

Casa Batroun

Eco-friendly & sustainable house

March 2014



Existing Conditions

Exterior



Interior



Clearing the stone



Clearing the stone

Discoveries outside



Clearing the stone

Discoveries inside



Clearing the stone

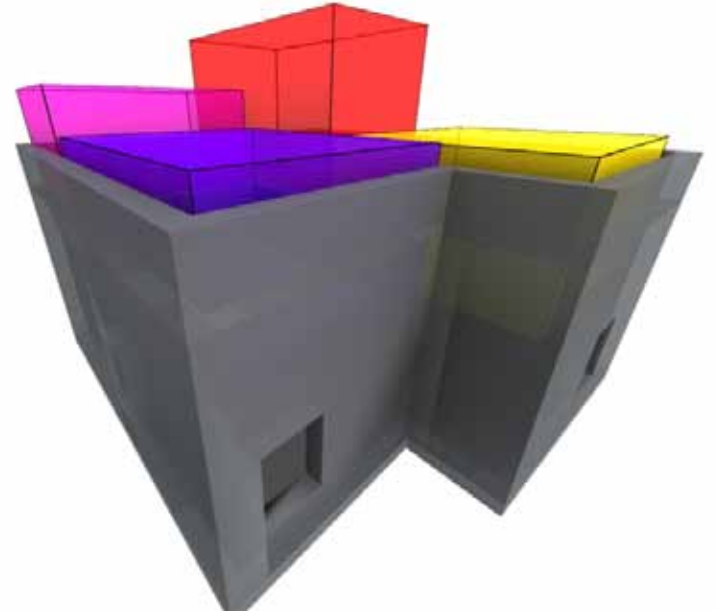
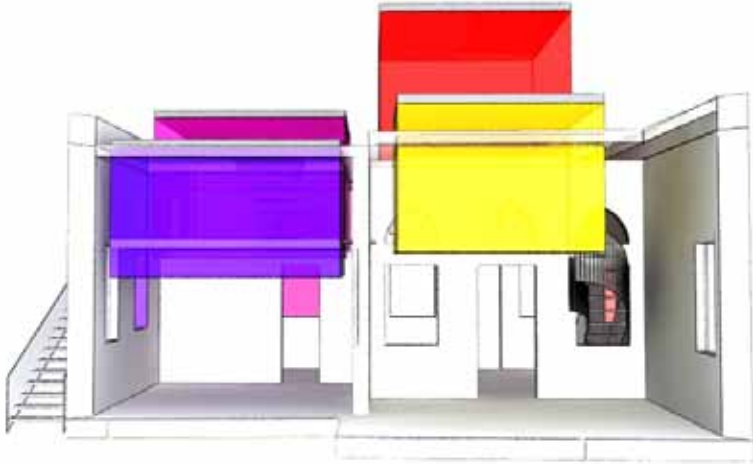
Discoveries inside



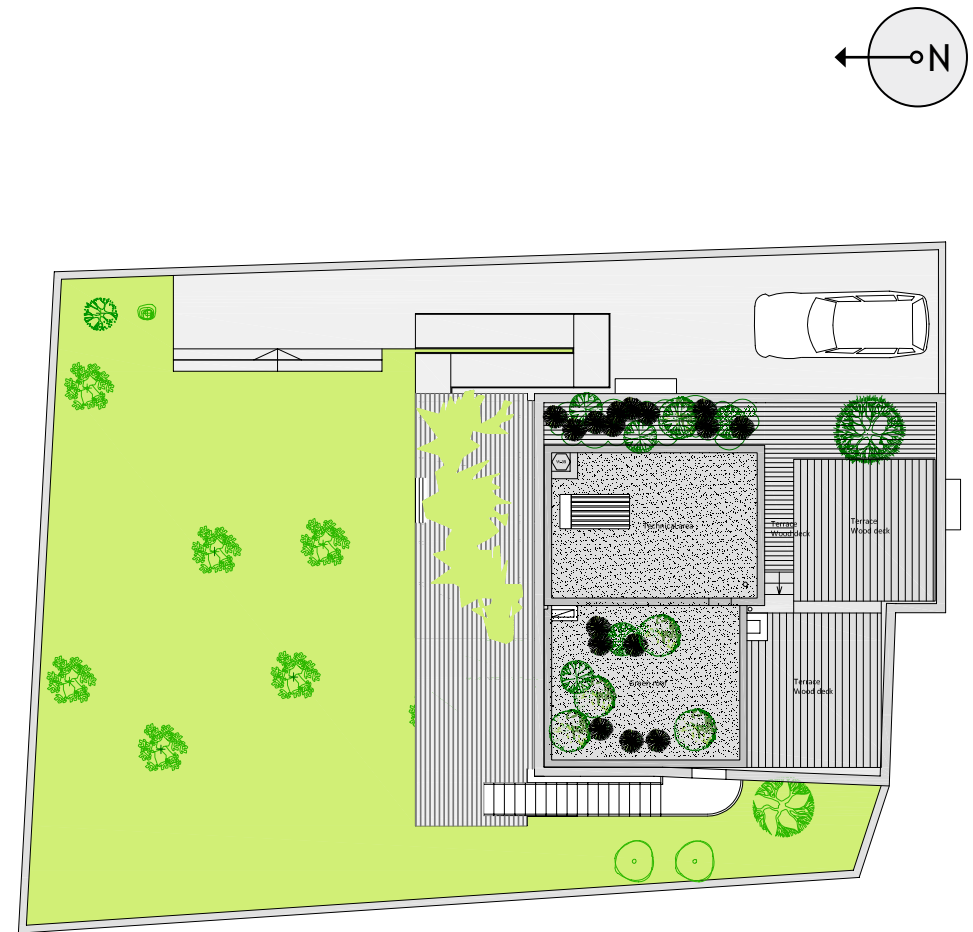
Concept

Volumetric Study

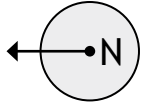
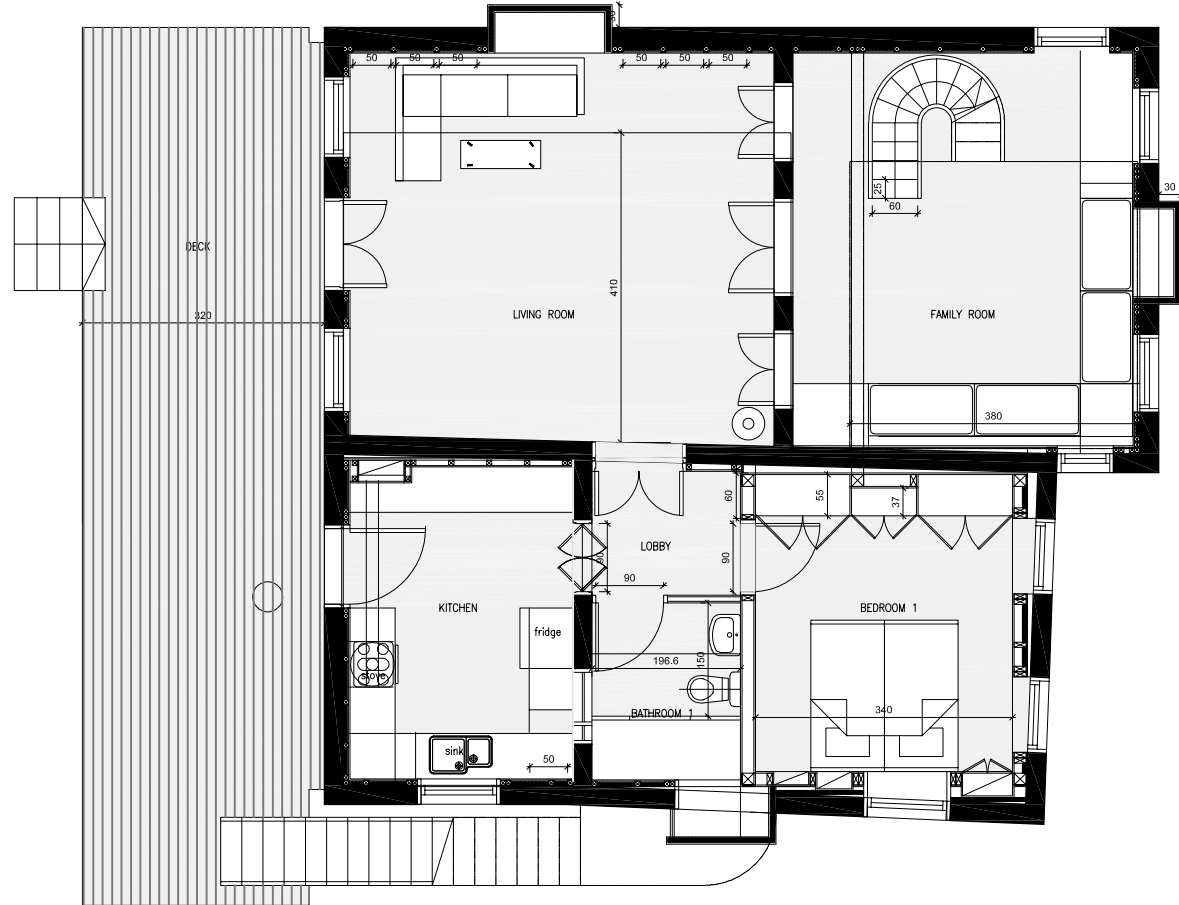
3-D



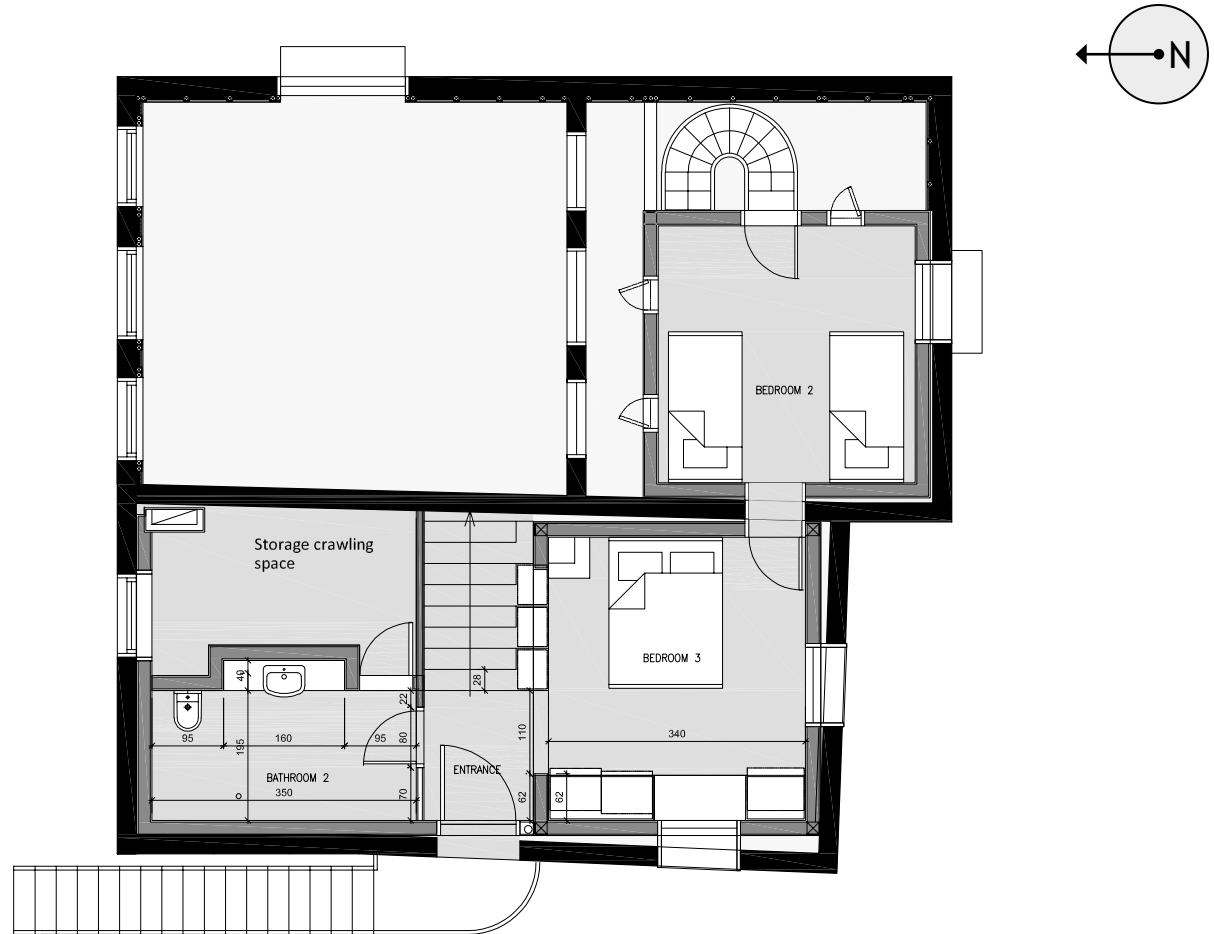
Top View



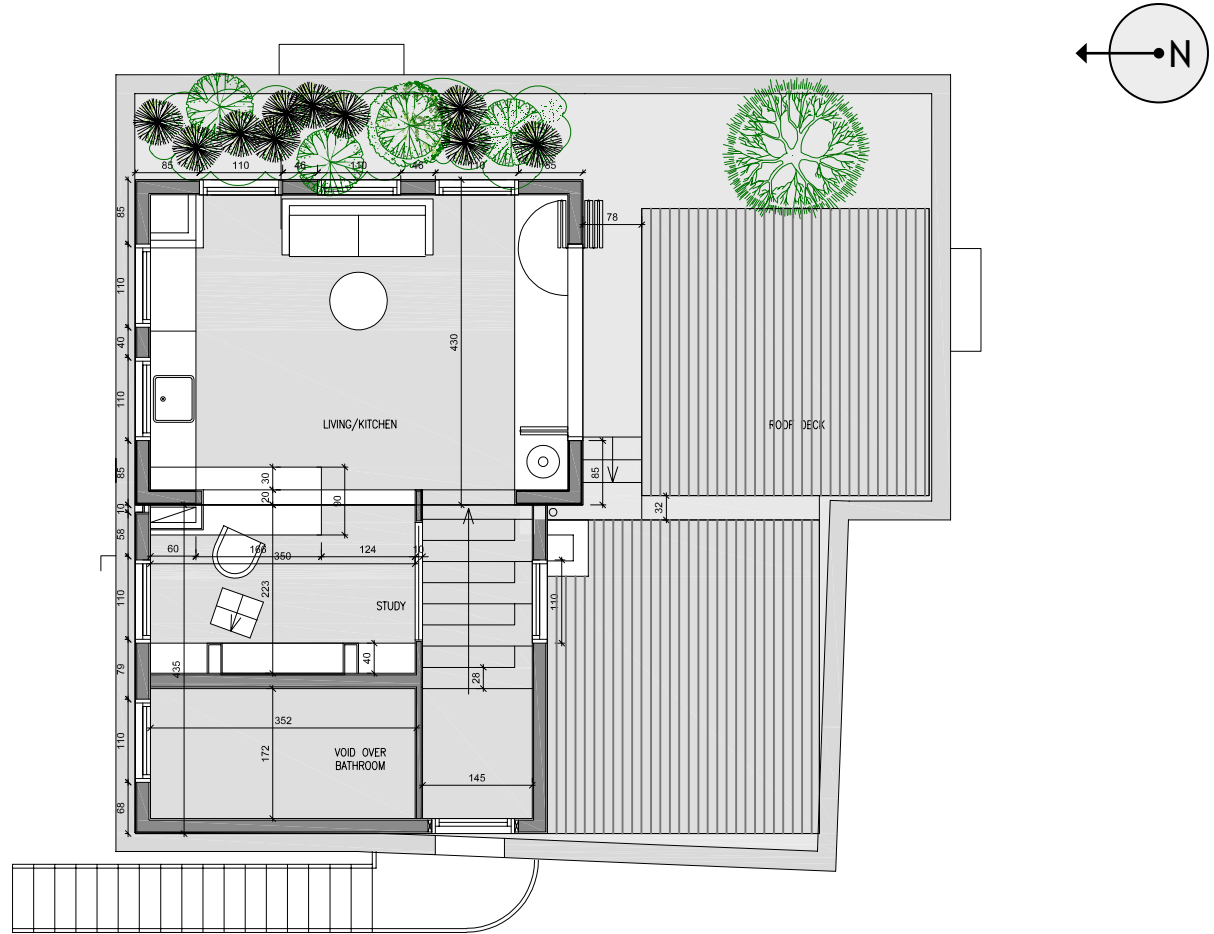
Ground Floor



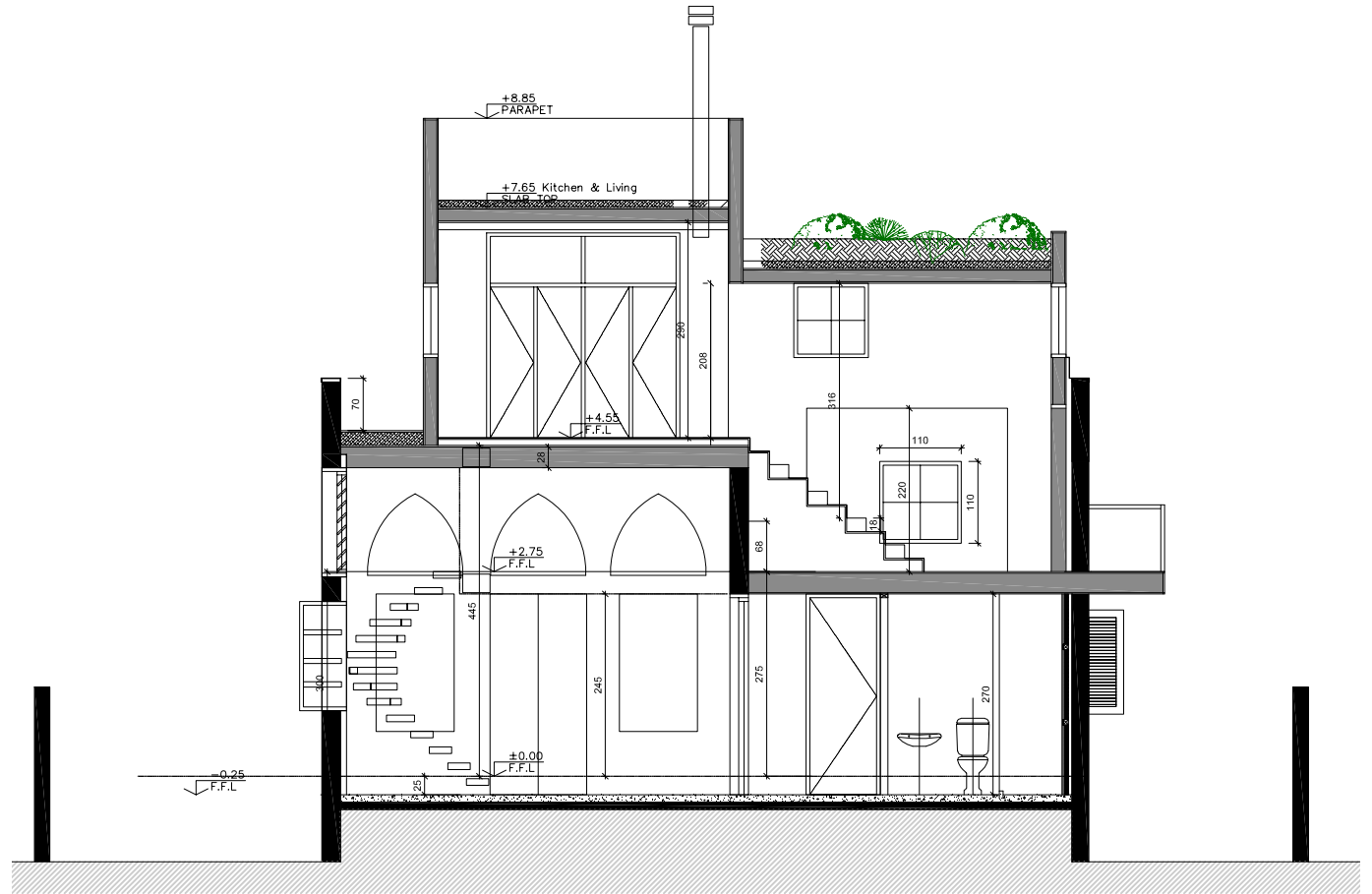
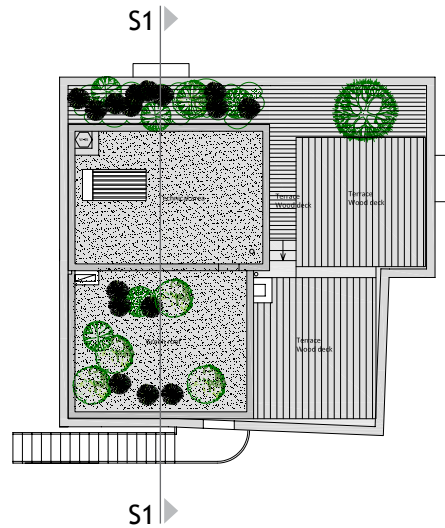
Mezzanine



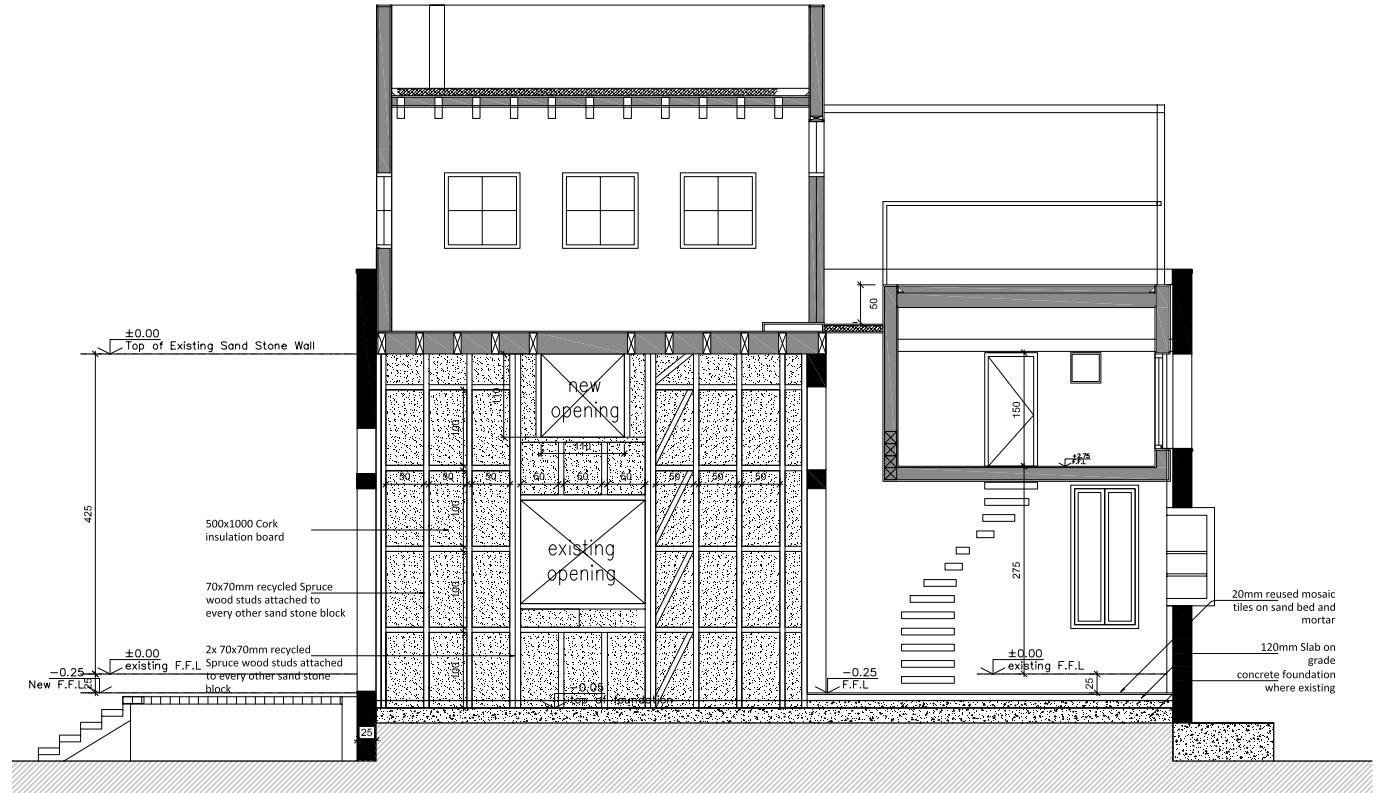
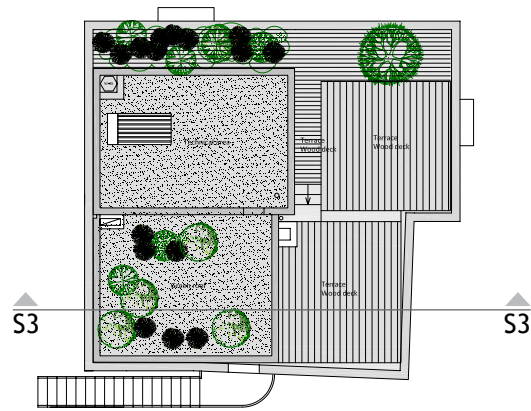
First Floor



Section 1

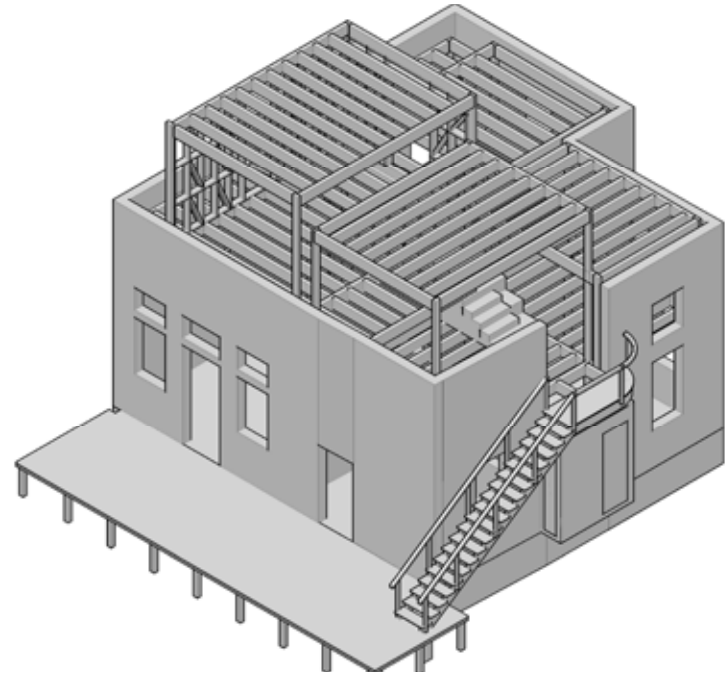
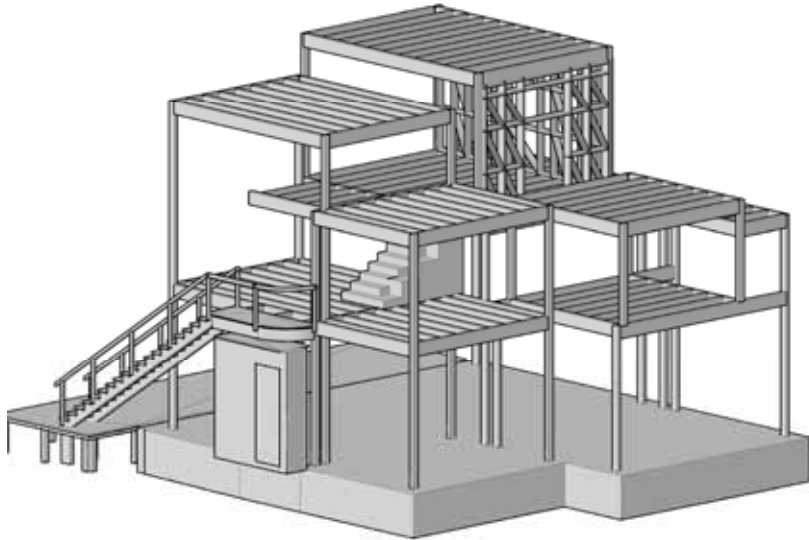


Section 2



Wood Structure

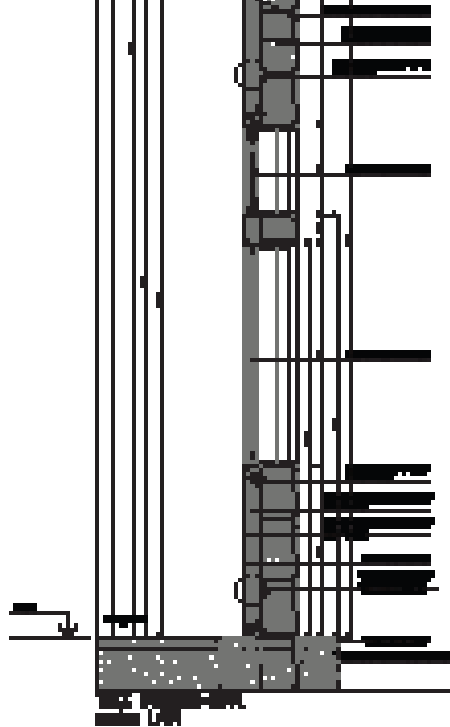
3-D



Re-used Materials

Sand Stone Wall Reinforcement

re-used spruce wood from construction scaffolding treated with linseed oil



Solid Wood Floor

re-used white cedar “kotrani” for bathroom floor



low VOC adhesive & coating



Windows, Doors & Stairs

Re-used windows, shutters, doors, metallic staircase



Floor Tiles

Re-used terracotta & colored mosaic tiles



Furniture

salvaged furniture: lighting fixture, “namliye”, low cabinet (some items were purchased from Arc-En-Ciel)



Natural Materials

Wood Structure

pine wood studs and beams

FSC (Forest Stewardship Council) approved or from sustainable forests



Exterior Cladding

ACCOYA



FSC approved-Cradle-to-Cradle certification



Program Category
Material Health
Material Reutilization
Renewable Energy and Carbon Management
Water Stewardship
Social Fairness
OVERALL CERTIFICATION LEVEL



Interior Cladding

OSB: FSC approved + zero added formaldehyde



low VOC adhesive & coating from KeraKoll



Insulation

Casa Batroun Roof "U" value: 0.22
Lebanese Thermal Standards - Coastal Area Residential "U" value: 0.71

Sheep wool for roofs: Natural breathable insulation; Low embodied energy; Zero ODP Zero GWP



Insulation

Casa Batroun Walls “U” value: between 0.33 and 0.42
Lebanese Thermal Standards - Coastal Area Residential “U” value: 1.60

wood fiber for exposed walls: Natural breathable; Low embodied energy; Zero Ozone Depletion Potential; Zero Global Warming Potential



Earth Plastering: testing

using local clay, straw, lime and sand.



Earth Plastering: learning



Earth Plastering: applying

first layer of plastering + wire mesh + second layer of plastering



Lime Plastering: finishing

using Italian natural lime plastering: Breathable; low embodied energy, odorless, no VOC



Lime Painting

Auro paint, water and mineral based: Breathable; low embodied energy, odorless, no VOC



linoleum

natural resin linoleum flooring: durable, low embodied energy, recyclable + no VOC



handmade materials

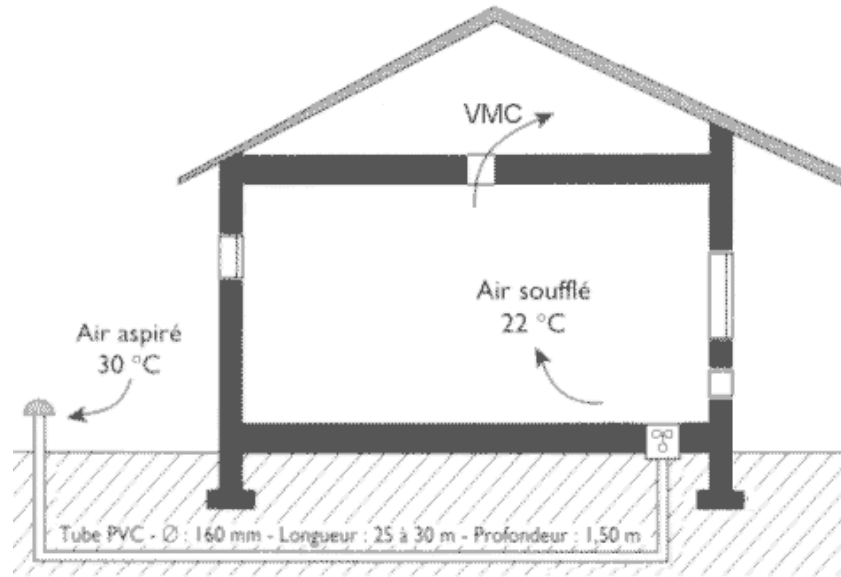
colored tiles, mosaics, lampshades



Energy

Canadian Well: experimenting

Ruled out as summer soil temperature was not favorable



Summer Objective

The Summer Objective of the Canadian Well is to provide Fresh Cool Air into the Batroun House to reach a comfortable Temperature Level of 26°C-27°C (the end range of a typical Summer Comfort Zone) inside.

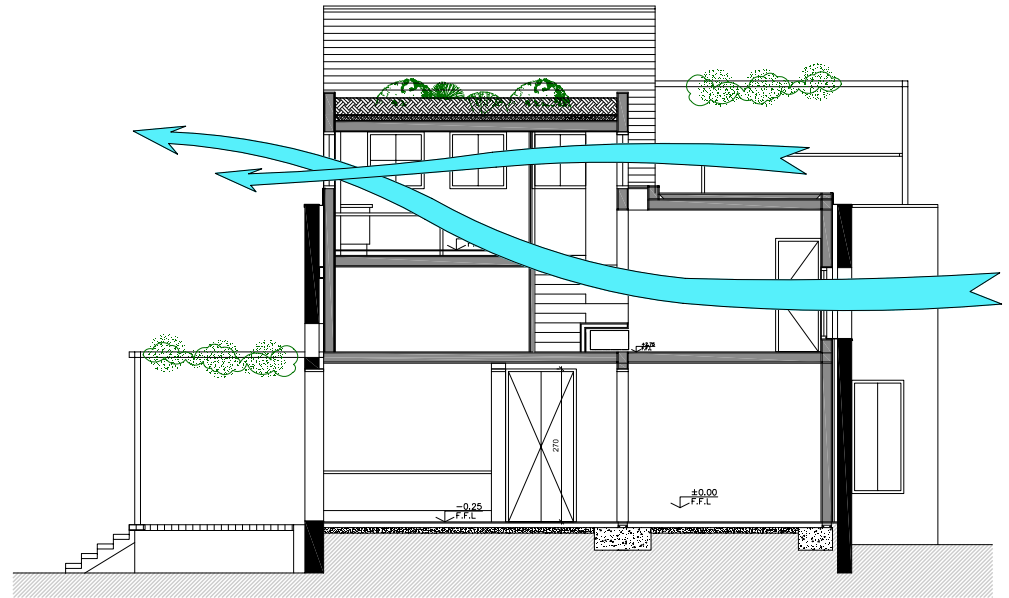


Bioclimatic design

cross ventilation, window orientation, fans

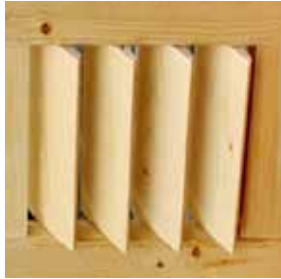


Natural Ventilation

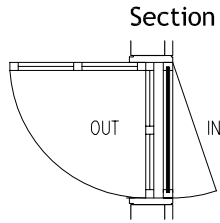


Bioclimatic design

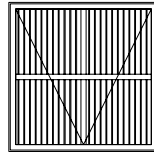
cross ventilation, window orientation, shading



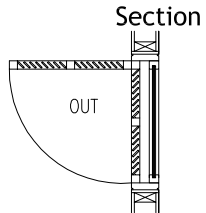
East and West Window Louvers



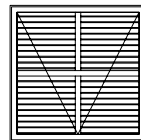
Louvers elevation



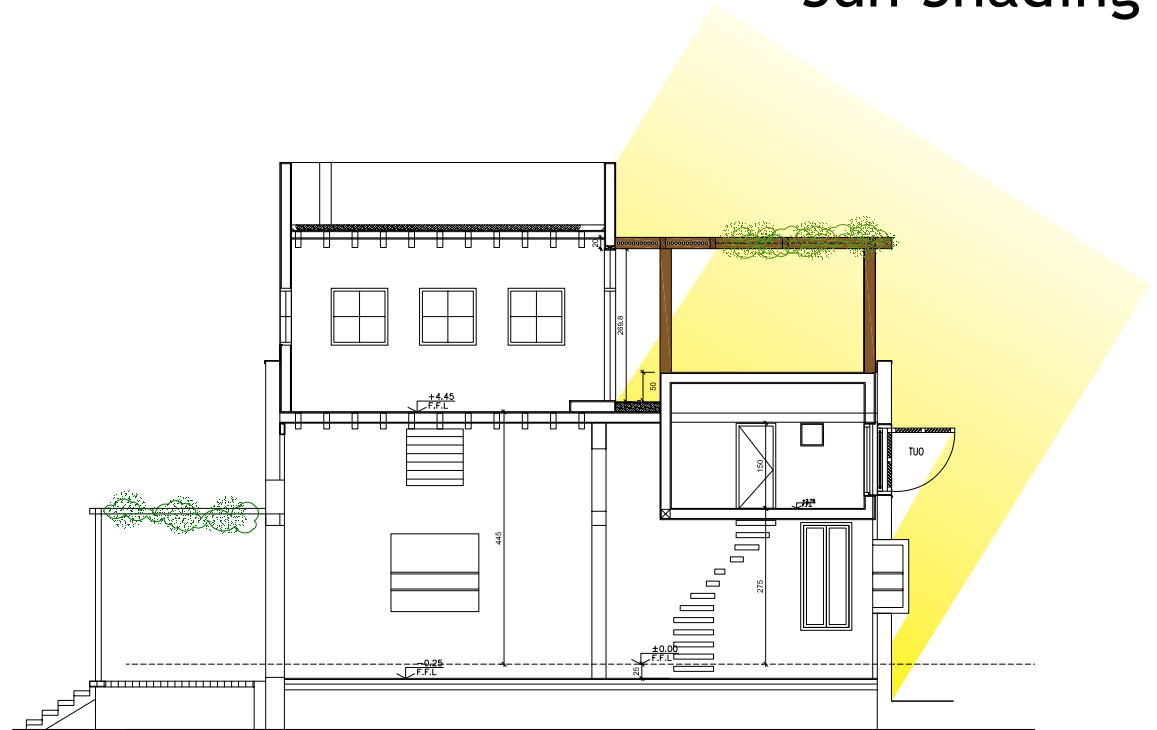
North and South Window Louvers



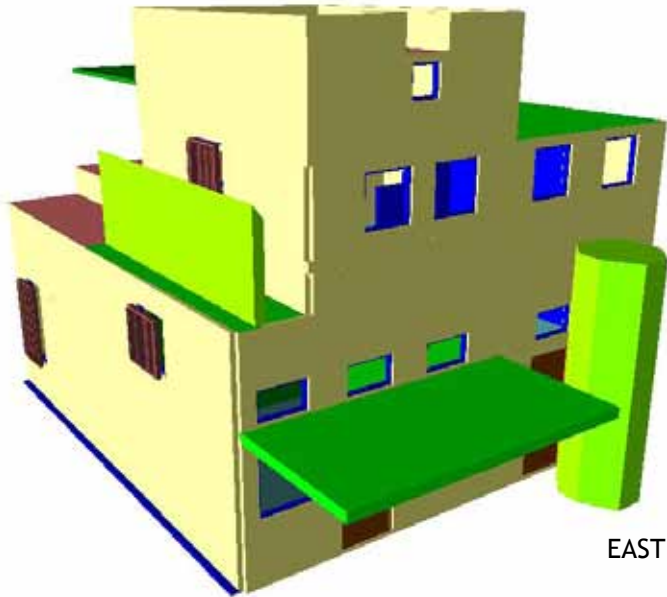
Louvers elevation



Sun Shading

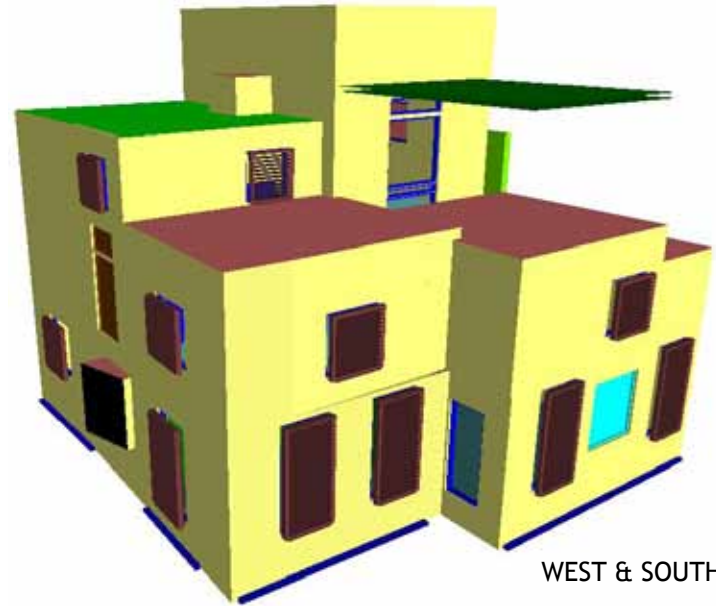


Thermal Modeling



EAST & NORTH FACADES

55% more energy efficient



WEST & SOUTH FACADES

The bio-climatic design of Casa Batroun will enable us to achieve throughout the year:

- * A decrease of 38% in the total number of overheating hours (above 28°C)
- * A decrease of 79% in the number of coldest hours (below 17°C)
- * A decrease of 55% in the total energy consumption of the house; and 41% in the CO₂ emissions associated with running it
- * An estimated annual kWh consumption of 20 kWh/m²

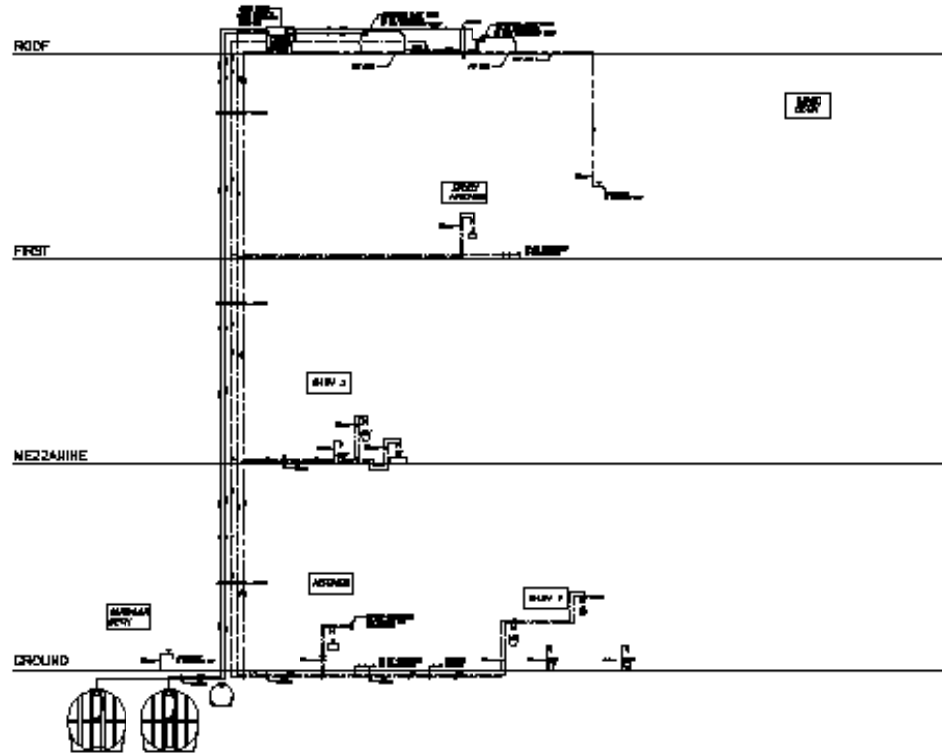
Wood Pellet Stove



- * Pellets of homogenous size
- * Moisture and ash content carefully controlled
- * More kWh/m³



Solar Energy



Solar Vacuum Tubes



LED lighting

Additional energy-efficiency through multiple lighting zoning of each space



Low-Energy Appliances

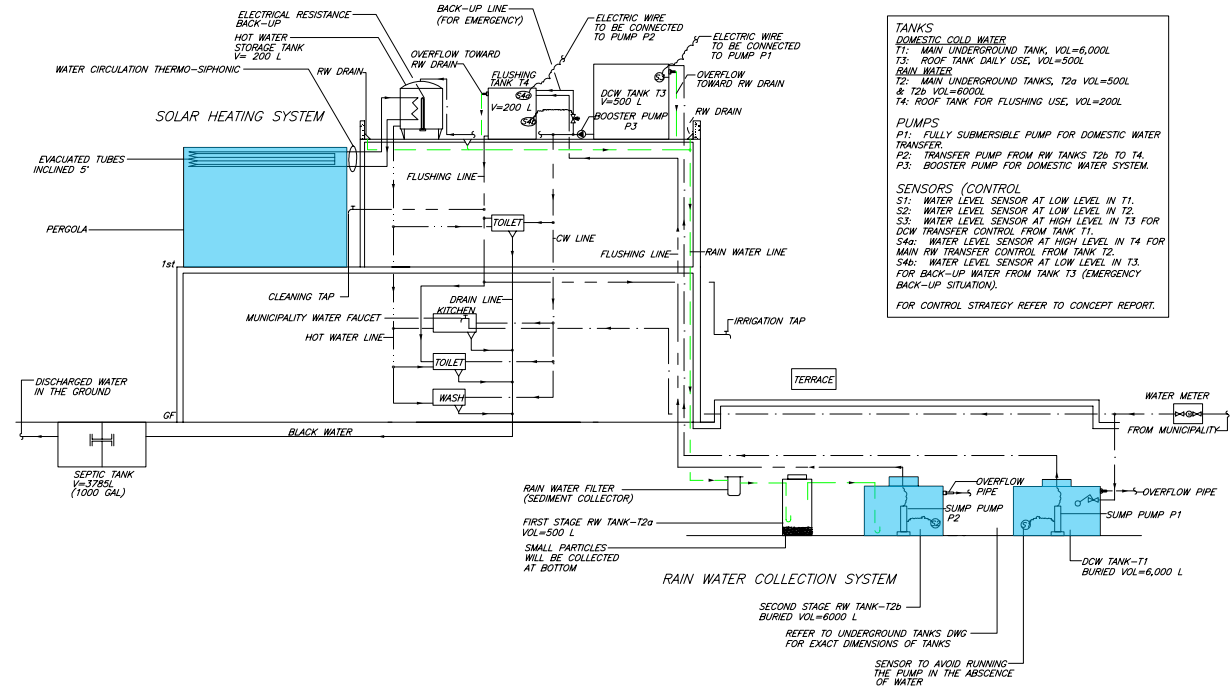
A+ to A++ energy-rated appliances based on the EU Energy Labeling Scheme



Sustainable Systems

Rain Water Harvesting

re-used for irrigation, toilet flushing & cleaning

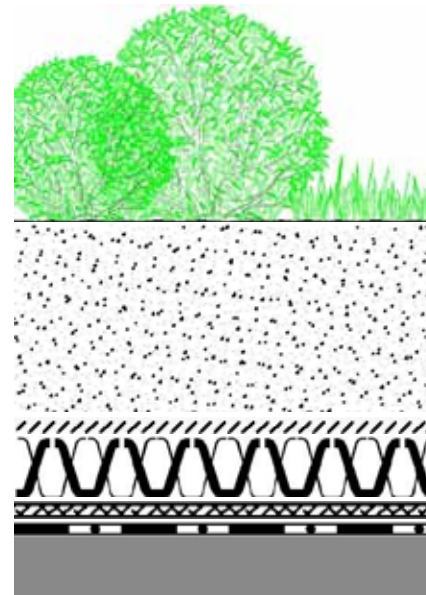
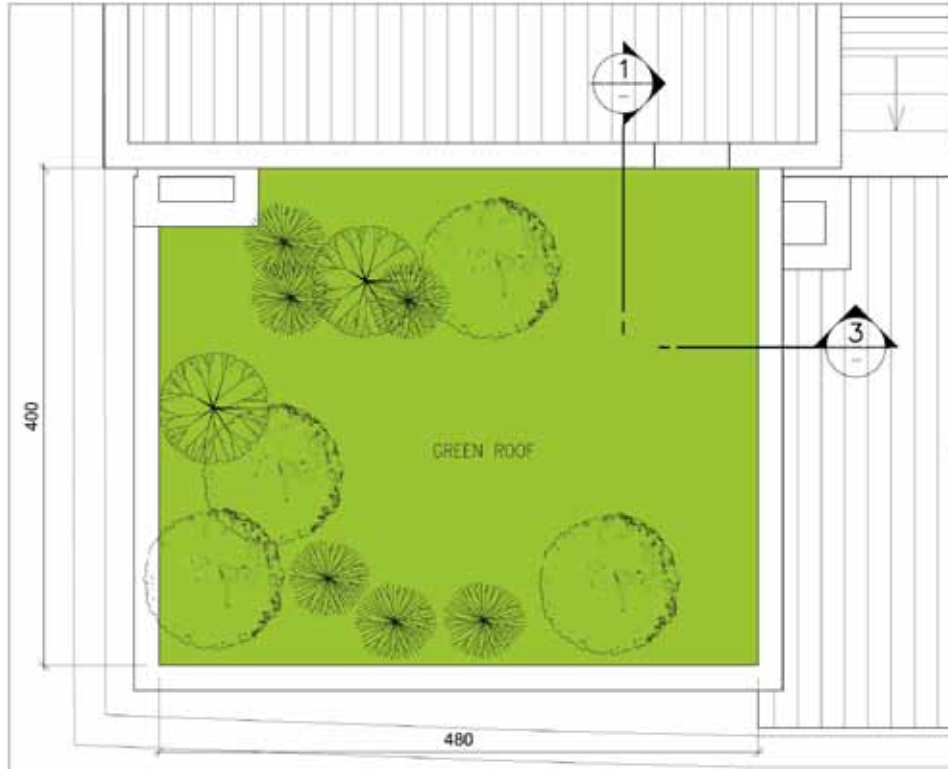


Low Water Fixtures

low water appliances, low water taps, dual flush WC



Green Roof



Lawn, Perennial plants, small bushes

System substrate "Roof Garden", approx. 200 mm

Filter Sheet SF

Floradrain® FD 40-E

Protection Mat ISM 50

Roof construction with root-resistant waterproofing

Green Roof

semi-intensive green roof + ecologically adapted plants



Green Roof



Green Roof



Green Roof



Ecological Enhancements

Planting new Native Lebanese species in the Garden; selected by a qualified ecologist and adapted to thrive in coastal weather



Green Walls & Veggie Garden

Workshop on sustainable & affordable green walls by re-using materials; planting organic herbs & vegetables



Recycling & Composting

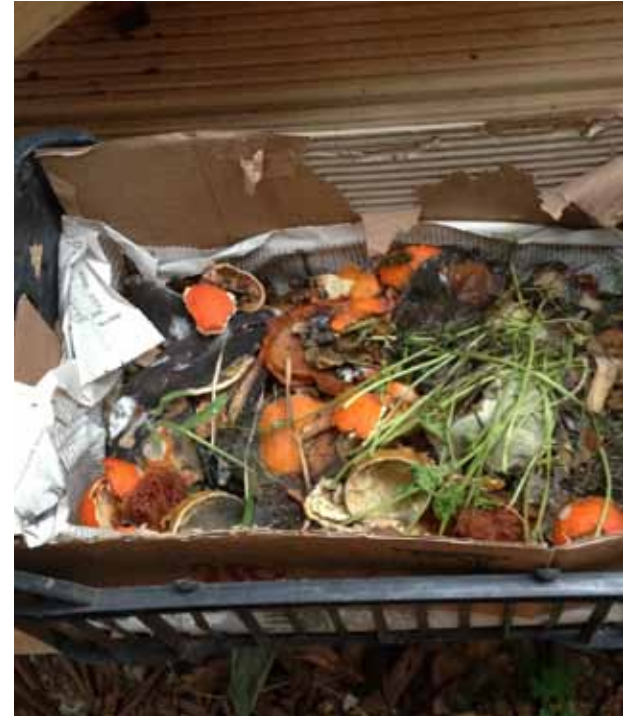
sorting & recycling



ecoboard bin: composting bin made from recycled & re-used materials



wormery made from re-used vegetable crates



BREEAM certification

Building according to BREEAM Excellent - Certification Received in Feb 2014.
1st BREEAM certificate in Lebanon, 1st BREEAM Excellent in the Middle-East

1 Star	30%	PASS	
2 Stars	45%	GOOD	
3 Stars	55%	VERY GOOD	
4 Stars	70%	EXCELLENT	← CASA BATROUN
5 Stars	85%	OUTSTANDING	

breeam:international

Final Certificate

This is to certify that:

CASA BATROUN
Plot number 2117
Batroun Seaside Road
Batroun
Lebanon

has been assessed to:

BREEAM 2010 International: Bespoke (Fully Fitted)

by a licensed assessor for:

Private Family

and has achieved a score of 70.9%

Excellent



Monitoring

A 15-day PHD study by Dima Al Badra, under the wings of the University of Bath, UK

Sensors capturing night-time cooling versus day-time ventilation

Very good initial results

Night-time cooling strategy reduced indoor temperatures by an additional 3C to 4C during hot September month
Maximum indoor temperatures of 26.5C at GF and 27.5C at FF levels, when outdoor mid-day temperatures went up to 35C.



Green Apple Award

The 2013 Green Apple Awards for the Built Environment and Architectural Heritage



Gold medal



the house

































Illustrated Plans
of Lebanon

The Outpost











the team

Architectural Consultant

Maha Nasrallah architects

Electro-mechanical Consultant

Mecanica Design

Civil Engineer Consultant for Stone

Wael Kayyali

Sustainability Consultant

EcoConsulting

Stone Structure Contractor

Elie Samrani

Wood Structure

L'atelier Aziz Moussawer

Renewable Energy Technologies

Solarnet

Kerakoll Natural Products

Hardwood Flooring Company

Hydroponic Green Roof

Green Studios

Restoration Consultant

Jean-Pierre Zahar

Interior Design Advisor

Tamar Hadechian

Layout & Graphics

Rabih Ibrahim

Advisor

Marcelle Tanal

LED Lighting

Solmadis

Ecologist

Arbi Sarkissian

Green Walls

Monika Fabian & Khaled Sleem

Auro Natural Paint

Arcan Altern Eco

Linoleum Flooring

Armstrong

Plumber

Johny Sader

Electricians

Samir Akil & Jacques Der Sahakian

Blacksmiths

Mohammad Boulos & Issa Dada

Old Wood Carpenter

Joseph El Kai

Earth Plastering

Issa Issa

Helper

Anama

Old Ceramic Tiling

Raqqi Lattouf

Salvaged Materials

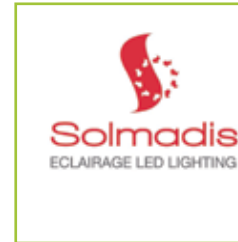
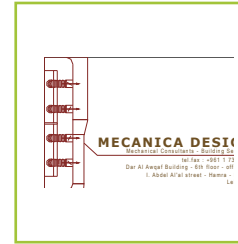
Abou Ali

Recycled Tiles Mosaic Art

Wassim Kays

Real Estate Agent

Ronald El Khoury



all photos were taken by Maya Karkour Walid Rashid and Maha Nasrallah

Thank you