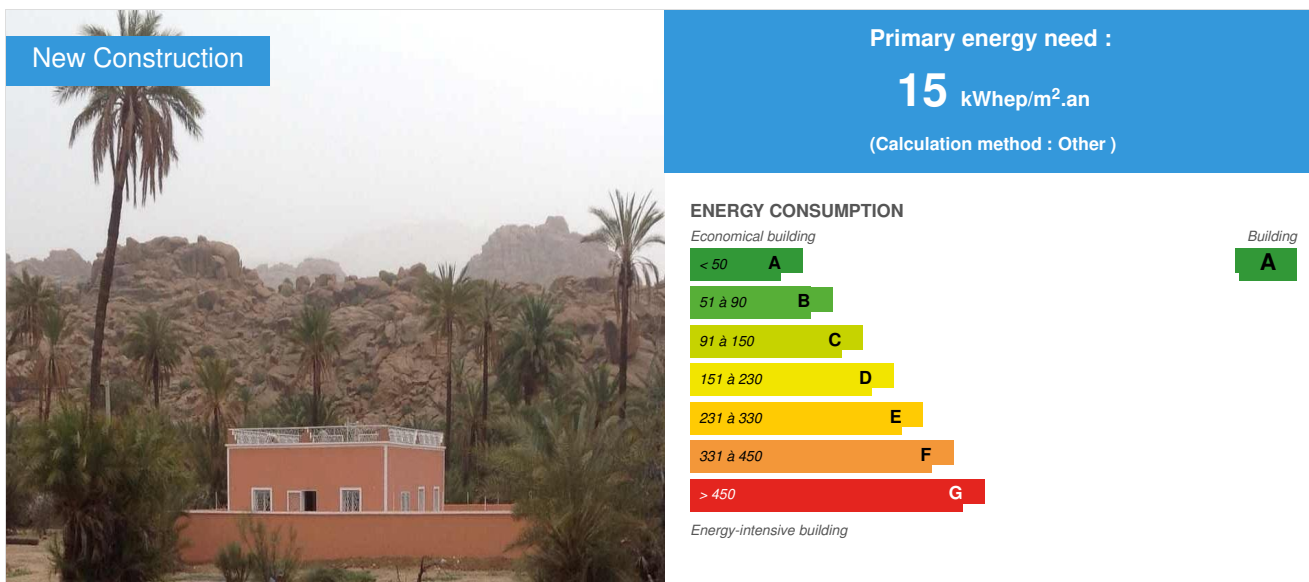


## CHALLENGE: Experimental device for evaluating uses Reduced Impact (city Tafraout)

by [Mohamed El Mankibi](#) / 2015-03-30 01:51:26 / Maroc / 13483 / FR



**Building Type** : Isolated or semi-detached house  
**Construction Year** : 2012  
**Delivery year** : 2014  
**Address 1 - street** : 85450 TAFRAOUT, Maroc  
**Climate zone** : [BSh] Subtropical Dry Semi-arid (Steppe)

**Net Floor Area** : 110 m<sup>2</sup>  
**Construction/refurbishment cost** : 130 000 €  
**Number of Dwelling** : 1 Dwelling  
**Cost/m<sup>2</sup>** : 1181.82 €/m<sup>2</sup>

### General information

CHALLENGE The building is a second home and experimental platform. It was designed and built as part of a French-Moroccan-Italian partnership involving the National School of Public Works of the State (Lyon) and Public Facilities Directorate (Rabat) and Politecnico di Torino (Turin). The goal is to provide methodologies and tools (numerical and experimental) design and characterization of the overall performance of buildings. This building is also one of the supports for the initiation of a research nucleus in Morocco in order to contribute to improving the energy efficiency of buildings and provide advice and elements of decision support.

The DCI project also has the support of three industrial: SOMFY, ALDES and ATI-ISOLATION

- Goal

The platform "CHALLENGE" is an experimental scale building and finely instrumented actual occupation in order to:

1: Validate thermo-aeraulic models

2: Characterization of hybrid ventilation, heating and cooling passive phase change heat exchangers as well as masking devices.

3: Assessing the potential and relevance of solar systems

4: Evaluate the impact of occupant behavior interiors and overall consumption

## Data reliability

Assessor

## Stakeholders

### Stakeholders

**Function :** Assistance to the Contracting Authority

Mohamed El Mankibi

mohamed.elmankibi@entpe.fr

Architectural design, design Energy, Thermal Modeling Aéraulic, Experimental Protocol, Control and BEMS,

**Function :** Construction company

AL ANSARY et Fils

+212 66 2161505

Gros and second works

**Function :** Environmental consultancy

Direction des Equipement Publics (Ministère de l'équipement, du transport et de la Logistique du Maroc)

Nelbied@mtpnet.gov.ma

<http://www.mtpnet.gov.ma/>

Logistics Support, Design Thermo-ventilation

**Function :** Environmental consultancy

Laboratoire Génie Civil et Bâtiment (ENTPE-LYON)

[http://www.entpe.fr/internet/contenu/departements/genie\\_civil\\_batiment/laboratoire\\_genie\\_civil\\_et\\_batiment\\_lgcb](http://www.entpe.fr/internet/contenu/departements/genie_civil_batiment/laboratoire_genie_civil_et_batiment_lgcb)

Experimental Protocol, Numerical Modeling

**Function :** Environmental consultancy

Politechnico Di Torino

stefano.corgnati@polito.it

<http://www.polito.it>

Occupant behavior, user interface

## Contracting method

Lump-sum turnkey

## Owner approach of sustainability

The principle of design and construction approach respects the Moroccan thermal regulation and allows one hand to demonstrate the reproducibility on a large scale (individual houses) on the other. the principle of purchase and information system of the house DEFI allows both the experience feedback on the building behavior and the adoption of best practices by occupants

## Architectural description

The "CHALLENGE" platform is a reinforced concrete building in accordance with Moroccan seismic rules. Different architectural consideration were taken into account to improve Energy efficiency CHALLENGE: 1- Orientation South East: to enjoy sunshine Winter and avoid morning overheating was 2- Lack of openness on the facade West (Avoid overheating summer morning and enjoy the temperature rise to less over-ventilation) on level ground floor 3- (Continuous insulation and inertia) 4 - Roof Painting board (gains reduce radiation in summer) 5 - compactness with a central corridor (Gain energy and ventilation efficiency) 6- Openings reduced> 20% of the thermal envelope 7 Double room (North - South) was dual use - Winter.

## Building users opinion

Recruiting Volunteer current occupants

### Energy consumption

Primary energy need : 15,00 kWh/m<sup>2</sup>.an

Primary energy need for standard building : 50,00 kWh/m<sup>2</sup>.an

Calculation method : Other

CEEB : 0.0003

### Envelope performance

Envelope U-Value : 0,69 W.m<sup>-2</sup>.K<sup>-1</sup>

More information :

The main architectural components of the platform are: • full slabs from reinforced concrete with secluded terrace • Partitions sandwich cinderblock cinderblock + Expanded polystyrene • Double glazing with argon fill

Building Compactness Coefficient : 1,07

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

Air Tightness Value : 7,26

## Renewables & systems

### Systems

Heating system :

- Heat pump
- VAV System
- Canadian well

Hot water system :

- Individual electric boiler

Cooling system :

- Geothermal heat pump
- VAV Syst. (Variable Air Volume system)

Ventilation system :

- Natural ventilation
- Nocturnal Over ventilation
- Double flow
- Canadian well

Renewable systems :

- No renewable energy systems

Other information on HVAC :

An exchanger phase change materials-Air system is developed and during calibration. Installation planned Winter 2016

### Smart Building

BMS :

The acquisition, monitoring and control system is composed of modules and National Instruments hunted and allows a hybrid control (Automatic - Manual) by integrating simple techniques (digital and PID) and advanced (Fuzzy logic, algorithms génétiqu

Smartgrid :

En perspective

## Products

### Product

Heat pump: T.One

ALDES

<http://www.aldes.fr>

Product category : Table 'c21\_italy.innov\_category' doesn't exist SELECT one.innov\_category AS current,two.innov\_category AS parentFROM innov\_category AS oneINNER JOIN innov\_category AS two ON one.parent\_id = two.idWHERE one.state=1AND one.id = '3'

T.ONE is an individual heating solution for any type of habitat that also ensures the refreshment in summer. This system implements a heat pump air / air coupled to a distribution plenum and motorized vents. Exclusive Aldes, the system loads a T.One room control for better management of comfort and saving more, adjusting the power of the heat pump and blown air flow. In addition to its exceptionally low consumption, this solution is characterized by its low noise level. T.ONE range of products consist of an indoor unit and an outdoor unit associated with regulation and a complete range of ventilation accessories.



Double Glazing Argon Filling

Product category : Table 'c21\_italy.innov\_category' doesn't exist SELECT one.innov\_category AS current,two.innov\_category AS parentFROM innov\_category AS oneINNER JOIN innov\_category AS two ON one.parent\_id = two.idWHERE one.state=1AND one.id = '10'

A reinforced insulation glazing (VIR) has a treatment that is opposed to infrared radiation and forms a thermal barrier, without constituting an excessive obstacle to visible light. A VIR therefore prevents the heat from escaping in winter and return in the summer.



Canadian well

Fabrication artisanal sur Place

Al Ansary et Fils (+212 66 2161505)

Product category : Table 'c21\_italy.innov\_category' doesn't exist SELECT one.innov\_category AS current,two.innov\_category AS parentFROM innov\_category AS oneINNER JOIN innov\_category AS two ON one.parent\_id = two.idWHERE one.state=1AND one.id = '3'

The ground-air heat exchanger is used to supply air in a building by circulating in a pipe buried before that depending on the weather cooled or preheated by using the thermal inertia of the soil. The air serves as coolant while the tube serves as a heat exchanger while channeling the air to the building. The Provençal well, although mainly used as natural cooling system may also be used in winter to preheat the incoming air or to maintain a dwelling frost. It is the same Canadian wells.



Echangeur Air-MCP

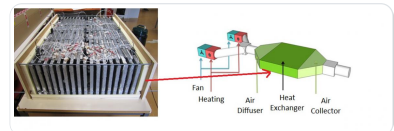
Laboratoire Génie Civil et Bâtiment (ENTPE-LYON)

mohamed.elmankibi@entpe.fr

<http://www.entpe.fr>

Product category : Table 'c21\_italy.innov\_category' doesn't exist SELECT one.innov\_category AS current,two.innov\_category AS parentFROM innov\_category AS oneINNER JOIN innov\_category AS two ON one.parent\_id = two.idWHERE one.state=1AND one.id = '3'

The Air-exchanger Materials Phase change is used to heat the building in winter, it will be coupled with a solar chimney. A summer release is outstanding experimentation.



Matlab/Simulink

mathworks

[http://www.mathworks.com/support/contact\\_us/](http://www.mathworks.com/support/contact_us/)

<http://fr.mathworks.com/>

Product category : Table 'c21\_italy.innov\_category' doesn't exist SELECT one.innov\_category AS current,two.innov\_category AS parentFROM innov\_category AS oneINNER JOIN innov\_category AS two ON one.parent\_id = two.idWHERE one.state=1AND one.id = '29'

MATLAB ("matrix laboratory") is a fourth-generation programming language emulated by the same name development environment; it is used for numerical calculation. Developed by The MathWorks, MATLAB can manipulate matrices, display of curves and data, implementation of algorithms, creation of user interfaces, and can interface with other languages like C, C ++, Java, and Fortran. MATLAB users (about one



million in 2004) are very different backgrounds such as engineering, science and the economy in a context as well as for industrial research. Matlab can be used alone or with toolbox ("Toolbox").

Labview

National Instruments

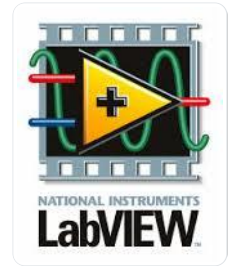
<http://www.ni.com/support/>

<http://www.ni.com>

**Product category :** Table 'c21\_italy.innov\_category' doesn't exist SELECT one.innov\_category AS current,two.innov\_category AS parentFROM innov\_category AS oneINNER JOIN innov\_category AS two ON one.parent\_id = two.idWHERE one.state=1AND one.id = '29'

LabVIEW (Laboratory Virtual Instrument contraction Engineering Workbench) is the heart of a platform measuring system design and control, based on National Instruments graphical development environment. The graphic language used in this platform is called "G".

Originally created on Apple Macintosh in 1986, LabVIEW is used primarily for measurement data acquisition to instrument control and industrial automation. The platform development is running under different operating systems like Microsoft Windows, Linux and Mac OS X can generate LabVIEW code on these operating systems but also on real-time platforms, embedded systems or FPGA reprogrammable components. The latest version of LabVIEW was released in August 2013.



## Costs

### Construction and exploitation costs

Cost of studies : 20 000 €

Total cost of the building : 135 000 €

Subsidies : 55 000 €

### Urban environment

Building in an open rural area. The building height has been reduced to 4 m for the development of the surrounding vegetation.

### Land plot area

Land plot area : 750,00 m<sup>2</sup>

### Built-up area

Built-up area : 15,00 %

### Parking spaces

2

## Building Environmental Quality

### Building Environmental Quality

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

## Contest

### Building candidate in the category





Smart Buildings



Bâtiment zéro énergie



Santé et confort



Date Export : 20230613144232