EFdeN 4C

by Alexandra Tatar / 2016-06-25 20:38:32 / International / 10686 / EN

Primary energy need :

4330.47 kWhpe/m².year

(Calculation method :)

ENERGY CONSUMPTION

Economical building *Building*

< 50	A
51 à 90	B
91 à 150	C
151 à 230	D
231 à 330	E
331 à 450	F
> 450	G

Energy-intensive building

Building Type : Isolated or semi-detached house
Construction Year : 2015
Delivery year : 2015
Address 1 - street : 66 Pache Protopopescu Boulevard 021414 BUCHAREST, Romania
Climate zone : [Dfb] Humid Continental Mild Summer, Wet All Year

Net Floor Area : 130 m²
Construction/refurbishment cost : 174 483 €
Number of Dwelling : 1 Dwelling
Cost/m2 : 1342.18 €/m²

Proposed by :

General information

We are over 30 young and passionate students, from fields ranging from architecture, engineering, communication or management, and together we form the EFdeN team.
In 2014 we represented Romania in the final for Solar Decathlon Europe in France, alongside 19 teams from 16 countries and 4 continents. We attended 10 interdisciplinary events, from architecture to engineering, innovation and communication.
We designed and built an extraordinary safe and comfortable solar house, energetically efficient. The house is automatized, being 100% electrical, without monthly bills and environment-friendly.After many hours of work and dedication, the house became Romania's First Center of Research for Comfort Conditions - EFdeN 4C.

See more details about this project

http://efden.org//

Stakeholders

Stakeholders

Function : Investor

Romstal

+40 21 332 09 01, +40 21 332 09 02

http://www.romstal.ro/

Function : Investor

Saint Gobain

+40 21 207 57 00

http://www.saint-gobain.ro/

Function : Investor

Transelectrica

+40 21 303 56 11

http://www.transelectrica.ro/

Function : Investor

UFX

+40 31 432 87 36

http://umbrellafx.com/

Function : Investor

Transgaz

+40 26 980 33 33

http://www.new.transgaz.ro/

Function : Investor

Engie

+40 21 9281

http://www.gdfsuez.ro

Contracting method

Public Private Partnership

If you had to do it again?

We participated with this house in the Solar Decathlon competition, in the 2014 edition. Because we had to transport the house to France and back, to Versailles, it had to respect a modular model. Based on this modular design, our permeability simulations didn't match with the real tests. That's why, next time, we hope to manage a more compact model, with as few joints as possible.

Also, the facade is made from 3mm ceramic plaques. During the construction stage, we discovered it is very breakable and thin, some of them being ruined either by transportation, either by bad handling.

Building users opinion

Our prototype is open for the public every Thursday and Sunday, and during special occasions, such as "Museum Nights" or during important visits. People were overjoyed by the concept of "The Futuristic House" and some even traveled from other countries to visit and see the new technologies and innovations. Also, some of our colleagues did an experiment, sleeping in the house for three days. The feedback was positive, the ability to control the lights and the heat coming in handy, as well as the modular design, describing the house "comfortable" and "feeling like a true residence".

Energy

Energy consumption

Primary energy need : 4 330,47 kWhpe/m^2.year

Primary energy need for standard building : 268,00 kWhpe/m^2.year

Calculation method :

CEEB : -0.0233

Breakdown for energy consumption : Heating - 10% / 3.37 kWh FE/m2/year
Cooling - 11% / 3.58 kWh FE/m2/year
Ventilation - 13% / 4.30 kWh FE/m2/year
Domestic hot water - 19% / 6.16 kWh FE/m2/year
Lighting - 16% / 5.18 kWh FE/m2/year
Appliances & devices - 31% / 10.12 kWh FE/m2/year

Envelope performance

Envelope U-Value : 0,30 $W.m^{-2}.K^{-1}$

More information :
Walls area (m2) (W/m2K) 246 / 0.129
Floor area (m2) (W/m2K) 132.5 / 0.124
Roof area (m2) (W/m2K) 90.77 / 0.121
Glazing area (m2) Triple glazed:45.18 / 0.8
Double glazed:42.4 / 1

Indicator : EN 13829 - n50 » (en 1/h-1)

Air Tightness Value : 0,87

More information

A one-year monitoring interval will start soon, with our Living Building Challenge application. At this time no corrective actions have been done.

Real final energy consumption

Final Energy : 32,68 kWhfe/m^2.year

Real final energy consumption/m2 : 4 331,75 kWhfe/m^2.year

Real final energy consumption/functional unit : 4 331,75 kWhfe/m^2.year

Year of the real energy consumption : 2 015

Renewables & systems

Systems

Heating system :

- Boiler fuel
- Heat pump
- Combined Heat and Power
- Others
- Electric heater
- Radiant ceiling
- VAV System
- Others
- Solar thermal

Hot water system :

- Individual electric boiler
- Boiler fuel
- Heat pump
- Solar Thermal
- Other hot water system

Cooling system :

- Radiant ceiling
- Chilled Beam

Ventilation system :

- Natural ventilation
- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic
- Solar Thermal
- Energy recovery from waste
- Heat pump

Renewable energy production : 43,00 %

Other information on HVAC :

The majority of the materials and equipments used in the HVAC system can be reused or recycled in high percent. Most of them contain materials like copper, steel, aluminum and brass known for their recyclable and reusable properties.
Overall, the percentage of reuse and recycle of the HVAC system is 95%. The toxic substance that is found in the HVAC system is the refrigerant used by the heat pump, specifically the R407C. The refrigerant is contained in a closed circuit, in the outside of the heat pump, so the eventual risk probability is very low.

We also have photovoltaic panels, solar panels and heat pumps.

Solutions enhancing nature free gains :

We use buffer zones, thermic table, shadowing system, ceramic facade, PCMs (Phase Changing Material) and the photovoltaic panels, that cover the terasse and hide it from sunlight.

Smart Building

BMS :

We use the BMS system in order to keep parameters of thermal comfort and indoor air quality values within the maximum admissible limits. In order to obtain the desired effect we monitor the exterior parameters of temperature, solar radiation humidity and

Environment

Urban environment

At the moment, the EFdeN prototype is situated in the yard of the Faculty of Installations in Bucharest, in a central, easily accessible area. Being a research center, the location is perfect for the pertaining students, who can come and study the equipment and the houses' effect on the environment.

Still, the house was designed as part of a residential complex, its purpose being to revitalize the old industrial neighborhoods, the disaffected spaces, known as "brown-fields", of Bucharest.

Land plot area : 181,55 m^2

Built-up area : 50,56 %

Green space : 415,00

Products

Product

Blu Mohito

Arta Gradinilor

+40 721 202 053; +40 743 605 158

https://www.artagradinilor.ro/

Product category : Second œuvre / Peinture, revêtements muraux

It is a natural moss that is called Blue Mohito. It has not only aesthetic but also functional properties, absorbing moisture and gradually releasing it.

The moss was chosen for its functional purposes. Also, it helped our goal of increasing the green space per capita, integrating nature in the EFdeN house.

Aspera Fenix Nanotechnology

Atipic

+40 21 253 15 79

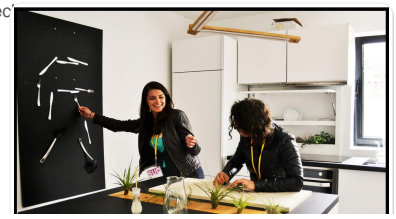
http://www.atipic.ro

Product category :

The external surface of Aspera Fenix Nanotechnology involves the use of nanotechnology and it is characterized by next generation acrylic resins, hardened and fixed with Electron Beam Curing process, opening up new avenues in the field of interior design. With low light reflectivity, its surface is extremely opaque, anti-

fingerprint and features a very pleasant soft touch. Thanks to the use of nanotechnologies, Aspera Fenix Nanotec scratches, as its name indicates.

This material, with its power to regenerate, was greatly accepted and embraced by our members and our stakeholders. Being easily cleanable and its scratches self-healing, it respects our goal of reducing unnecessary household items in the EFdeN house.



Costs

Construction and exploitation costs

Global cost : 200 329,12 €

Reference global cost : 174 482,98 €

Renewable energy systems cost : 11 360,70 €

Global cost/Dwelling : 200329.12

Reference global cost/Dwelling : 174482.98

Total cost of the building : 174 483 €

Health and comfort

Water management

Consumption from water network : -117,17 m^3

Consumption of harvested rainwater : 41 760,00 m^3

Water Self Sufficiency Index : 1

Water Consumption/m2 : -0.9

Water Consumption/Dwelling : -117.17

For Bucharest, the local rainfall collected from our house in one year is calculated as follows:
Q- quantity of rainwater, 580 [L/sqm/year]
S - collecting surface, 80 [sqm]
cf- material coefficient, 0.9
VrB = Q x S x cf [L/year]
VrB= 41760 L/year

Indoor Air quality

COV <30ug/m3

Comfort

Calculated indoor CO2 concentration :
<720ppm

Measured indoor CO2 concentration :
0.04%

Calculated thermal comfort : Summer - 12.01% Winter - 13.17%

Measured thermal comfort : 26 degrees Celcius in the Summer, 20 - 22 degrees Celcius in the Winter

Acoustic comfort :

Carbon

GHG emissions

GHG in use : -5 781,60 $KgCO_2/m^2$/year

Methodology used :
Romanian methodology

GHG before use : 41 850,00 $KgCO_2$ /m^2

Building lifetime : 50,00 year(s)

, ie xx in use years : -7.24

Contest

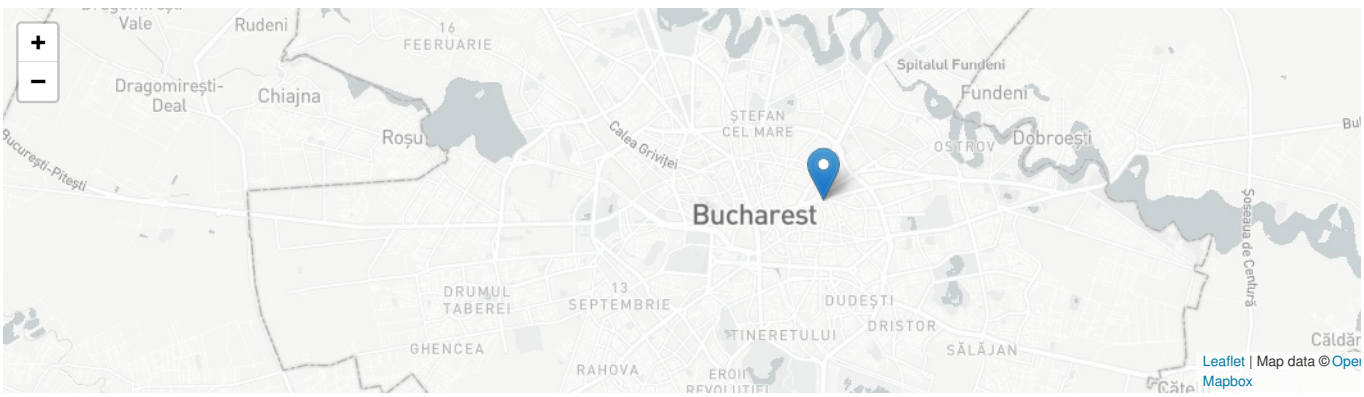
Building candidate in the category

Energy & Temperate Climates

Low Carbon

Smart building

Users' Choice Award




Domnești
Țegheș
Clinceni
Bragadiru
Poșta
Cornetu
Măgurele
Șoseaua de Centură
SĂLAJ
GIURGIULUI
BERCENI
PROGRESUL
APĂRĂTORII PATRIEI
Popești-Leordeni
LEORDENI
CARTIERUL DANUBIANA
AGROPOL
Splaiul Unirii
Glina