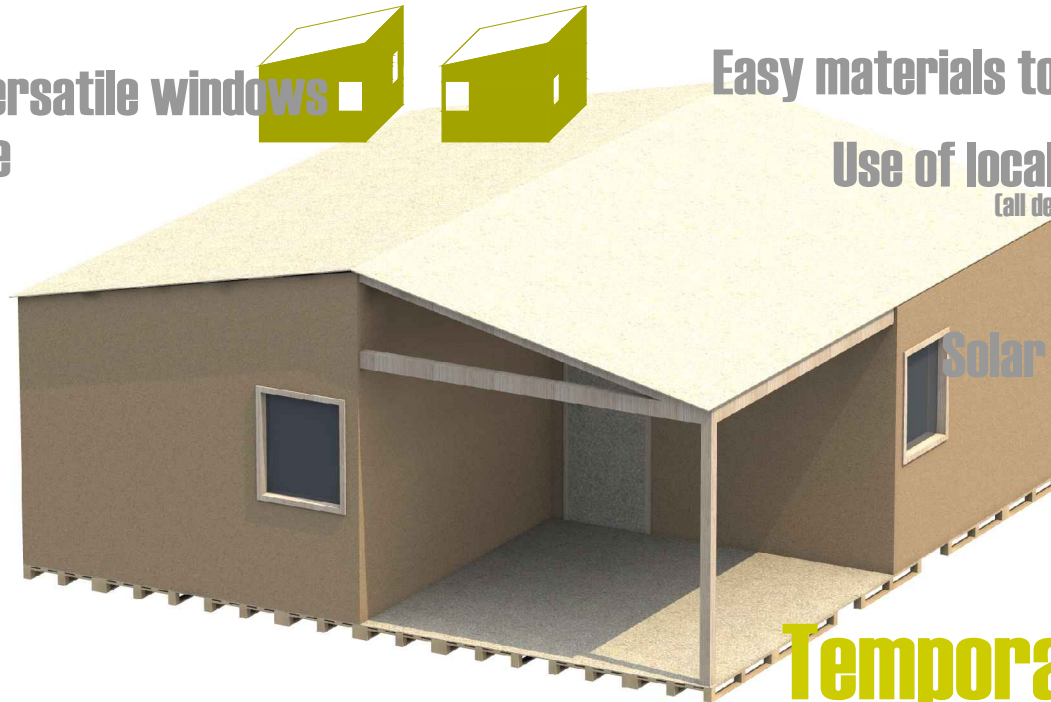
Easy materials to transport



Use of local materials  
(all derivative of wood)



Solar energy resource



# Temporary Housing



Private  
A house with identity



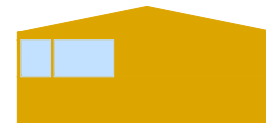
Semi-private  
The house's porch, second layer of pallets



Semi-public  
The first layer of pallets



Public  
The square's original pavement



# 05

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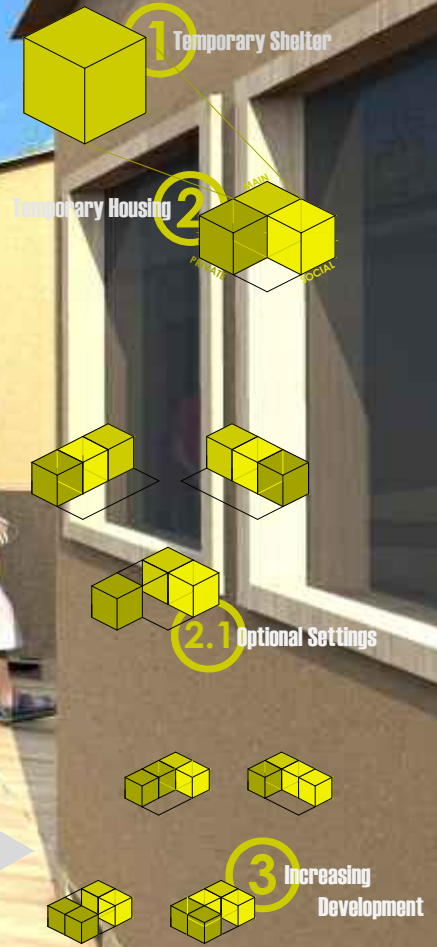


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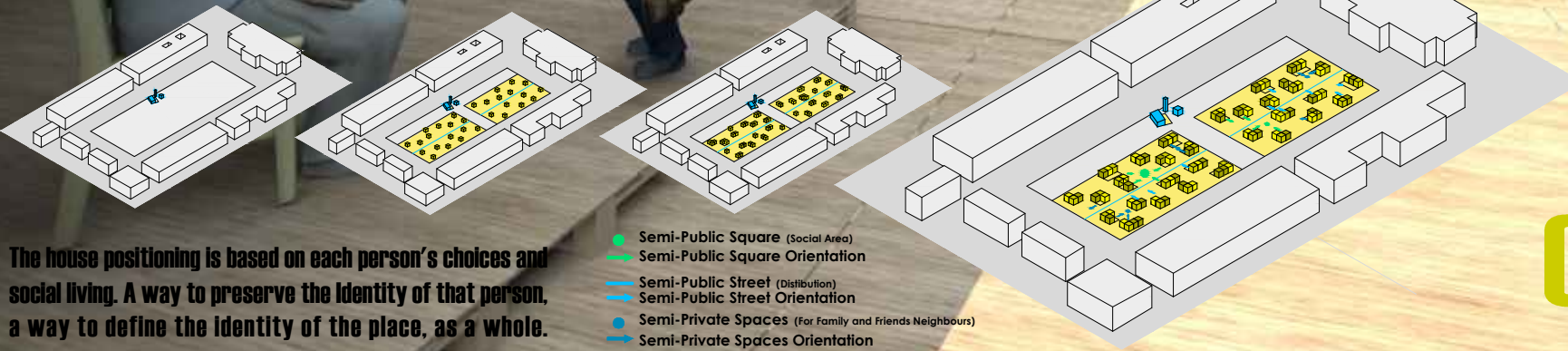
PRESENTATION CONCEPTUALIZATION ANALYSIS STRATEGY SOLUTIONS IDENTITY CONSTRUCTION RECOVERY

# Identity

A place to live where each one refines their Identity  
Social Areas  
Main Module  
Private Areas



## Urban Development



- Semi-Public Square (Social Area)
- Semi-Public Square Orientation
- Semi-Public Street (Distribution)
- Semi-Public Street Orientation
- Semi-Private Spaces (For Family and Friends Neighbours)
- Semi-Private Spaces Orientation

**06** Ana Luisa Gonçalves  
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The house positioning is based on each person's choices and social living. A way to preserve the Identity of that person, a way to define the Identity of the place, as a whole.

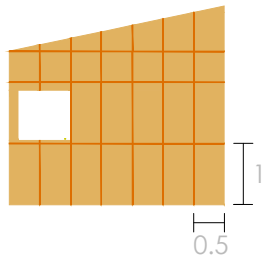
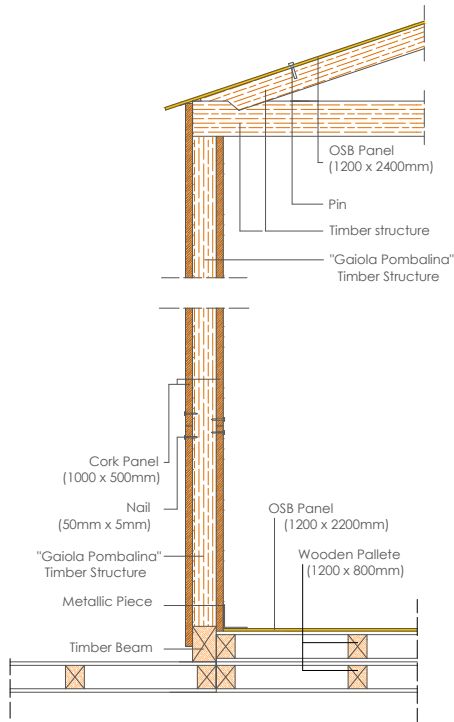




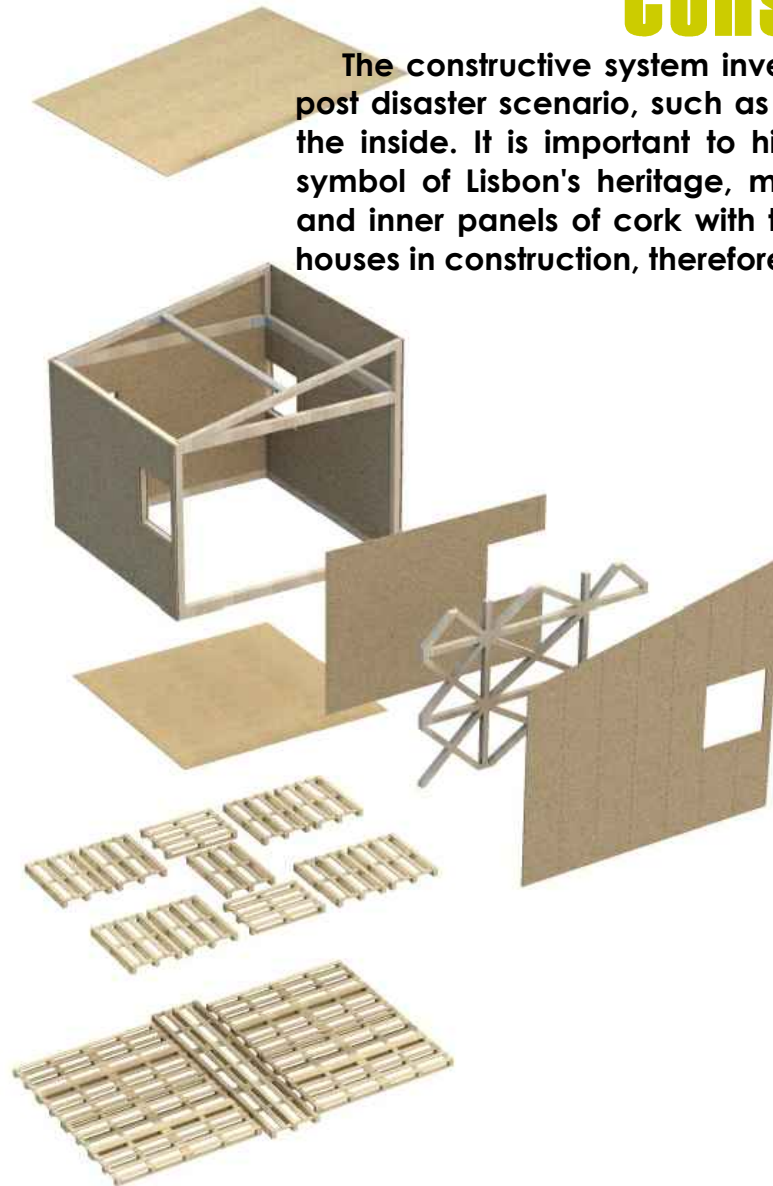
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# Constructive System

The constructive system invests in the most sustainable materials to the post disaster scenario, such as materials propitious to people's comfort on the inside. It is important to highlight the Gaiola Pombalina which, as a symbol of Lisbon's heritage, may be transported alongside with the outer and inner panels of cork with the function of insulation, to the permanent houses in construction, therefore transforming it into a cyclical use.



Maximum use of the cork pannels standard sizes, in a way to avoid material waste.



The Gaiola Pombalina, besides representing an iconic symbol of Pombaline's system, is also an excellent anti-seismic structure, as the wood that constitutes it is a very effective material, when it comes to dissipating forces.

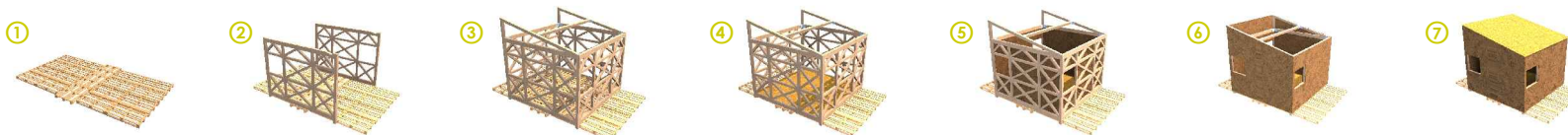


Cork is a very used material in the buildings outer walls and in insulation. Some of its main characteristics are:

- Excellent insulation both thermal and acoustic;
- Easy workability;
- Light material;
- Manufactured in standard panels;
- Completely impermeable;
- Visually appealing and warming.

Cork is a massively produced material in Portugal, which represents more than 50% of its worldwide production. Therefore, the economy of use in a post catastrophe situation, is extremely favorable as well as the short distance transportation consequently reducing the response time.

## Assembling Process

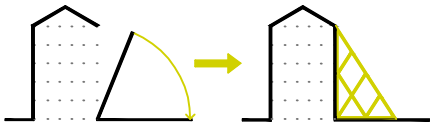


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## The Counterfort

From the Pombaline's structure, it will be developed a reversible counterfort structure which, in the post-disaster process, will prevent already damaged buildings from completely collapsing. This process will aid in people's safety and also allow the recuperation of the building.



## Disassemble the temporary housing:

The materials used in the temporary houses will be almost fully reused in the construction of the permanent residences.

The mechanical connections make possible to disassemble the pieces without them being damaged, and therefore transported to a place and use. Since the structures also don't puncture the square's pavement, it will still maintain the same familiar identity know to the population: The so symbolic and charismatic "Calçada Portuguesa".

The Gaiola Pombalina and its cork panels (now acting more as an asset in the thermal and acoustic insulation), will be used as anti-seismic interior walls in the reconstruction of the downtown's buildings, contributing to the heritage conservation, safety, and avoiding investment wastes. The Gaiola Pombalina will now have its empty spaces filled with wreckage from the earthquake, giving these some purpose and contributing to the cleaning process of the downtown, as it's been done after the 1755's earthquake.

