Aulario IndUVA

by María Jesús González Díaz / 2018-03-20 16:35:56 / Espagne / 15405 / ES

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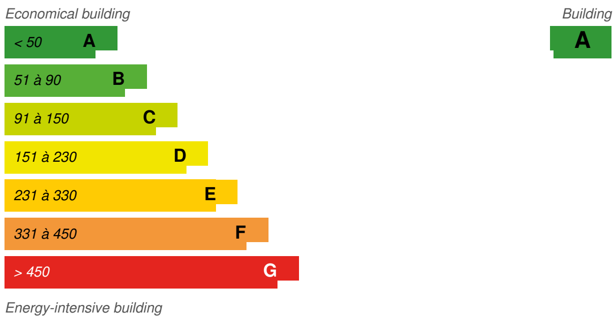
Primary energy need :

307 kWhpe/m^2.year

(Calculation method :)

ENERGY CONSUMPTION



Building Type : School, college, university
Construction Year : 2017
Delivery year : 2018
Address 1 - street : Paseo del Cauce, 50A 47011 VALLADOLID, España
Climate zone : [Csb] Coastal Mediterranean - Mild with cool, dry summer.

Net Floor Area : 5 539 m^2
Construction/refurbishment cost : 5 700 000 €
Number of Pupil : 2 523 Pupil
Cost/m2 : 1029.07 €/m^2

Certifications :

4 hojas VERDE

General information

The construction of the Aulario for the School of Industrial Engineering of the University of Valladolid presents an extraordinary casuistry from several points of view: it recovers a well-known space of the traditional culture of the university, it has been projected as a building of almost null energy, and it recovers and improves the previous experience of the University of Valladolid in the realisation of sustainable building in all its aspects (cultural, economic, environmental, and social). Although it is newly built, it is connected to the other buildings and facilities of the Campus, where a general recovery and sustainability intervention is being carried out. It will be externally certified through the GREEN GBCe, LEED, and Well certifications.

The building is composed of 34 classrooms of different sizes, with a university calendar, an intermittent and irregular schedule and a variable occupation from 100 to 2,523 students in a constructed area of 5,845 square meters. It is located within the headquarters of Mergelina, a university area that hosts other buildings such as workshops, laboratories, residential centers, and also includes gardens, recreation areas and parking. It has a long tradition in the city, and several generations of students and teachers from different areas of science have passed through it.

The Aulario IndUVA will embrace the process of continuous learning developed by the European Higher Education Area (flipped classroom), optimising the environments in which the student develops his work, both inside and outside the university classrooms. It will allow both collective and individual learning, with spaces transformed into dynamic and interactive environments for new teaching techniques and methodologies, creating adaptable spaces where students can choose when and where they learn, formally or informally, with the advances that digitization offers to the education of students. The incorporation of the use of Information and Communication Technologies (ICT) will led to more opportunities in the continuous access to learning and will provide a complement to internationalisation.

The building and its environment have taken into consideration the broadest possible accessibility as one of the design objectives.

See more details about this project

http://comunicacion.uva.es/export/sites/comunicacion/01.lauvainforma/3d0bb80f-1c8b-11e8-9079-d59857eb090a/

Data reliability

3rd part certified

Stakeholders

Contractor

Name : Constructora San-José S.A.
Contact : Alberto Sánchez Barbero
http://www.grupo-sanjose.com/

Construction Manager

Name : Constructora San-José S.A.
http://www.grupo-sanjose.com/

Stakeholders

Function : Designer

Francisco Valbuena García

direccion.unidad.tecnica@uva.es

http://www.uva.es
Architect. Project and construction management.

Function : Developer

Universidad de Valladolid- Vicerrectorado de Patrimonio e Infraestructuras

direcion.unidad.tecnica@uva.es

http://www.uva.es/export/sites/uva/1.lauva/1.03.vicerrectorados/1.03.05.infraestructuras
Promotion of the building.

Function : Other consultancy agency

Torre de Comares Arquitectos S.L.P

María Jesús González Díaz

http://www.mjg.es
Environmental Consulting- Assessed Accredited VERDE-GBCe

Function : Other consultancy agency

Ana Jiménez / María de la O García /Manuel Muñoz / José Luis Muñoz

Consulting and assistance to the Execution Project

Function : Thermal consultancy agency

Cristina Gutiérrez Cid

Cristina Gutiérrez Cid

Consulting and environmental support - Assessed AEDitado VERDE-GBCe

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Function : Environmental consultancy

Vega Ingeniería

Rafale vega / Borja Román

http://vegaingenieria.com

LEED Accredited Evaluator

Function : Other consultancy agency

José Emilio Nogués / Diego Tamayo

BIM support

Function : Structures calculist

Pejarbo SL

Calculator structures

Function : Construction company

REUQAV Ingenieros

Jesús Vaquer

Function : Environmental consultancy

Cristina Cano Herreras

Universidad de Valladolid-Oficina de Calidad Ambiental y Sostenibilidad

http://www.uva.es/

Function : Others

Antonio Vázquez Photo.

mail@antoniovphoto.com

http://www.antoniovphoto.com

Architecture Photography / photos 16 to 20

Contracting method

Other methods

Owner approach of sustainability

The University of Valladolid, promoter of the building from the Vice-Rectorate for Patrimony and Infrastructures, considers the realisation of this building, as well as other previous ones such as the LUCIA building, like an opportunity for investigation and growth in the area of sustainable edification. The realisation of the building itself can be a field of research, an opportunity for the incorporation of new solutions, and even the verification and control of existing methods, thus becoming a testimony of the possibility of achieving the greatest possible sustainability in buildings. The objective is to use the growth needs of the University of Valladolid as opportunities to advance in the field of sustainability as an educational community, in cultural, social and technical fields.

Architectural description

The final image of the building reflects the complete coordination between traditional elements of the environment (the garden, the connection with other buildings), with techniques adapted to new forms of learning and previous experience obtained in terms of environmental architecture. It is a building of monolithic volume, with its own distinctive and personal language, in which elements such as modulation and colour are integrated, strong and remarkable as an identity element of the building, and supported by an absolute and radical technical functionality seeking the comfort of the students. The design and technical team already have enough experience to solve the challenges of this new architecture that integrates the maximum knowledge in sustainability issues. The IndUVa has, in addition to the circumstances already mentioned and those of its function, two main characteristics. The first one is its status as an autonomous building but annexed and linked to the general university complex and the main building, whose exploitation and coordinated use should be part of it. This main building in which it depends will be rehabilitated, which requires some coherence in geometry, distributions, and connections in terms of facilities and operation. The second characteristic lies in its assigned parcel, which has a specific interest and is the subject of detailed study. A research of the original documentation has been made to take into account the characteristics of the design of its gardens and improve its species. Since the beginning, the project has been supported by the following passive systems:

- - Compact design with simple volumetry.
- - Optimisation of natural light: given that the orientations of the facades established in the general arrangement of the complex are assumed, criteria are established in their composition seeking for optimal conditions in terms of solar-lighting collection.

The facades of classrooms (Northeast and Southwest) open almost completely looking for the greatest illumination of spaces. The Northwest and Southeast façades, close almost completely protecting the spaces of classrooms, considering the university calendar and the forecast of thermal gains. These façades only open themselves in the central corridor areas to provide the user with lighting and views of the outdoor gardens.- Control of sunlight through the screening produced by the filtering screen, whose image is one of the most unique identifying features of the building.

- - Night ventilation, air renewal, and cooling.
- - A system of Canadian tubes (geothermal) supporting the ventilation system.
- - Great thermal insulation.
- - Use of phase change materials for storage of thermal energy.
- - Special attention to the closed cycle of construction materials (circular economy).
- - Collection and reuse of rainwater, separative networks, low consumption sanitary devices, etc. The building has all its plant covers.
- - Building management system (BMS) with digital automatic regulation, including the DALI lighting management system.
- - A requirement of high efficiency installations, equipment and devices (such as elevators), and environmental certification.

Within these passive systems, the following systems are especially innovative: - The increase of the natural interior lighting by means of an optical fiber. Natural lighting, especially in this type of programmes, is important for health and not only from the point of view of energy savings in electricity.- Absolutely innovative use of phase change materials (micronal material from the Basf house in laminated plasterboard from Knauf) in two building classrooms (classrooms 3.6 and 3.4), as a thermal balance regulator. Passive systems have been added with a careful implementation of active systems based on renewable energies, which together with advances in other areas are expected to achieve excellent certification marks.

If you had to do it again?

The promoter, as it has been doing for a long time, learns from previous experiences to continue researching sustainability, so the University of Valladolid would probably continue along the same path in future projects. One of the lessons learned during the construction process is that each case is unique and solutions must always be specific to each place.

Building users opinion

The building is not yet in use, so the Promotor is not able to answer this question. However, based on the previous experience of the LUCIA building, users stress: "it is good to be here!"

Energy

Energy consumption

Primary energy need : 307,00 kWhpe/m^2.year

Primary energy need for standard building : 431,00 kWhpe/m^2.year

Calculation method :

Final Energy : 109,00 kWhfe/m^2.year

Breakdown for energy consumption :

Refrigeration 6.40 kWh / m2 Heating 44.37 kWh / m2 Electricity 32.62 kWh / m2 ACS 0.00 kWh / m2 Total without equipment 82.71 kWh / m2 Equipment 10.60 kWh / m2 TOTAL BUILDING (INCLUDED EQUIPMENT): 109.7 KwH / m2

More information :

In high-efficiency buildings, most heating loads usually come from ventilation. In the case of the InduVA building, this becomes more important because there is a very high maximum occupancy. In the classrooms there are, on the one hand, very little energy consumption and loads throughout the day, such as lighting, projection equipment, digital whiteboards, etc.; and on the other hand there are burdens with enormous variability as those associated with occupation, both due to the schedules and the number of students. Therefore, adaptation to occupation, with a discontinuous and variable schedule pattern (between 100 and 2,523 students) becomes a key issue. Ventilation control, therefore, becomes the main active design strategy to reduce the need for energy and improve discomfort due to excessive ventilation. To ensure a healthy indoor environment while maintaining energy saving objectives, ventilation demand control systems have been installed using CO2 probes and temperature sensors.In air conditioning, according to the specific need of each type of space, the following subsystems will be installed:-Induction to 4 tubes in the classrooms, which allow the supply of cold and heat inside the rooms regardless of the time of year, considering the need for refrigeration practically during all seasons. The minimum ventilation airflow necessary for the rooms is sufficient to guarantee the necessary heating input for the rooms.-Fancoil to 4 tubes in the aisles and distributors. In the case of the corridors and distributors, the heating and cooling loads do not depend mainly on ventilation, but rather on the direct variation of occupancy, so it is necessary to recirculate air from the room through fancoils with 4 tubes with high-efficiency fans. This allows a differentiated treatment for each classroom of the building, which significantly improves the comfort of the occupants. In addition, it eliminates the need for fans inside the classrooms to cool down, since the ventilation flows allow the room to be heated or cooled without the need for recirculation of air inside the room itself.The building receives heat from the district power station of the University campus, coming from biomass, aided by geothermal (geothermal pipes) and photovoltaic energy.

Envelope performance

Envelope U-Value : 0,15 W.m^{-2}.K^{-1}

More information :

Envelope in roofs: 0.15 W / m2k. Envolvente in exterior screeds: 0.16 W / m2k

Building Compactness Coefficient : 0,27

Indicator :

Air Tightness Value : 3,00

Users' control system opinion : undefined

Real final energy consumption

Real final energy consumption/m2 : 109,70 kWhfe/m^2.year

Renewables & systems

Systems

Heating system :

- Urban network

Hot water system :

- Other hot water system

Cooling system :

- VAV Syst. (Variable Air Volume system)
- Canadian well

Ventilation system :

- Free-cooling
- Canadian well

Renewable systems :

- Solar photovoltaic
- Biomass boiler
- Other, specify

Renewable energy production : 53,00 %

Other information on HVAC :

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The building receives heat from the district power station of the University campus, coming from a biomass power plant. The system is aided by geothermal energy (geothermal pipes), and photovoltaic energy is used for the internal electrical system.

Solutions enhancing nature free gains :

The system of geothermal pipes as support to the air conditioning and ventilation system is very useful.

Smart Building

BMS :

To achieve the harmonization of all these energy systems with those of any building related to access control, security, monitoring and remote management, etc., there will be a Building Management system integrated into BMS that will integrate the subsystems of control of the air conditioning, control of the illumination, central of alarms, control of accesses, database, etc., by means of the corresponding protocols that operate in the different areas of management like illumination (DALI), air conditioning (BACNet), etc., along with those of the University's own development such as access control, anti-intrusion systems or video surveillance, through the programming and operating instructions controlled by the UVa from its command post.As "smart grid", the building is integrated into the collective system of the University Campus, including district heating and other energy infrastructure and collective maintenance of the Campus.

Users' opinion on the Smart Building functions : undefined

Environment

GHG emissions

GHG in use : 20,30 $KgCO_2/m^2$/year

Methodology used :

Energyplus v.8.5.0

Building lifetime : 50,00 year(s)

Life Cycle Analysis

Eco-design material : - Eco-designed materials: 0.49% in reused material budget.

- Percentage in cost of durable materials with respect to the total of materials used in the work, except for the structure: 28.60%.
- Percentage in cost of recycled materials with respect to the total of materials used in the project: 37.97%.

Water management

Consumption from water network : 1 224,00 m^3

Consumption of grey water : 257,00 m^3

Consumption of harvested rainwater : 242,00 m^3

Water Self Sufficiency Index : 0.29

Water Consumption/m2 : 0.22

Water Consumption/Pupil : 0.49

An important Runoff Management Plan has been made, which includes everything related to Phases I and II. (the building and its surrounding plot). The general objectives of the promoter, for the two phases of the intervention included in this PM Runoffs are:1. Promotion of biodiversity, which implies the study and maintenance of the current conditions of the plot space attached to the building.2. Create an outside space for learning that can be used by students as an extension of the classroom building.3. Maintenance of the structure of the existing garden, both for its own environmental qualities and control of the heat island effect, as well as for the cultural ones that entails a certain type of design that has remained over time and for several generations of students in the same place, representative of previous eras.4. Redefine the existing inner courtyard with an adequate landscape design to integrate it into the new building.Regarding the runoff management, it is an intervention at a local level in an urbanized space with a high degree of permeability, on which it is necessary to introduce new uses maintaining as much as possible the existing garden structure, and on which to apply non-structural and structural techniques for on-site control of runoff that allows the reuse of water, while ensuring safe management and avoiding sending rainwater to the municipal network.The cover is vegetal, and the rainwater is recovered for its reuse in the toilets cisterns. All the gray water of the building is recycled.

Indoor Air quality

IDA 2 Air quality. In order to achieve a building energy rating as high as possible, it is intended to meet the minimum requirements indicated by the American standard Ashrae 62-2007 for ventilation of premises, increasing the ventilation of the premises in a 30%. All spaces are equipped with a CO2 concentration control system.

Comfort

Health & comfort :

The WELL Evaluation will be applied in the building.
Natural lighting has been specially implemented. The surfaces of habitual use that improve the applicable norm are more than 50%. A system of natural light through fiber optic will be used as implementation and extension of natural light in the interior.

Calculated indoor CO2 concentration :

Todos los espacios habitables cuentan con detectores de CO2 conectados a la instalación de Control.

Measured indoor CO2 concentration :

Todos los espacios habitables cuentan con detectores de CO2. En cada aula/local una sonda de CO2 controla la compuerta proporcional de aporte/extracción de aire a la sala. El sensor vendrá provisto de un LED que indique que se sobrepasa el nivel aceptable

Calculated thermal comfort : Los sistemas de climatización están diseñados con un sistema de control adecuado para asegurar las condiciones de confort de categoría B.

Measured thermal comfort : Atendiendo a los criterios del RITE se hará una ventilación mecánica de los locales con categoría IDA-2 (aulas). El caudal de aire mínimo exterior se calcula mediante el método B) "método directo por calidad de aire percibido", basado en el informe CR 175

Acoustic comfort : The Project foresees the realisation of a study of acoustic conditioning of the building, to be carried out on-site, once the building is in use, by accredited acoustic Entity that includes the final tests that accredit in-situ the level of isolation to exterior noise (D2m.nT, Atr), between protected areas and between these and the facilities enclosures (DnT, A and L'nT, W), according to the test plan established by local legislation. In the absence of this legislation, the tests will be carried out according to the sample plan of AECOR for the certification of the acoustic quality of the buildings.

Products

Product

Solution of geothermal tubes, also called Canadian wells

El sistema se construye en obra y se ha realizado con tubos de polipropileno reforzado REHAU

Calculista: Cristina Gutiérrez Cid

http://www.uva.es

Product category :

Use of enthalpic recuperator combined with geothermal wells. For forced ventilation by CTE, an installation of geothermal pipes that preheat or cool the air, depending on the seasons, prior to entering the circuit, has been used as a support system. The energy equivalent of the contribution of this system is 31,726 kWh. This reduces the consumption of energy to condition the indoor air and starts the way for the exploitation of this system on a larger scale.

This system, used in LUCIA, a building previously built by UVA, has shown an excellent result.

ALBA-Gypsum board with phase-change materials

PLACO-RIGIPS- SAINT GOBAIN

Sergio Pérez- Saint Gobain Placo ibérica S.A.

https://www.placo.es/

Product category :

The use of phase-change materials has been foreseen in certain parts of the building where it is considered important to improve the thermal inertia to balance the thermal jumps. It consists of the use of gypsum plaster that contains gel microcapsules of phase-change material. The use of this material is done experimentally, in order to establish results for future applications.

In this system, it has been considered that the thermal loads of the summer in certain orientations, mainly in the month of June (July is considered practically non-working and August null) will be the most difficult to combat. In certain classrooms, all its perimeter will be covered with drywall with the phase change material (Alba-de Rigips-Saint Gobain plates). It is expected that the delay in the thermal wave that this material can contribute to a thermal balance, taking advantage of the usual thermal jump between day and night in this climate.

PARANS- natural lighting devices with fiber optics

PARANS

http://www.parans.com/contact-en.cfm

http://parans.com

Product category :

The project has determined the improvement of natural lighting through fiber optic lighting devices. The natural lighting of the whole building, especially in the classrooms, is direct and good, but in areas where this lighting inevitably does not arrive (interior corridors and distributors) or needs to be supplemented (classrooms 1.5, 2.5, 3.5, 4.5 and 5.5), (see diagram Fig. 1), it has been planned to introduce natural light through fiber optic transmission systems with Parans devices, of Swedish origin and not yet known in Spain. Thus, the natural lighting of all the spaces will be guaranteed, even those that are geometrically interior.

It is a system that introduces natural lighting in places without lighting: the objective is not the energy saving, but the improvement of health, taking into account the benefits of natural light, both in the purely hygienic and healthy field and in the psychological perception.

Costs

Construction and exploitation costs

Total cost of the building : 5 700 000 €

Urban environment

The building is located at the University Campus, within the plot designated for that purpose. It has a great tradition in the city and, at the same time, a consolidated urban environment incorporated in the city, with many basic services in an area of consolidated urban density, with a good access and public transport.

The green areas of the project plot are especially interesting. For this reason, a careful study has been carried out with a specific project, which includes the promotion of biodiversity and the maintenance of the original gardening design of the plot, both for its own environmental qualities and control of the heat island effect, as well as the cultural qualities that it involves in terms of a design that has remained over time and several generations of students in the same place, representative of previous eras. The possible treatment of the existing inner courtyard and the landscape design of the exterior area linked to the building are being covered.

Land plot area

Land plot area : 5 677,00 m^2

Built-up area

Built-up area : 37,00 %

Green space

Green space : 3 182,00

Parking spaces

It is planned to provide an extensive parking for bicycles, for electric or special cars and, finally, a car parking, with the number of parking places required by the municipal ordinances, in the collective area of the Campus. The building is located at the University Campus, within the plot designated for that purpose. It has a great tradition in the city and, at the same time, a consolidated urban environment incorporated in the city, with many basic services in an area of consolidated urban density, with a good access and public transport.

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Building Environnemental Quality

Building Environmental Quality

- indoor air quality and health
- biodiversity
- energy efficiency
- renewable energies
- integration in the land
- products and materials

Contest

Building candidate in the category

Energía & Climas Temperados

Premio de los Usuarios

Gran Premio de Construcción Sostenible

Date Export : 20230617214100