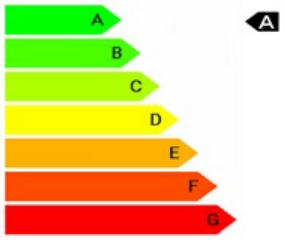
E4 House

PUBLISH BY PETREA | 28 JUNE 16

- Project type : New Construction
- Building Type : Isolated or semi-detached house
- Construction Year : 2015
- Climate zone : [Dfb] Humid Continental Mild Summer, Wet All Year
- Net Floor Area : 350 m^2 Useful area (ro)
- Construction/refurbishment cost : 216 000 €
- Number of Dwelling : 1 Dwelling
- Cost/m2 : 617 €/m^2
- Cost/Dwelling : 216 000 €/Dwelling



, 077066 Ostraru, Romania

// Description

The challenge of designing an E4 House, coming up with personalised ideas and design to enhance the 4 main concepts: Energy efficiency, Environment, Emotion &health, Economy.

Energy efficiency refers to the minimization of energy consumption through design, seeking ways to use innovative heating and edge building technologies in order to become a referenced NZEB. Environment. Reduction of greenhouse gas emissions by the use of environmentally friendly renewable energy sources such as sun, geothermal heat or biomass. Emotion & health. The house seeks to achieve that unique quality of living and explores ways to ensure a healthy room climate using as much as possible the natural building material of clay products. Economy. Last but not least, we obtained an affordable house and maintenance costs in order to prove that it is possible to have an attractive and affordable NZEB.

The E4 House concept follows the subsequent development of the major energy efficient building design methods but at the same time pays attention to the cultural background and the regional adaptation of the layout to each context. In architectural terms, the main elements that are crucial to the building's energy-efficiency are also the most powerful visual characteristics - in particular the components of the buildings envelope. And these elements are also the main factors that bear the marks of tradition and culture, represented by the urban rules and the site context. Based on this, the project focused on the contemporary approach of the pitched roof - covered with ceramic tiles, of the massive brick walls and terraces - possible to have ceramic finishes, of the windows typology and the balance of textures and colours, both for exterior and interior.

See more details about this project :
http://tecto.ro/portfolio/e4-house-casa-e4/
http://casae4.ro/casa-e4-din-caramida/

Data reliability : Self-declared

// Stakeholders

Designer

Name : TECTO Arhitectura
office@tecto.ro
Website : http://tecto.ro/
Action : Architecture design

Contracting method : Other methods

Owner approach of sustainability : TECTO CONCEPT SEEKS THROUGH ITS DESIGN TO FIND MEANINGFULNESS, RECEPTIVNESS TO INNOVATION AND AESTETHIC EXPRESSION. THROUGH IN-DEPTH STUDIES OF CONTEMPORARY ARCHITECTURE, TECTO PUSHES THE LIMITS TO THE MOST INSPIRING, INTRIGUING AND INNOVATIVE CONCEPTS. GOOD ARCHITECTURE DOESN`T JUST FULFILL PRACTICAL NEEDS BUT EXCEEDS THEM BY CAPTIVATING THE USERS AND ENGAGING THEIR IMAGINATION.
TECTO GREEN WORKS AT THE INTERSECTION BETWEEN RESEARCH AND PRACTICE. WE SEEK TO DEMONSTRATE THAT SUSTAINABLE MATERIALS AND TECHNOLOGIES HAVE A LEGITIMATE AND NECESSARY ROLE WITHIN ARCHITECTURE. THEY DO NOT HAVE TO BE ASSOCIATED WITH COMPROMISING AESTHETICAL VALUES; ON THE CONTRARY, THEY CAN ENRICH THE ARCHITECTURE BY CREATING HEALTHY AND DYNAMIC BUILDINGS. TECTO`S GREEN CONCEPT CHALLENGES TRADITIONAL THINKING BY STUDYING, REFINING AND IMPLEMENTING NEW MATERIALS AND TECHNOLOGIES INTO PROJECTS.
AS PART OF OUR SUSTAINABLE DEVELOPMENT WORK, TECTO TEAM HAS BEEN CERTIFIED PASSIVE HOUSE DESIGNER IN ACCORDANCE WITH THE PASSIVE HOUSE STANDARDS FORMULATED BY THE GERMAN PASSIVE HOUSE INSTITUTE IN DARMSTADT. THIS WAY, WE OFFER COMPETENT CONSULTANCY IN DESIGN, CALCULATION AND CONSTRUCTION OF PASSIVE HOUSES OR BUILDINGS WITH LOW ENERGY CONSUMPTION, WITH HEALTHY AND COMFORTABLE INDOOR CLIMATE ALL YEAR ROUND.
TECTO DETAIL IS SPECIALIZED IN DESIGN OF COMPONENTS AND DETAILS, IN ORDER TO IDENTIFY, RETHINK AND REFINE ANY ELEMENT THAT DOESN`T ACHIEVE THE HIGHEST POSSIBLE ARCHITECTURAL QUALITY. FROM INDIVIDUAL DETAIL TO OVERALL SYSTEMS, OUR AIM IS TO OPTIMIZE FORM AND STRUCTURE. WE FOCUS ON BUILDING WITH APPROPRIATE METHODS AND SUSTAINABLE TECHNOLOGIES IN ORDER TO HAVE THE BEST POSSIBLE RESULT, NO MATTER THE SCALE OR FUNCTION.
WE STRONGLY BELIEVE THAT MEANINGFUL, WELL-SOLVED DETAILS ARE THE ONES THAT SHAPE AN ARCHITECTURE WORTH LIVING IN.

Architectural description : THE PURPOSE OF THE PROJECT IS TO DESIGN AN AFORDABLE SINGLE FAMILY HOUSE THAT BEST DESCRIBES THE 4 PRINCIPLES OF AN E4 STYLE CONSTRUCTION: ENERGY, ECONOMY, ECOLOGY, EMOTION & HEALTH.

// Energy

Energy consumption

Primary energy need : 36,00 kWh PE/m^2/year
Primary energy need for standard building : 126,00 kWh PE/m^2/year
Calculation method : Other
CEEB : 0,00 kWh PE / €

Envelope performance

Envelope U-Value : 0,22 $W.m^{-2}.K^{-1}$
More information : Exterior insulation to ambient air - 0.22W/(m²K)
Exterior insulation underground - 0.18W/(m²K)
Windows and external doors - 0.94W/(m²K)
Building Compactness Coefficient : 0,20
Indicator : n50 (I4) m^3/H.m^2 n50 (Vol/H) Q4

// Renewables & systems

Systems

Heating system :
- Gas boiler
- Low temperature floor heating

Hot water system :
- Condensing gas boiler
- Solar Thermal

Cooling system :
- No cooling system

Ventilation system :
- Natural ventilation

Renewable systems :
- Heat pump

// Environment

// Products

Porotherm Clay Blocks

Producer : Wienerberger
Contact : office@wienerberger.co.uk
Website: http://wienerberger.co.uk/
Product category: Structural work / Structure - Masonry - Facade

Description :

Porotherm is a precision clay block walling system - a modern method of construction with reassuringly traditional values.

Comments :

Both designers and workers.

// Costs

Construction/refurbishment cost : 216 000 €

// Urban Environment

Urban environment : THE HOUSE IS LOCATED NEAR THE CITY, IN A LOW DENSITY RESIDENTIOAL AREA THAT PROVIDES THE BEST ENVIRONMENT FOR THE CONSTRUCTION OF A NEARLY ZERO ENERGY BUILDING

Land plot area : 944 m^2

Built-up area : 117 %

Green space : 524

Parking spaces : 1

// Building Environnemental Quality

Building Environmental Quality :

- Building flexibility
- indoor air quality and health
- acoustics
- comfort (visual, olfactive, thermal)
- energy efficiency
- renewable energies
- products and materials

// Contest

Green Building Solutions Awards 2016 powered by Construction21.org

Contest categories

Energy & Temperate Climates

E4 starts with the development of advanced energy concepts as a prerequisite for 2010/31/EU Directive, which asserts that starting with 2020 all the new buildings will have ZERO ENERGY BALANCE. Thus, the so called E4 program - E for Energy, Economy, Ecology and Emotion – was developed as a possible future house model.

The architectural took into account the localization of building into the site and orientation facing the cardinal points and the predominant wind. These decisions contributed to the shape of the building geometry, as well as to the distribution and properties of transparent and opaque elements of the façades.

A major innovative energy system considered in the proposed E4-house design consists in an optimized Trombe wall, known to provide heat by a combination of thermal mass and greenhouse effects. In the original Trombe wall solution, the southern wall of the building – usually made of materials with heat storage properties (thermal mass: bricks, concrete, stones) – is painted in dark colors and has a glass panel placed in front of its surface, at a certain distance to create an air cavity. By greenhouse effect, the wall is heated by convection from the warm upward airflow that is generated through the gap. The present design attempts to optimize the Trombe wall by combining its effects with ventilation. The Trombe wall is placed on the Southern surface of the living room, where the overnight temperature may be lower than the temperature needed for comfort during the day. The energy efficiency approach of the architectural design also focused on the building materials. A key element was the use of recyclable/recycled and/or locally available materials. The design team developed a range of performance measures in terms of the

building envelope materials, among which the most important are: High levels of thermal insulationAdditional insulationUse of metal consoles and 15 cm of extruded polystyrene to break the thermal bridgesUse of intelligent adaptive membranesUse of energy performant triple-glazing windows and doorsThe passive energy efficiency strategies are however limited in their effects for the NZEB concept. Active measures were added to bring their part in the overall energy performance of the building. This included:Two solar collectors that supply heat to a buffer energy storage unit to partially support domestic hot water preparation, as well as space heating. Twelve photovoltaic solar panels were also mounted in order to produce electricity and reduce the carbon foot-print of the house.Low-temperature heating pipes placed underfloor and radiant wall heating/cooling with built-in tubesA central home automation technology may enable homeowners to control heat, window coverings, lighting, security sensors and cameras, as well as to track comfort parameters in real time or various energy consumptions over times. Such a system inform and educate the users and may lead to a change that experts call in short format „energy bahavior”.