I+D+I SORIA CAMPUS

by María Jesús González Díaz / 2021-11-25 11:33:35 / España / 2715 / ES

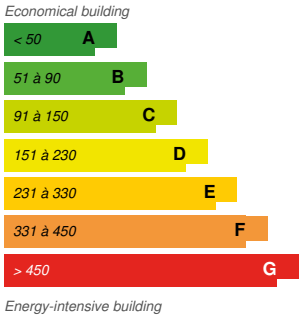
New Construction

Primary energy need :

63.8 kWhpe/m^2.year

(Calculation method : Other)

ENERGY CONSUMPTION



Building Type : School, college, university
Construction Year : 2018
Delivery year : 2020
Address 1 - street : José Tudela nº 12 42004 SORIA, España
Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 3 504 m^2
Construction/refurbishment cost : 4 600 000 €
Cost/m2 : 1312.79 €/m^2

General information

An educational building for university research that includes innovation in energy and sustainability in the building itself, in energy exchanges on the district scale, and measures to improve the health and comfort of users.

The objective was to build a functional, sustainable and multi-purpose infrastructure, capable of adapting to the diverse uses and changing needs of the University of Valladolid at the Soria Campus. The program required a flexible layout to allow simultaneously research-related activities, and training workspaces and derived activities, in accordance with the European Research Area and European Higher Education Area (ERA and EHEA, Bologna Process).

The 3,504.34 m2 project includes:

- classrooms complementary to the existing ones
- offices and workplaces for faculty and staff
- laboratories and mixed spaces for practical research and engineering

One of the prerequisites of the program was the adaptation to evolving educational patterns. This objective was put in practice with the outbreak of the COVID-19 pandemic: the building was opened precisely at that time, thus proving its adaptability to unforeseen circumstances. The laboratory was temporarily converted into classrooms and the ventilation system worked in accordance with the new health, social distancing and security needs.

Another issue of interest of this building is the innovative and radical approach of its design, in accordance with its close environment, seeking energy autonomy. The previous experience of this University in sustainable buildings and NZEB (LUCIA and INDUNIVERSIDAD DE VALLADOLID buildings in Valladolid), has been implemented and extended in the Soria Campus, improving the same principles. Universal accessibility, social criteria and circular economy have been

considered, with special emphasis on local and healthy building materials (all with EDP, no VOC, partly recycled, no waste, etc.), and waste control and reuse. But the main aspect lies in the coordination between design and on-site renewable energy production to achieve NZEB targets.

This has been achieved based on a careful study of the site, its microclimate and its own resources, analyzing:

- solar radiation
- topographic and geothermal characteristics of the soil
- wind regime
- water availability
- shadows and the impact of nearby buildings
- accessible energy in the environment

The result of the adaptation of the program and the requirements is two distinct volumes of different dimensions, orientation and design, each requiring its own particular combination of passive and active bioclimatic energy systems. In addition to the bioclimatic energy solutions and saving strategies (incidence of natural light lighting, low consumption devices and intelligent control systems, etc.), the use of an air conditioning and ventilation system based on an integrated design of renewable energies from the site has been added:

- A solar wall, which is a new technical and experimental solution of solar radiation, as an air preheating system
- Photovoltaic solar radiation integrated into the building for electricity production
- Geothermal, in subway pipes
- Local biomass central heating system

It is in the process of certification by the VERDE-GBCe and LEED methods, opting for the best results (in process, 5 GREEN and Platinum LEED leaves).

See more details about this project

https://gbce.es/edificios/22709/edificio-idi-campus-duques-de-soria/

Data reliability

3rd part certified

Photo credit

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Stakeholders

Contractor

Name : Unión Temporal de Empresas (UTE) Duques de Soria- Arcor - Herce
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https://www.grupoherce.com

Construction Manager

Name : Unión Temporal de Empresas (UTE) Duques de Soria- Arcor - Herce
Contact : https://www.grupoherce.com/es/contacto
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Stakeholders

Function : Contractor representative

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Construction management

Function : Others

David Ramos - Soria prevención

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https://soriaprevencion.es/
Health and Safety Coordinator

Function : Construction company

J. Manuel Muñoz Martín / Jesús Vaquer

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Facilities project and management

Function : Others

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https://directorio.Universidad de Valladolid.es/arbol/4009014
BIM management

Function :

Pejarbo S.L.

Calle Santiago nº13 4ºE, Valladolid 47001

https://pejarbo.com
Proyecto / Asistencia Técnica

Function : Thermal consultancy agency

Architect: Daniel Pascual

https://www.danielpascual.com/contacto/

https://www.danielpascual.com/
Energy Consultant

Function : Environmental consultancy

Cristina Gutiérrez Cid, Arquitecta

Project- Consulting

Function : Other consultancy agency

Daniel Pérez; Luis Ignacio Díez: Ana I. Jiménez; María de la O. García ; González Díaz, M. Jesús

Collaboration and external consulting

Function : Construction company

Javier Jiménez (GEOTER, Geothermal Energy, SL)

https://geoter.es/contacto

https://geoter.es/
Geothermal Consulting

Function : Other consultancy agency

Juan José Ventura Pou

Owner approach of sustainability

The University of Valladolid has been carrying out a campaign for sustainability for a decade. It applies innovative systems in buildings with zero energy consumption (NZEB, national and international awarded) and simultaneously disseminates these achievements to students, educational staff and management of the University. It is a way to present, in a direct and practical way, zero-carbon solutions and sustainable attitudes in general. The building is itself an educational subject as it is part of the academic curricular subject, especially in the schools of engineering and architecture.

Architectural description

The topography, very pronounced, and the shape of the site, semicircular surrounded by other university buildings, suggests different levels and shapes in the design of the building and its connection with the other buildings of the Campus on the north face. The design team, the Directorate of the Technical Unit of Architecture of the University of Valladolid, planned two different volumes, according to the particular functional requirements. Renewable energy production was integrated into the building such that each façade (including the roof) has its own renewable energy system based on its solar orientation.

The main laboratories (910 m2) have a dedicated space, as they require large open spaces. The other laboratories (300 m2), offices and specialized classrooms and workshops (600 m2) are located in another volume, regular prismatic, of 2590 m2.

The southeastern facade of the volume of the laboratories is closed as it contains the entrance of trucks and houses an air-collector-solar wall. It is a system for heating air mainly in a passive way, which reduces the use of non-renewable energy and moderates the losses of the wall on which it rests.

Next to the southwest façade, semi-buried, are the corridors for classrooms and workshops. For this facade, energy is produced by photovoltaic solar panels, such that it simultaneously allows for natural lighting and ventilation, as well as sight of the outside.

The roofs are green and skylights are located to provide light to the underground spaces. Geothermal pipes are also provided to support air conditioning.

The exterior treatment of the facades, glazing and windows and coatings have been chose in accordance with the energy objectives.

If you had to do it again?

Wood has been used as a structure for laboratories in large beams. The architect director of the Technical Unit of Architecture recognizes that, if he had to rebuild the building, he would use structural wood more exhaustively, as it is an existing product in the region (the forests of Soria), because of its good quality and because of to promote economically the area and other social aspects derived from its industry. In addition to this, it would make the deck accessible.
Since the project was completed and construction began, important achievements have been made in terms of circular economy: this chapter could be subject to improvement.

Building users opinion

The outbreak of the COVID-19 pandemic has provided an opportunity to verify the building's ability to guarantee the health of its occupants. The result of the satisfaction survey of the occupants is expected, which mainly indicates the comfort, the views, the adaptability and the light of the building.

Energy

Energy consumption

Primary energy need : 63,80 kWhpe/m^2.year

Primary energy need for standard building : 338,90 kWhpe/m^2.year

Calculation method : Other

CEEB : 0.0001

Final Energy : 38,30 kWhfe/m^2.year

Breakdown for energy consumption :
BREAKDOWN:
Total non-renewable energy:
Heating 24537 kWh
Cooling: 8883 kWh
Fans: 101,088 kWh
Pumps: 21,443 kWh
Recovery 3117 kWh
Lighting 38123 kWh
Total 168,946 kWh
Total 63.8 kWh / m2

Envelope performance

Envelope U-Value : 0,17 $W.m^{-2}.K^{-1}$

More information :
Laboratories: Facade; 0.168 W / m2K (including substructure and thermal bridges)
Photovoltaic facade: 0.232 W / m2K
Composite facade: 0.227 W / m2K
Curtain wall (blind) 0.335 W / m2K

Cover:
Green roof (workshops): 0.18 W / m2K
Classroom area cover: 0.157 W / m2K
Input cover: 0.292 W / m2K
Skylights 0.50 W / m2K

Window joinery:
COR 70 IND series Aluminum joinery U = 1.9 W / m2K
Curtain wall: COR TP52 series Aluminum joinery U = 1.5 W / m2K

Glass
Double 4 + 4/16 (Ar 90%) / 3 + 3 (16mm Argon) and low emissive treatment and solar control
Planitherm 4S or Guardian Sun Ug = 1.1 W / m2K, g = 0.38 and Tl = 0.65.
38 dBA
U = 1.2 W / m2K

Renewables & systems

Systems

Heating system :
- Geothermal heat pump
- Others
- Radiant ceiling
- Canadian well

Hot water system :
- Other hot water system

Cooling system :
- Geothermal heat pump
- VAV Syst. (Variable Air Volume system)
- Radiant ceiling
- Canadian well

Ventilation system :
- Double flow heat exchanger
- Canadian well

Renewable systems :
- Solar photovoltaic
- Heat pump (geothermal)
- Other, specify
- Heat pump

Extract from the Project Report:
"The system consists of taking advantage of the air that is heated in a small chamber controlled by the effect of solar radiation on a micro-perforated metal sheet. To do this, a second skin is attached to the facade of the building through which, in winter, outside air is circulated which, due to conduction, convection and radiation phenomena, raises its temperature between 15 and 40ºC before being introduced inside the building by means of the general air conditioning system or through a parallel network.
This double skin, in addition to allowing free heating of air, cancels or reduces thermal losses due to the enclosure in which it is attached. In summer, the air is not forced into the chamber, which is why it acts as a ventilated façade, providing shade to the enclosure and allowing upward air flows. Although it is less studied, and the position is not optimal, this system would also allow, in the summer months, to reverse the operation and perform night cooling, which allows lowering the temperature inside the building using the effect of heat irradiation to clear night sky.
The system is not totally passive, it requires a fan to force air in in winter, and it must be equipped with a control system that analyzes the exterior, interior and chamber temperatures to regulate operation. "

Smart Building

BMS :
The Building Management System (BMS) covers the entire intervention (laboratories and other parts of the building) and controls by monitoring the air conditioning, security, other facilities, etc., as well as the centralized control of the interior lighting installation, Through the Premium system of DALI technology, and its terminals (presence detectors, etc.), linked via TCP / IP protocol to the building control software.

Environment

GHG emissions

GHG in use : 10,80 $KgCO_2/m^2$/year

Methodology used :
EnergyPlus 8.5.0

Life Cycle Analysis

Eco-design material :

All installed products have been required either DAP or the Type I ecolabel, preferably Type III, certified recycled content (pre- and post-consumer), durability, reuse or recyclability, and VOC content, and must be produced within a 200 km radius from the center at the construction site. The sum of the percentage of post-consumer recycled material and half of the percentage of pre-consumer recycling must exceed 29%.

Water management

Consumption from water network : 3 435,00 m^3

Consumption of grey water : 871,00 m^3

Consumption of harvested rainwater : 334,00 m^3

Water Self Sufficiency Index : 0.26
Water Consumption/m2 : 0.98
Water Consumption/Pupil : 7.23

Indoor Air quality

The building has centralized ventilation to control indoor air quality, continuously, with IDA-C1 air quality in accordance with the regulatory qualification. Heat recovery is included in the ventilation system

Comfort

Health & comfort :

The building is located in an area with excellent outdoor air quality (ODA 1 with 0 dp). Accessibility, air quality, acoustics and comfort level were expected to improve the level of mandatory Spanish regulations, in accordance with requirements to obtain optimal results in the external GREEN-GBCe and LEED certification methods.

The COVID pandemic verified the accuracy of the forecasts, since the requirements of social distancing, ventilation and air quality have been met.

Calculated indoor CO2 concentration :
5 l/s·p and 0,9 l/s·m2 vn ventilación

Calculated thermal comfort : invierno 21 oC - veranor 25 oC
Measured thermal comfort : medidores de CO2 y sensor en cada habitación, conectados al sistema BMS

Acoustic comfort :

The construction system and the planned measures ensure a high level of acoustic comfort, improving the mandatory levels, as will be verified by external environmental methods such as LEED and GREEN-Gbce.

Daylight factor : 14

Products

Product

ONYX- photovoltaic panels

Onyx Solar https://www.onyxsolar.com/photovoltaic-facade-r-d-i-building-soria-campus

info@onyxsolar.com

http://www.onyxsolar.com

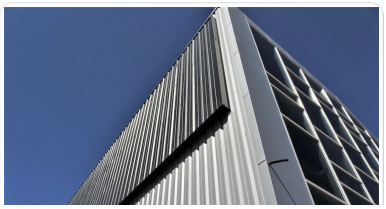
Product category :

283 units of Amorphous Silicon Photovoltaic Glass with dark transparency have been supplied in standard measurements 1245x635 mm and 3 + 4 mm configuration.

SOLAR WALL - SOLAR WALL

Product category :

Air preheating system composed of the following materials:
- Thickness: 0.7 mm - Material: galvanized steel S220 GD + ZA 255 - Coating: - External face: base of metallic coating in hot bath of 95% Zinc and 5% Aluminum. - Interior: 10 µm polyester. Reaction to fire: A2 - S1 - d0 according to EN 13501-01. - Width: 1000 mm - Color: Black



Costs

Construction and exploitation costs

Total cost of the building : 4 600 000 €

Additional information on costs :
Open public offering.

Urban environment

The building is located on the University Campus, 20 min. Walking from the city center and 3 min. walking from the city bus stop. The building is located on a plot of consolidated urban area, according to the territorial order (PGOU of Soria). The new research building will be located within a semicircle plot, surrounded by other educational buildings such as Agricultural Engineering, Library, Faculty of Education, etc., a green area. Close to a stadium and other municipal sports facilities.

Land plot area

Land plot area : 60 863,00 m^2

Built-up area

Built-up area : 13,00 %

Green space

Green space : 58 127,00

Parking spaces

Parking for vehicles (especially for special, adapted and electric vehicles) and bicycles is directly in front of the building. In accordance with the LEED and GREEN-GBCE requirements, the use of bicycles is encouraged and implemented.

Building Environnemental Quality

Building Environmental Quality

- Building flexibility
- comfort (visual, olfactive, thermal)
- energy efficiency
- renewable energies
- products and materials

Contest

Reasons for participating in the competition(s)

INTEGRACIÓN DE ENERGÍAS RENOVABLES EN EL DISEÑO

El tratamiento de los volúmenes como consecuencia de la función y los condicionantes del entorno, el exterior de las fachadas, acristalamiento y ventanas y recubrimientos se han adoptado de acuerdo con las estrategias energéticas renovables.

DISEÑO ADAPTADO AL ENTORNO CLIMÁTICO Y SOCIAL

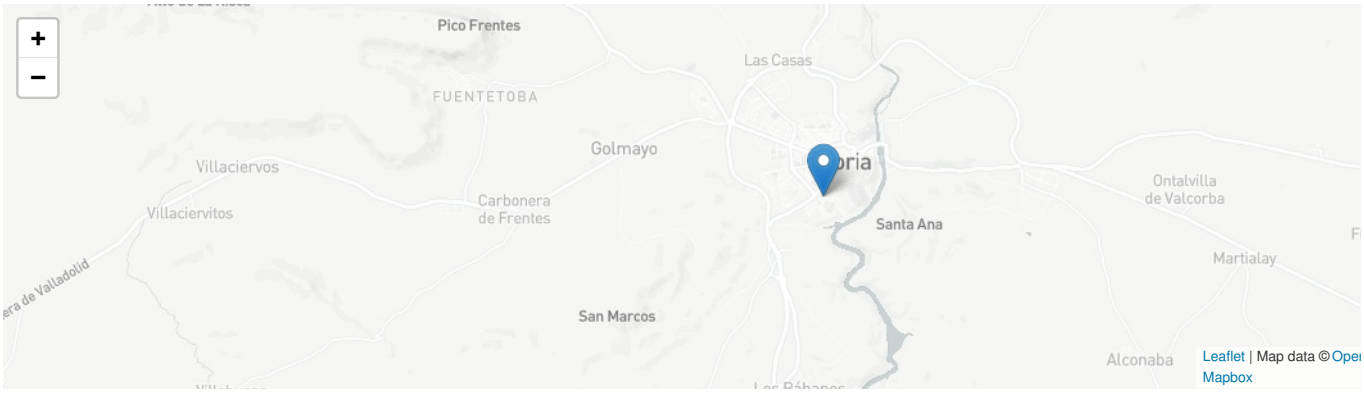
El promotor, la Universidad de Valladolid en el Campus de Soria, considera la realización de este edificio (así como los edificios anteriormente construidos LUCIA e IndUVA) como una oportunidad para continuar investigando y creciendo en el campo educativo en los aspectos culturales, sociales y medioambientales de la sostenibilidad. De esta manera está atento a la innovación.

SALUD Y COFORT

El edificio, abierto y funcionando en tiempos de COVID-19, ha mostrado ser muy eficiente y ha ofrecido excelentes resultados en materia de calidad de aire, confort y eficiencia energética.

Building candidate in the category

Users' Choice



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