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A.
15-16
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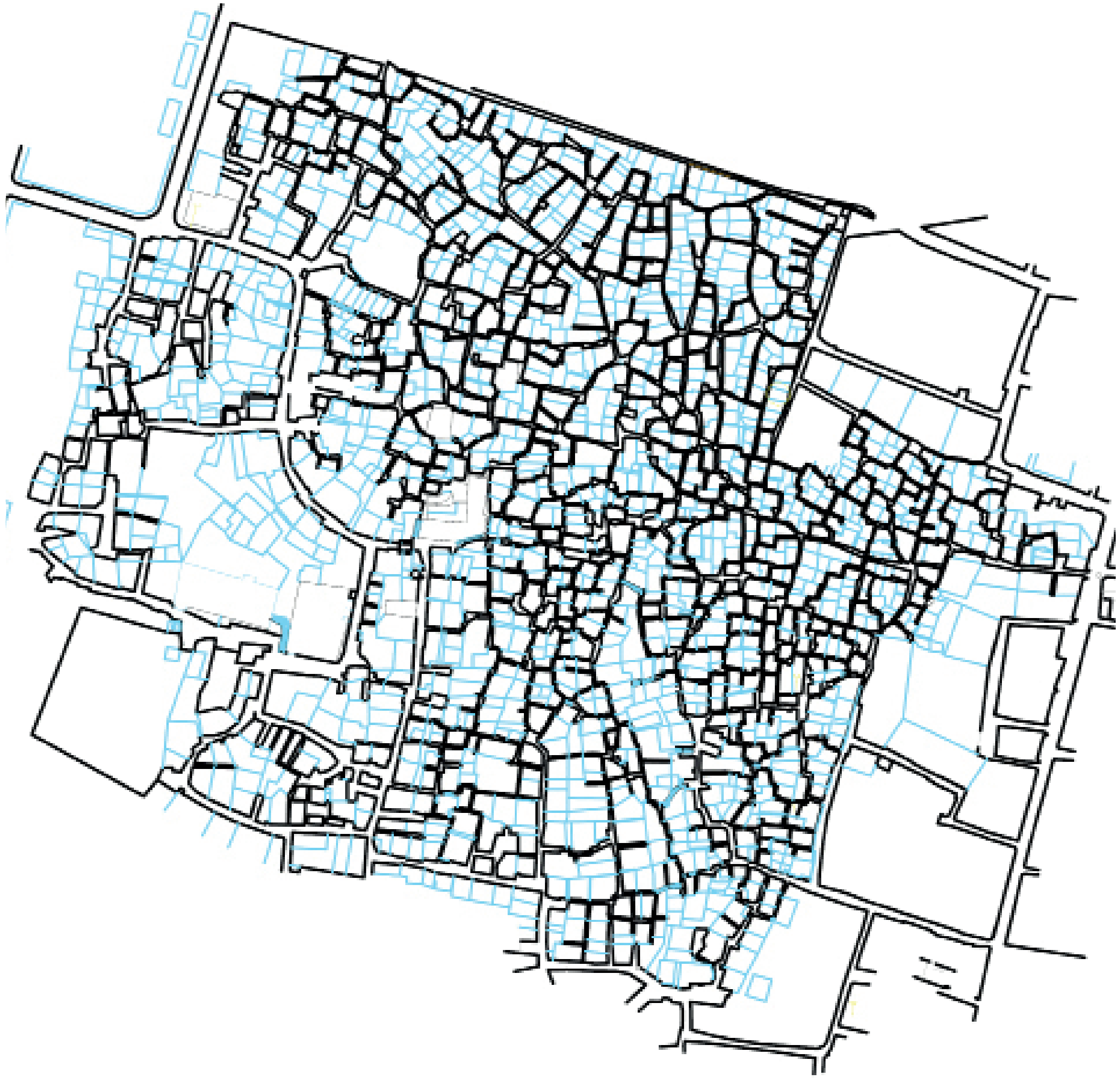


1.0

Design Guidelines for Reconstructing Camps in Beirut

AL Burj Prototype

Dissertation Project I September 2016

Abstract

Refugee settlements in Beirut, particularly Palestinian, have developed over 63 years, from being temporary shelters to deteriorated slums...The chaotic self-built constructions coupled with lack of funding and absence of building codes, regulations, and or government supervision, transformed the camps into random concrete morphologies, lacking any quality of life. On a larger scale, the camps became misery holes within the city urban fabric.

The suffering of the camps dwellers and the architectural challenge to rebuild sustainable dwelling structures, have enticed the choice of the topic.

This thesis will provide sets of design parameters for reconstructing those camps in Beirut. Hence, granting the refugees a suitable architectural substitute that compromises economic, environmental and social aspects.

The potentials of refurbishment were researched at the beginning of the study. However, due to the extremely poor unit structures and lack of urban spaces, the choice of refurbishment was dropped in favour of the reconstructing alternative.

In order to do so, camp design was investigated as on three different levels: the urban, unit and relationship between urban and unit. Indoor and outdoor comfort criteria, lessons from vernacular and other built precedents and socio-spatial camp considerations, were also studied in order to develop a starting point (base case unit).

Afterwards, the impact of different design parameters (mainly urban canyon, density, cost and geometry) were duly analysed on the urban and unit level, through simulation (using: Open Studio 1.10.0, Grasshopper and Rayman v 2.2) in order to upgrade the base case and select its proper urban morphology. The Burj Al Barajneh Camp, south of Beirut, was chosen as the design application site, where the upgraded base case was tailored to the density conditions of the site and simulation (ventilation, thermal and daylight) to verify the environmental efficiency of the proposal.

The results, courtyard conglomerates of different heights (maximum five floors) and generally SW oriented, were found to be environmentally and economically feasible solutions. Diverse outdoor spaces with dissimilar plot patterns were suggested.

The conglomerates are made of free running housing units (90% of the time). Multifunctional room dominated those units. A 15 % window to floor ratio of single glazed windows was a good balance between them and economical parameters. The low WFR hindered the effect of sun exposure on the units.

Methodology Tree

I Camp Analysis

Urban Level
- Density
- Sun lit Pathways

Unit Level
- Thermal comfort

Detect the problems

A
Construction methods
Standards
Socio-spatial
Environmental Considerations

Literature Overview

B
Sustainable Thermal Standards for Residential building in Coastal cities of Lebanon

Understanding the current situation in informal settlements in Lebanon

Environmental strategies on building sustainable Mediterranean cities

Case studies

Build Precedents

II General Guidelines

+

C *Preliminary Base case Unit Plan*

In-adaptive | Adaptive

In order to select wall material. An insulation investigation had to be done. Simulations were carried out of whether an adaptive or indaptive insulation strategy is better for the wall .

therefore an assumption of :
** Urban canyon - according to average sun*
** WFR - according to Lebanese Standards tested*

D *Base case unit with materials (assumed urban canyon width)*

E *Upgrade the assumed Parameters*

F Base unit and urban morphology

G *Density & thermal studies*

VI BURJ Specific Proposals

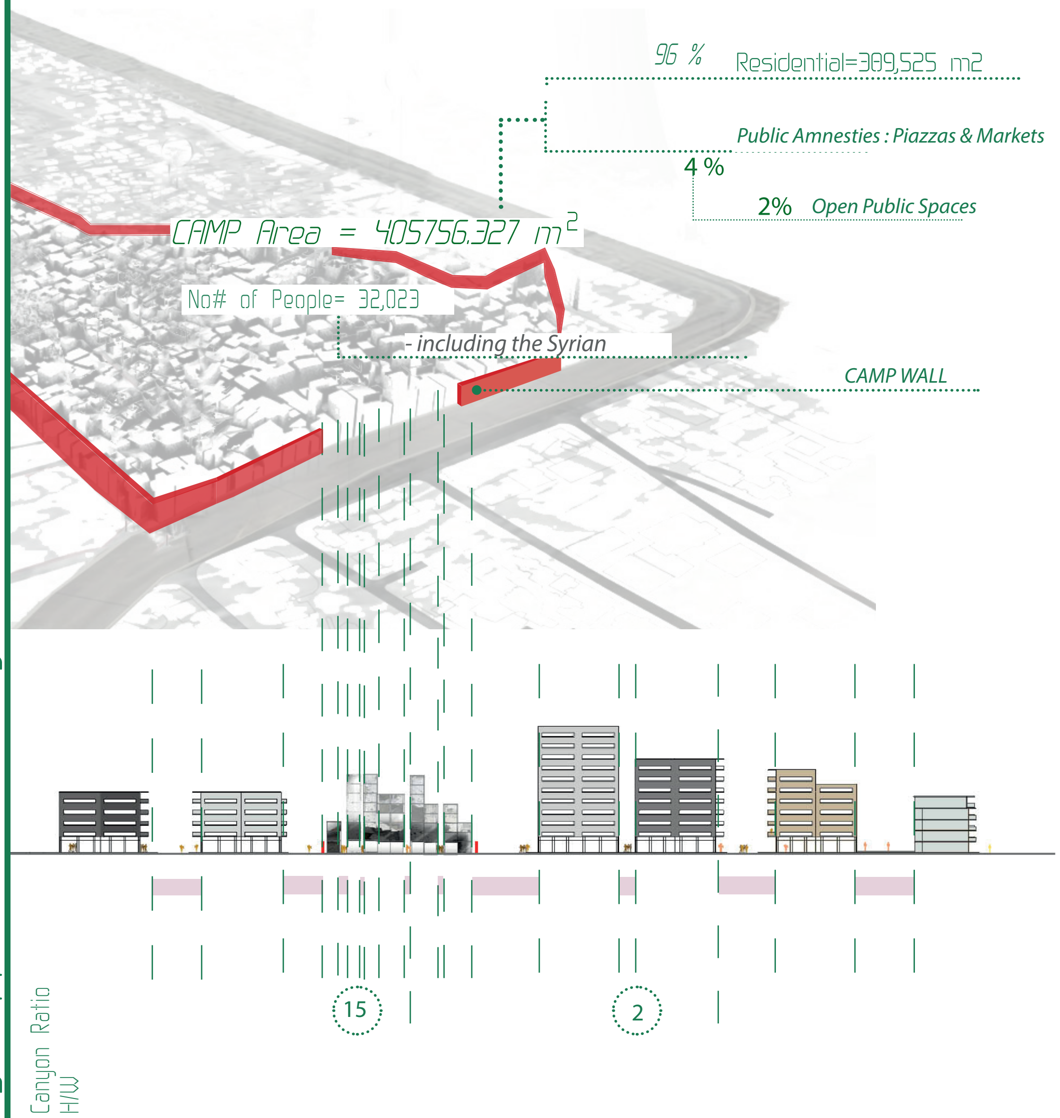
Strategies

VII Design Guidelines for Reconstructing Camps in Beirut

Design Application: Al Burj Case

Brief

The main goal of this architectural proposal is to define a series of feasible strategies that work to improve the camp living conditions and its role within the urban fabric. The main focus of the project is the residential units within the camp that occupy 96% of its total area.



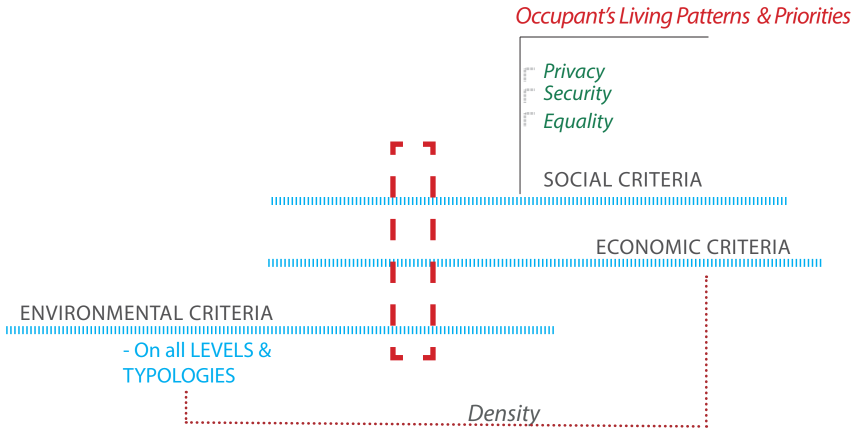
A diagram showing the camp specs (area, function distribution, demographics) and a canyon ratio comparison with the rest of Beirut.

"Our generation, where are we going to live? There is no place in the camp and we cannot own property outside."

Muhammad Hamady
(Amnesty International, 2007a)

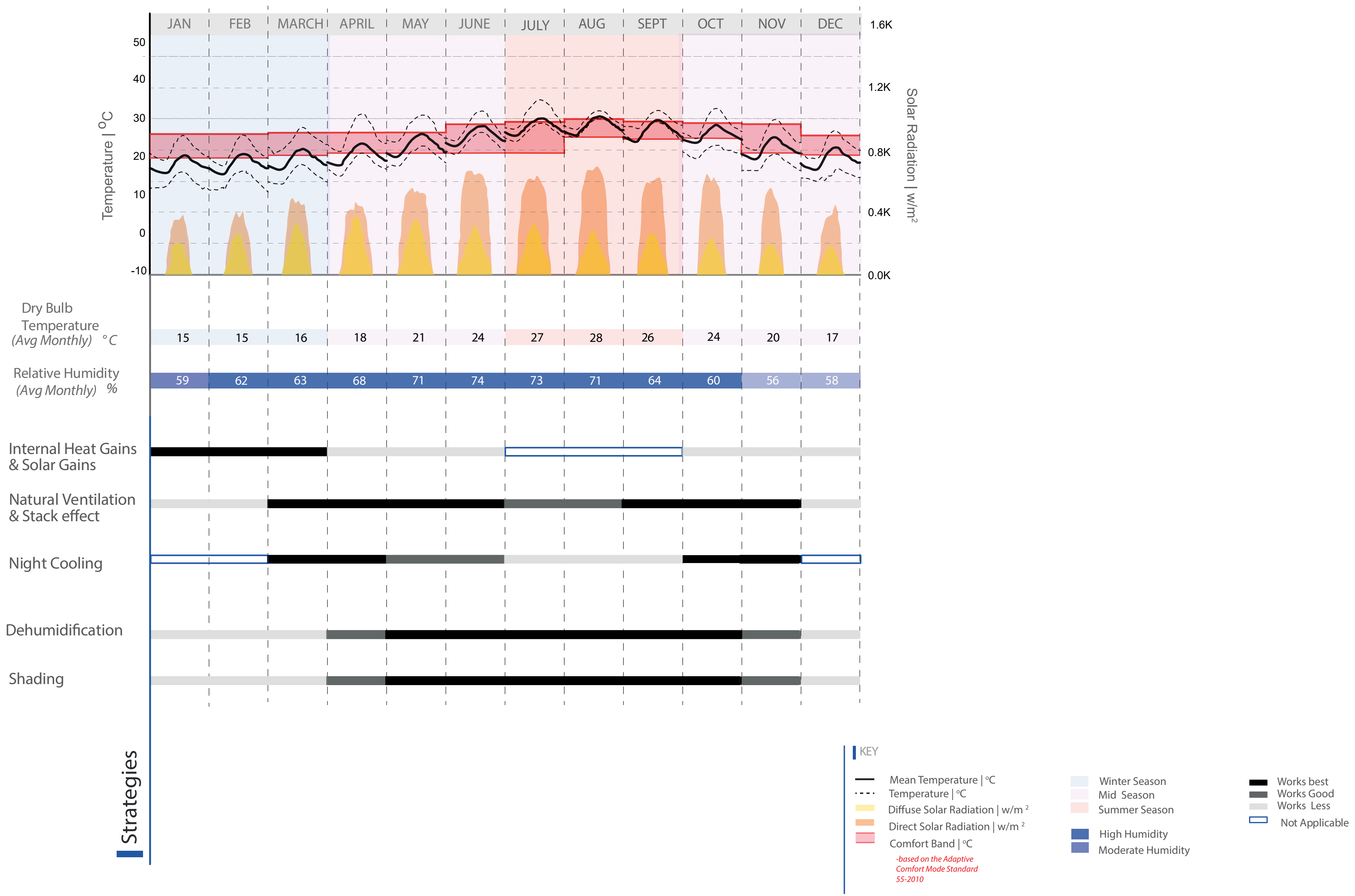
Deteriorated building envelop, showing the structure, and affected by the bullets in the Burj camp

The Balance Component



A diagram showing the balance component criteria of camp design, on which the decisions in this project were made.

Beirut's Climatic Analysis



Annual summary of Beirut's weather and the respective solar and diffused radiation. In addition to a monthly assessment of the efficiency of the passive strategies, based on criteria from literature I Data I Source: Climate Consultant 6.0 and Metronome 2015).

Creating the Base Case Unit

Current CAMP
Situation
Area = 83m²

STANDARDS
Area = 110 - 120 m2 -*(Parker Morris)*

BASE-CASE PLAN
Area = 102 m²

Why a straight grid?

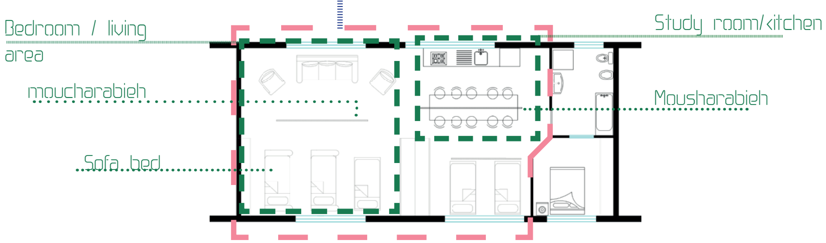
Lower cost

Easier to built (self built)

Easier to control (while building,and after building, security)

Narrow Floor Plan
SW Oriented
Cross Ventilated
Open Plan

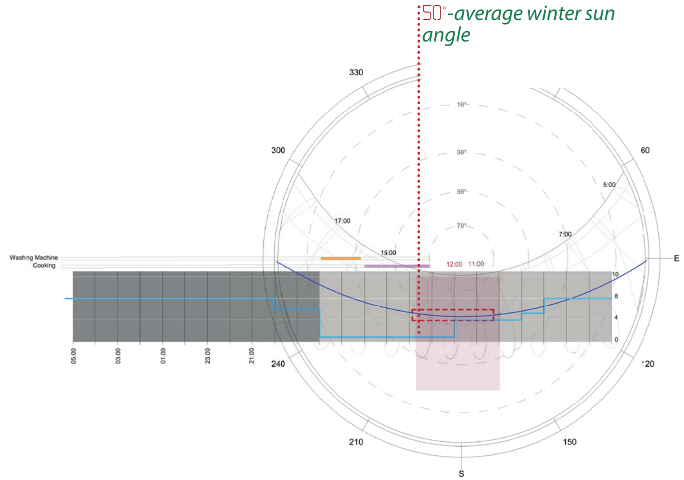
Multi-functional Rooms (80 % of the space)



Base case plan.

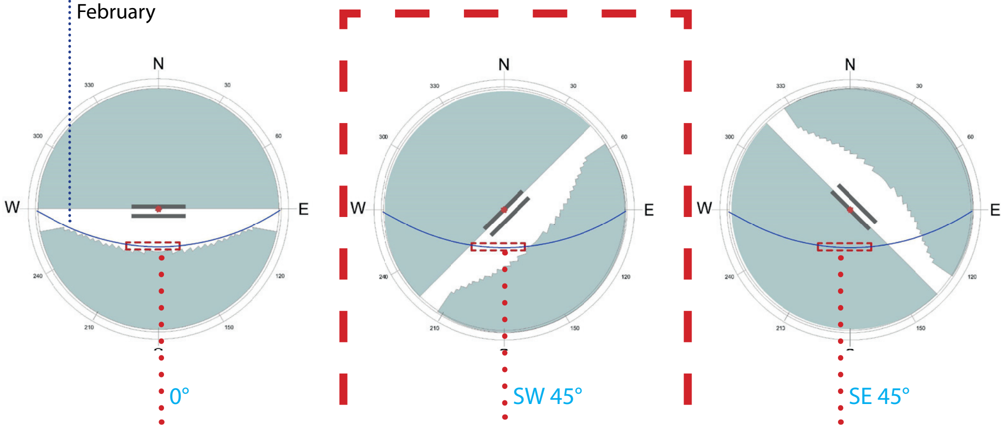
"We need the Sun from 11am to 1 pm"

-Camp Occupant



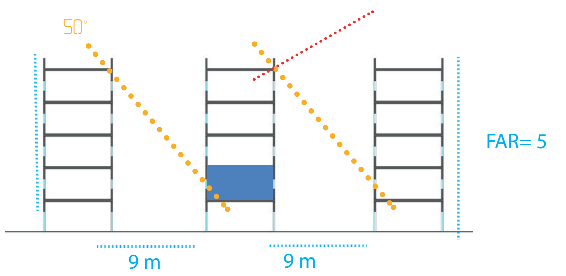
-Overlaying the occupant schedule on sun path diagram

Average Day :
Winter: 22nd of February



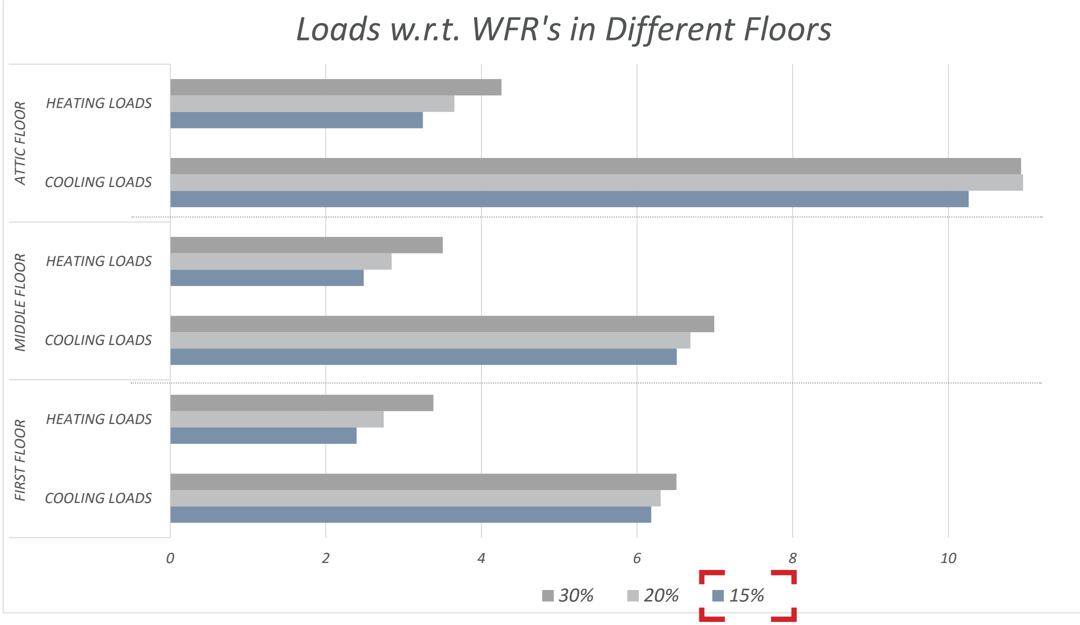
-Sky view factor

Diagram showing the sky view factor for different canyon orientations. (After: Grasshopper & Meteonorm v6.1)



-Urban ratio to be tested

A diagram showing the assumed urban canyon and height limitation.



Chosen

A diagram showing the overlaid the occupant schedule on sun path diagram - Sun path (Source: Grasshopper & Meteonorm v6.1)

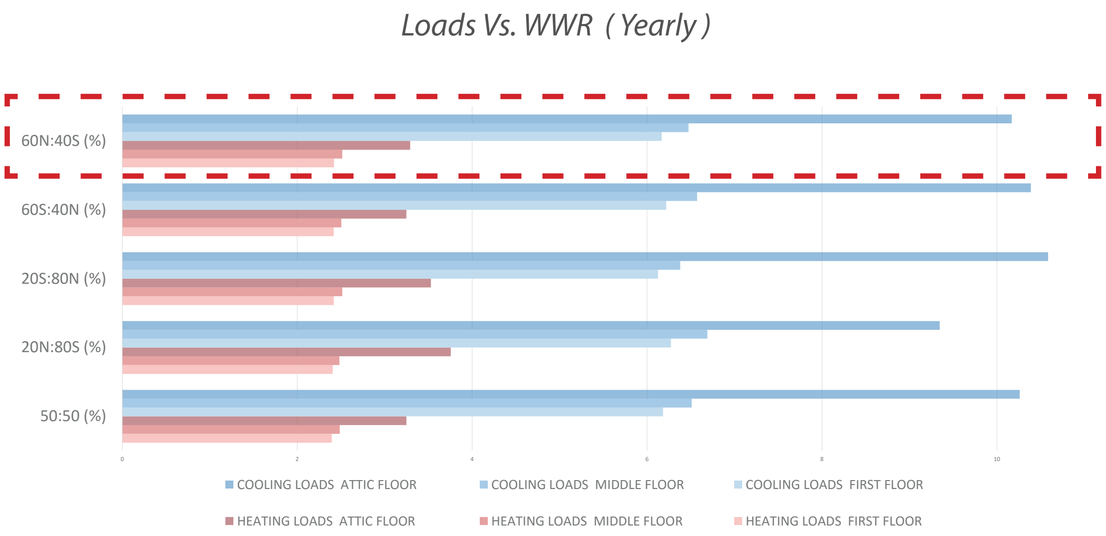
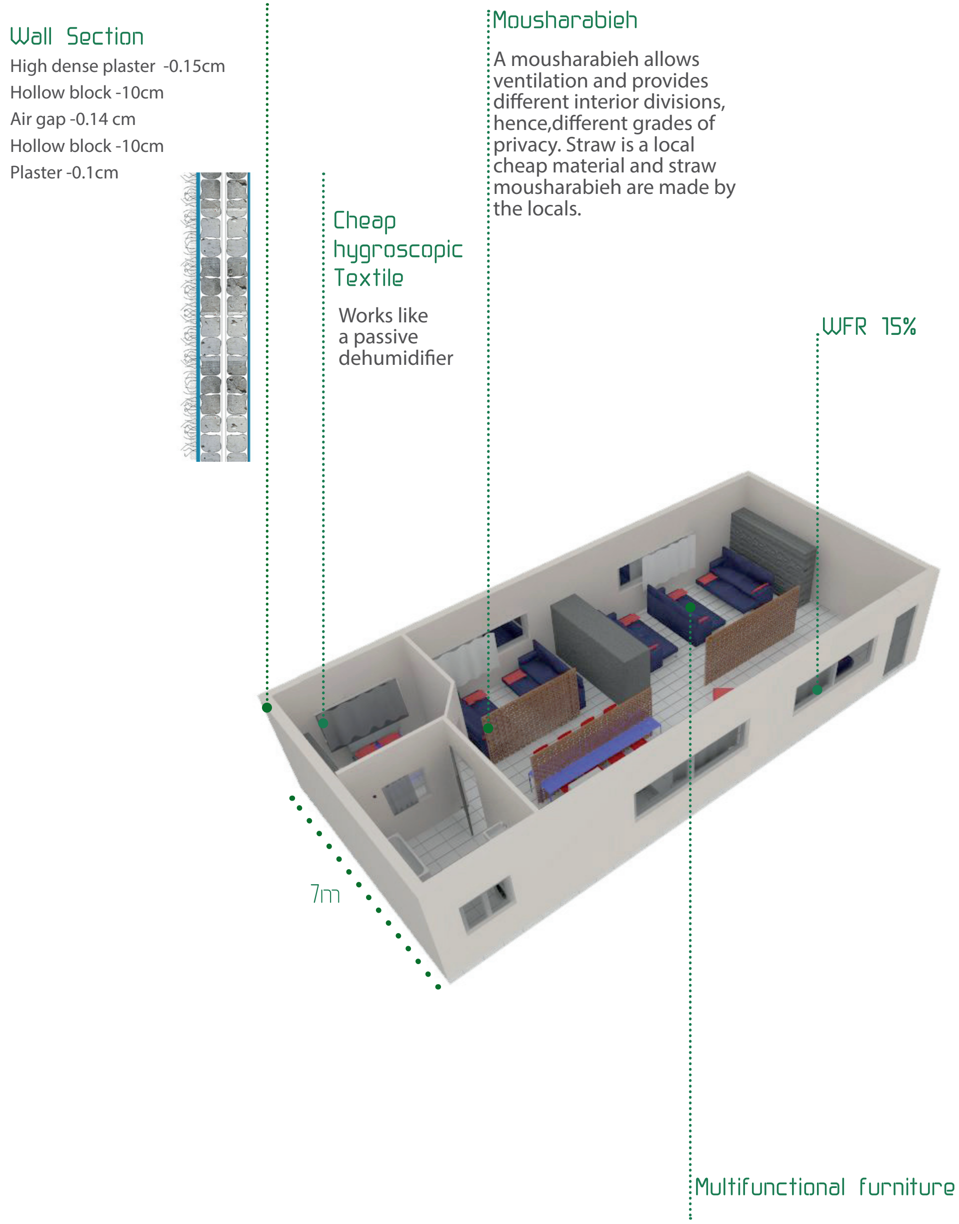
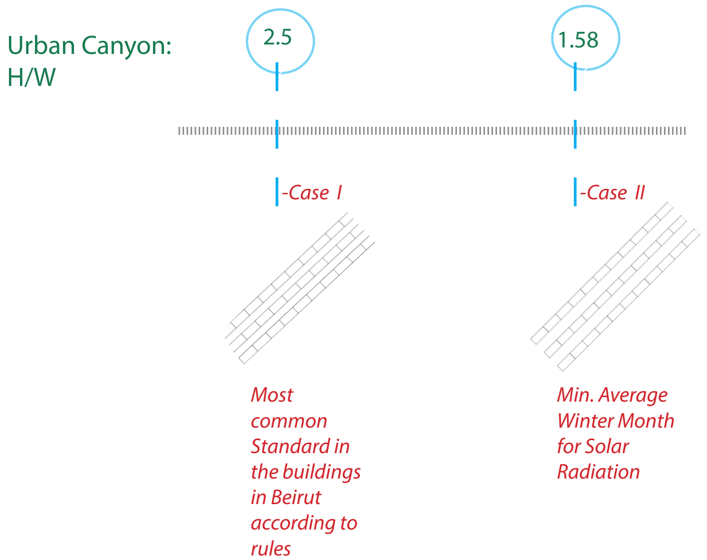


Diagram showing the yearly heating /cooling loads for the multi-purpose room with different WFR, on three floors (After: Open Studio v1.10.0).

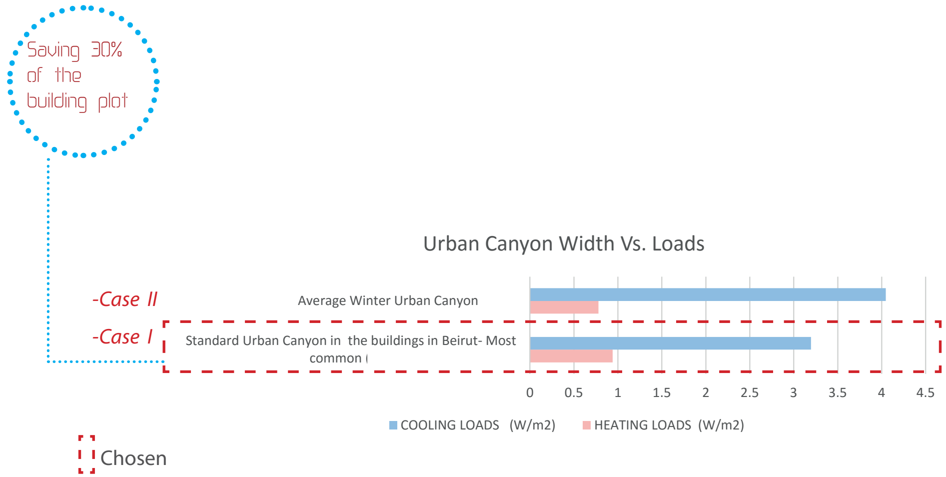


Generic base case unit showing the interior.

Finding the Urban Morphology



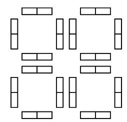
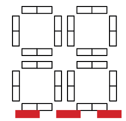
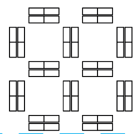
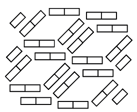
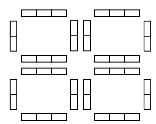
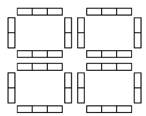
A diagram showing the tested urban canyon ratios (case I: H/W=2.5 I case II: H/W = 1.58).



A diagram showing yearly heating/ cooling loads of the multi-purpose room of the middle floor for two different canyons. (After :Open Studio v 1.10.0)

Morphology Vs. Density Studies

Camp Area= 389,525m^2 - without existing Public Amnesties
Number of people =33,000 - with the Syrian Refugees
Population Density =0.084
Canyon Ratio =W/H= 2.5= 6m -Main streets- inclusive of Fire Safety criteria

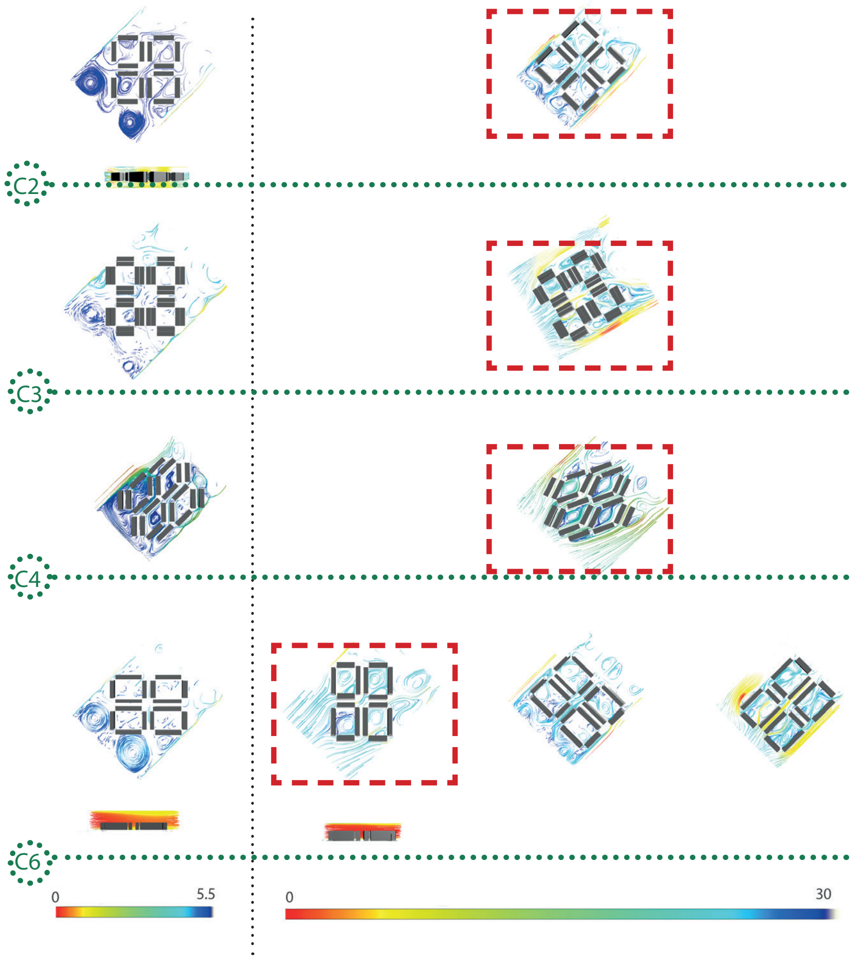
	Urban Morphology	Canyon Specs	Population Density [No# PPle/Area] (PPle/ km2)	No# of People in Camp Area
C1		Squarish Street width = 6m	78769	30,401
C2		Squarish Main Street width = 6m Secondary Street = 3.5m	89824	34,988
C3		Squarish Main Street width = 6m Building Typology: Corridors	128,449	50,034
C4		Rhombus Main Street width = 6m Secondary Street = 3.5m	95522	37,208
C5		Rectangular All Equal = 6m	77364	30135
C6		Rectangular Main Street width = 6m Secondary Street = 3.5m	0.037	34,385

A table showing the morphology Vs. density studies for Al Burj camp.

Urban level Studies: Ventilation Potential

A. Orientation Criteria

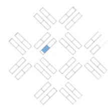
Three conglomerates C2, C3, C4 showed better ventilation potential when oriented SW and the C6 showed better results when elongated vertically.



A diagram showing the ventilation potential studies for the selected conglomerates of Al Burj camp

C2.A

Constants :

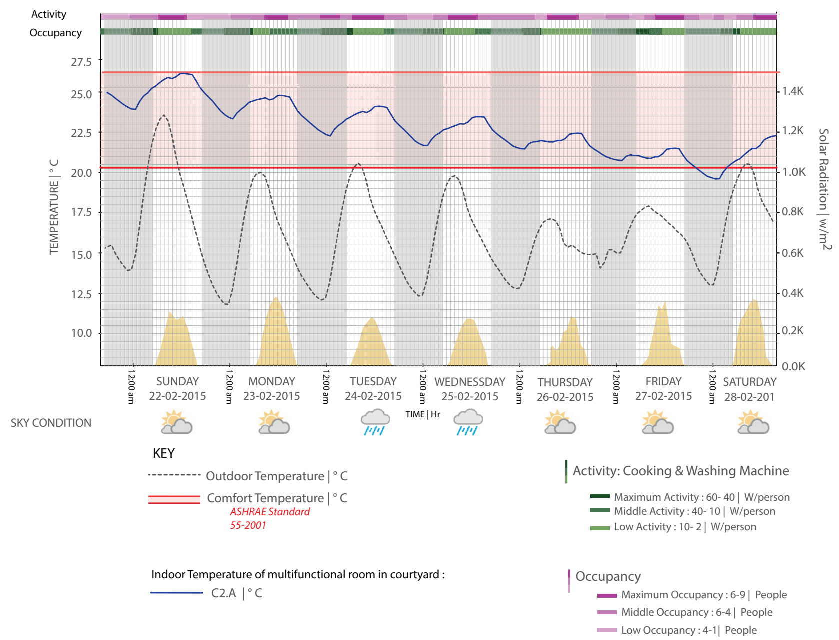


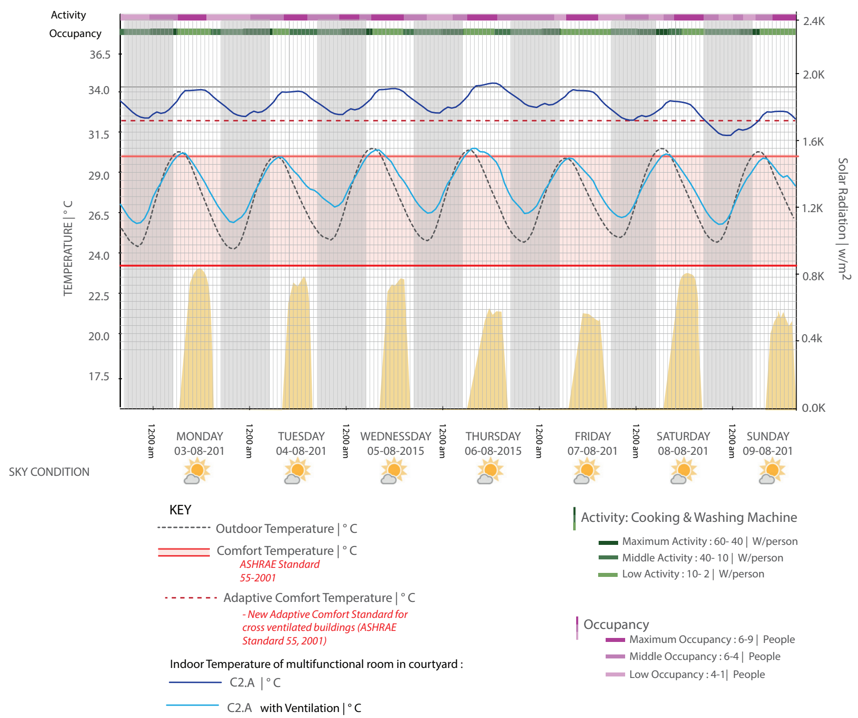
MIDDLE FLOOR

Min Infiltration: 0.91ach

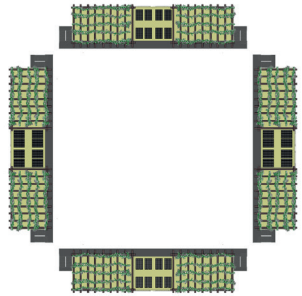
WFR = 15%
40%S - 60%N

Results of a simulation showing the thermal performance of the multi-purpose room C2.A inside the courtyard conglomerate during an average winter week.

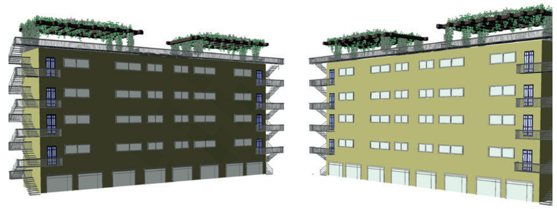




Interior rendering for the multifunctional room, showing the carpet walls, in winter.

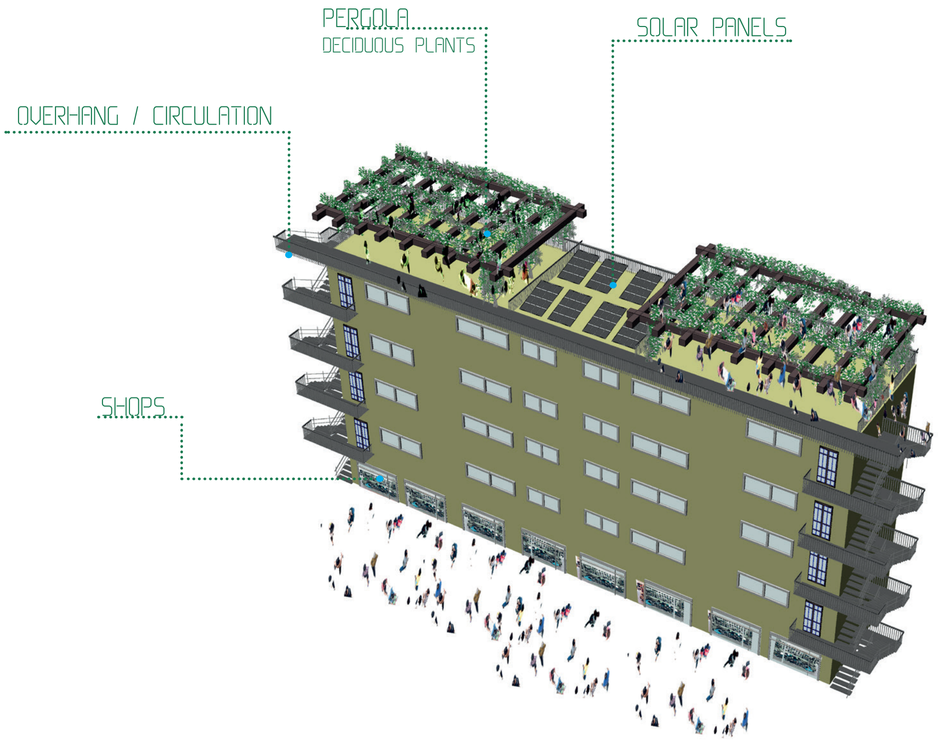


Top view rendering of the courtyard conglomerate C2.A, showing the pergolas and solar panel, and circulation/overhang.

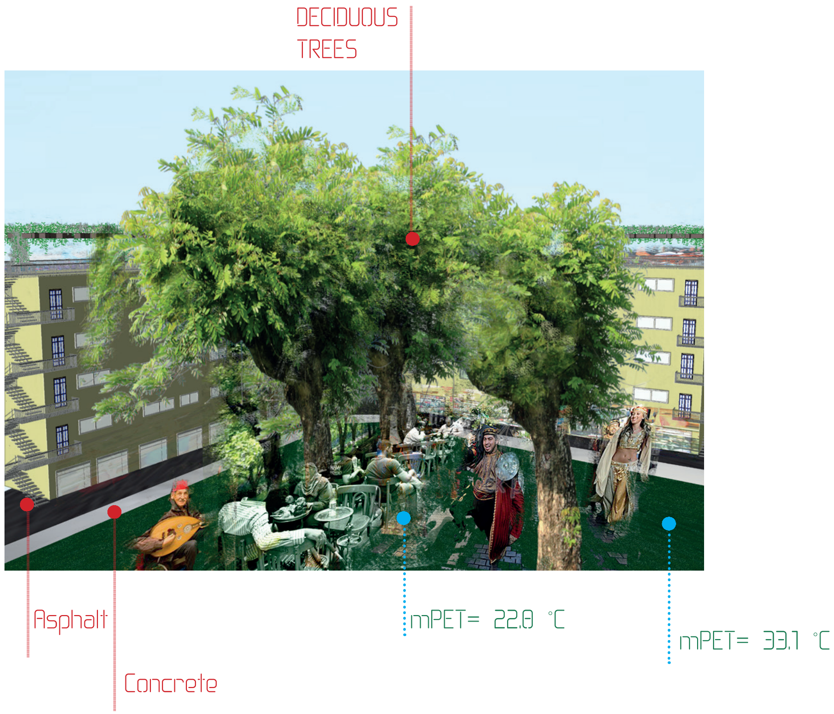


Rendering showing the interior view from the courtyard.

Interior rendering for the multifunctional room, in summer.

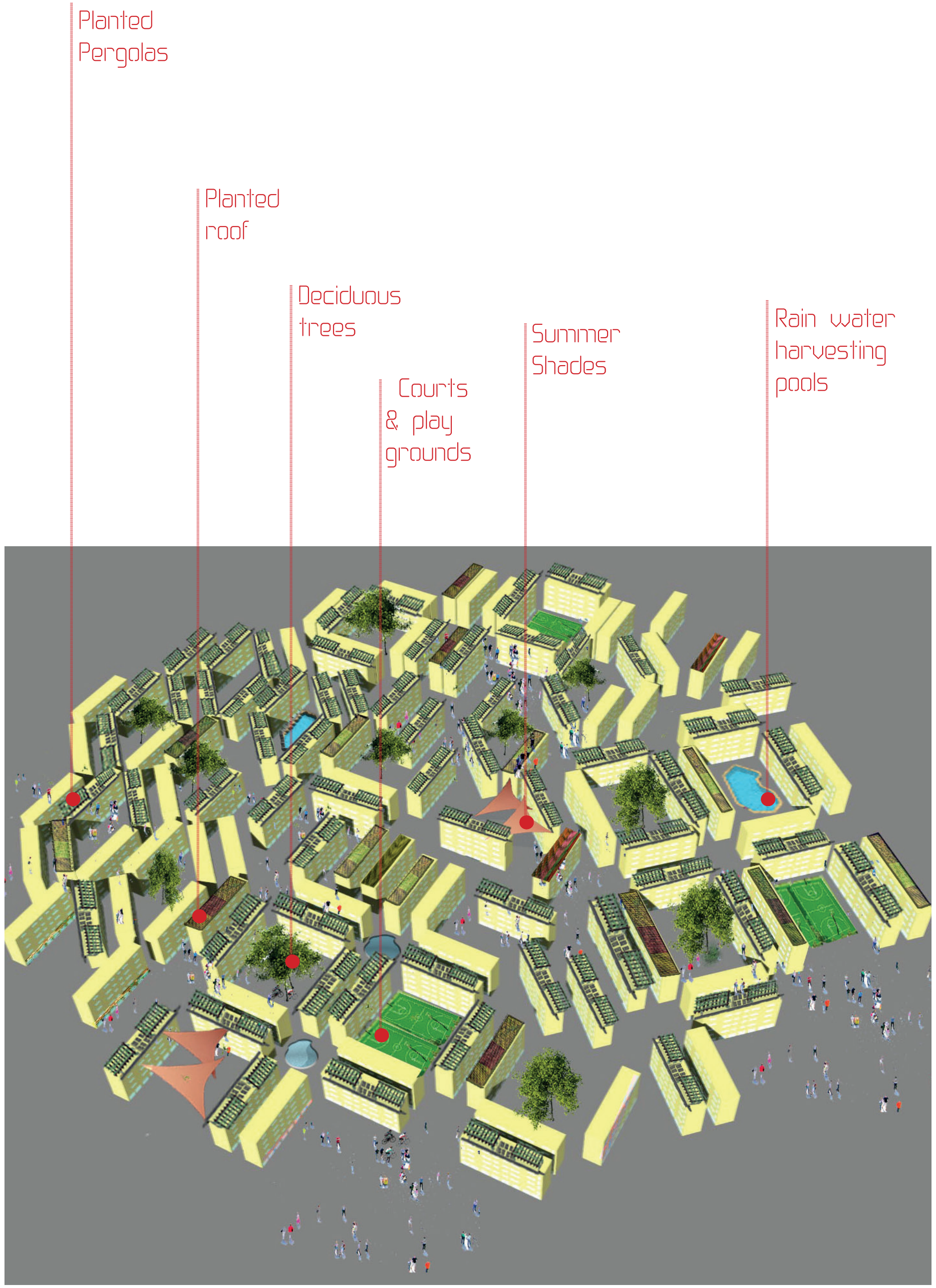


Rendering of one building inside the courtyard conglomerate C2.A, showing the pergolas and solar panel, and circulation/overhang.



Rendering showing the interior view from the courtyard & the ongoing outdoor activities, and materials in summer. For mPet parameters.

Rendering showing the interior view from the courtyard & the ongoing outdoor activities, in winter.



A rendered camp portion showing the different element constituting the variable outdoor spaces.