

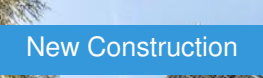


## Delta Green

by Anne ROUYEYRE / 2018-04-20 10:51:10 / France / 13768 / FR



**Primary energy need :**  
**100** kWhep/m<sup>2</sup>.an  
(Calculation method : RT 2012 )

**ENERGY CONSUMPTION**

*Economical building*

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

*Energy-intensive building*

**Building Type** : Office building < 28m  
**Construction Year** : 2016  
**Delivery year** : 2017  
**Address 1 - street** : 44800 SAINT HERBLAIN, France  
**Climate zone** : [Cfb] Marine Mild Winter, warm summer, no dry season.

**Net Floor Area** : 4 608 m<sup>2</sup>  
**Construction/refurbishment cost** : 6 570 000 €  
**Cost/m2** : 1425.78 €/m<sup>2</sup>

### Certifications :



### General information

On delivery, the only building in France that produces, stores and recovers electrical energy via a hydrogen station.

Delta Green is a building that meets the Passiv Haus certification requirements for high energy performance of the building.

This labeling process is not the least restrictive but in our opinion the most relevant and the most consistent with the requirements of this project.

He was also awarded in 2017 at the Silver Pyramids of the REIT (Federation of Real Estate Developers) at the regional level and ranked among the 3 best projects at the national level: Pyramids of gold.

A postulate "ALL USES" The whole of all the consumptions is taken into account.

A reasoning: GLOBAL COST at the market price by integrating investment AND operation - maintenance (all rental charges AND own consumption).  
One objective: AUTONOMY To be autonomous in annual smoothing:

To produce globally more than all the consumptions over one year.

## Sustainable development approach of the project owner

Today, we design buildings that are theoretically more and more efficient, but in reality energy consumption

realities are not mastered. The desire is to create an office building that is energetically positive, every day, and tends towards self-sufficiency. (with smoothing of annual energy consumption)

### ONE OBJECTIVE: 4 CHALLENGES TO BE TAKEN

- **TO AVOID :**

Minimize energy consumption by designing a building with low energy requirements. For this, the south and north orientations, the diffusion of natural light and the innovative materials were favored.

- **PRODUCE:**

Achieve a higher energy output than that consumed by the building using photovoltaic panels, a wood boiler and a passive cooling system.

- **STORE:**

Store the energy produced to cope with building consumption during periods of energy deficit.

- **USE :**

To sensitize the occupants in an awareness of their energy impact by presenting them in a pedagogical way the consumptions and the productions of energy in order to make them actors of the good use of their place of work.

## Architectural description

The Deltagreen project places these fundamentals at the center of its design:

### 1. NATURAL LIGHT

- Variable geometry for optimization of natural light: distance between frontage of 12m without central core at 20m with central core.
- Cutting of the constructive influence to favor the North and South orientations for the glazed parts and East and West for the solid parts in order to optimize the solar protections
- Faced with the first energy consumption that is artificial lighting, the workspaces have been sized according to the ideal penetration of natural light.

### 2. FLEXIBILITY OF SPACES

Structure "neither wall nor post":

- No rests or beams in fallout (No reservations)
- No lintels in front (High entrance of the light)
- Supports façade panels (no facade structure)
- Free trays
- "Structure" and "Skin" differentiated and separated (plane of the brakes-steam)
- Economic: Mutualization of floor structures and joinery
- Architectural freedom of writing (horizontal or vertical overlap on the facade)

The goal is to give users freedom. They must be able to arrange the space without constraints. We manufacture the fixed parts of buildings in which the user will not bump.

### 3. PERFORMANCE OF THE ENVELOPE

- Timber frame fixed on structure "neither wall nor post"
- Airtightness
- Vacuum insulator on full part of openings
- Management of thermal bridges

## Building users opinion

"This relocation project reflects our ambitions for further development of FIDAL in the region. Our installation in these new premises, modern, spacious, functional in a very innovative building will allow us to welcome our customers in optimal conditions and to provide an even more fulfilling working environment to our teams. In addition, we are pleased to integrate this positive energy building, which is fully in line with the firm's environmental policy. "

Eric Joanne, Regional Director of FIDAL, operator of the building on 2 levels.

## If you had to do it again?

We would do everything in the same way but had imagined fewer administrative and legal constraints. The initial ambition was "Can we imagine unplugging the building network: 100% autonomy" In the end a self-contained building smoothed over the year the only obstacle to ambition: the costs would have imposed a balance of storage and production of hydrogen for several million euros. Incompatible with the economy of the project ... The future may allow it ...

## See more details about this project

<http://galeo.fr/programmes/deltagreen/>  
<https://www.construction21.org/france/data/sources/users/10929/divisibilite-du-batiment.docx>

### Stakeholders

#### Contractor

Name : GALEO  
Contact : Alain RAGUIDEAU - 02 40 85 00 00 - a.raguideau@galeo.fr  
<http://www.galeo.fr>

#### Construction Manager

Name : CR&ON ARCHITECTES  
Contact : Thierry RAMPILLON - 04 76 56 24 04 - t.rampillon@creon.archi  
<http://www.creon.archi>

#### Stakeholders

Function : Thermal consultancy agency  
ITF

Bruno GEORGES - 04 79 75 00 29- contact@itf.biz

<https://www.itf.biz/fr/>

ENGINEERING ENERGY DESIGN - THERMAL -

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Function :

SERBA

Yoann GUITTENY- 02 51 11 10 99 - serba44@serba.fr

<http://www.serba.net/>

DESIGN - ENGINEERING STRUCTURE AND ECONOMY

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Function : Construction Manager

ESSOR

Caroline DEHAUT - 02 51 80 66 20 - c.dehaut@groupedelta.com

<https://www.essor.group>

ENGINEERING OF REALIZATION

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Function : Facility manager

SOLARIS GESTION

Karl BRICHETEAU - 02 85 52 49 00 - karl@solaris-gestion.fr

<https://www.solaris-gestion.fr>

MANAGER - PILOT OF THE ENSEMBLE

INSITECH

Vincent VILLENEUVE - vvilleeneuve@insitek.fr - 09 52 90 30 70

<https://www.insitek.fr>

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Function : Company

POWIDIAN

Bertrand CHAPUIS - Bertrand.chapuis@powidian.com - 06 70 16 60 05

<http://powidian.com>

HYDROGEN STATION

#### Contracting method

Separate batches

## Type of market

Global performance contract

## Energy

### Energy consumption

Primary energy need : 100,00 kWh<sub>ep</sub>/m<sup>2</sup>.an

Primary energy need for standard building : 110,00 kWh<sub>ep</sub>/m<sup>2</sup>.an

Calculation method : RT 2012

Breakdown for energy consumption : No details yet regarding the age of the building

### Real final energy consumption

Final Energy : 44,01 kWh<sub>ef</sub>/m<sup>2</sup>.an

Real final energy consumption/m<sup>2</sup> : 27,34 kWh<sub>ef</sub>/m<sup>2</sup>.an

Year of the real energy consumption : 2 017

### Envelope performance

Envelope U-Value : 0,52 W.m<sup>-2</sup>.K<sup>-1</sup>

More information :

The objective is to obtain spaces that are not constrained by walls or columns, for this we use load-bearing facades and an intermediate metal beam that is based on the technical blocks. The facades consist of carrying needles made of steel. A false ceiling plenum conceals the central beam and the distribution of fluids. The east and west facades are opaque and are mainly used to contravene the building. The other facades are made of curtain walls.

Building Compactness Coefficient : 0,32

Indicator : n50

Air Tightness Value : 0,33

## Renewables & systems

### Systems

Heating system :

- Geothermal heat pump
- Others
- Electric floor heating
- Solar thermal

Hot water system :

- Individual electric boiler

Cooling system :

- Geothermal heat pump
- Floor cooling
- Others

Ventilation system :

- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic
- Heat Pump on geothermal probes
- Other, specify

Renewable energy production : 51,27 %

Other information on HVAC :

Two heat pumps for on-site heating and cooling production with active slab emission (prefabricated concrete slabs traversed by PER networks)

Solutions enhancing nature free gains :

Stores automatiques sur les vitrages commandées avec gestion selon le vent, l'ensoleillement

## Smart Building

### BMS :

Centralized technical management on the building allowing:

- piloting and programming of dual flow plants;
- control and programming of the production of heating water or cooling water;
- control and programming of the demand for heating or cooling of the various trays of the building;
- control and programming of electric awnings;
- control and programming of indoor lighting and outdoor lighting;
- system of exploitation of energy data on the building.

## Environment

### Urban environment

Land plot area : 4 825,00 m<sup>2</sup>

Built-up area : 2 268,00 %

Green space : 1 912,00

Close to the ring road and well served by public transport, Delta Green offers easy access to all the regional capitals and easy access to Nantes Atlantique Airport and the TGV station in the center of Nantes.

On the spot, you can also benefit from aerated pedestrian paths and cycle tracks that cross the islands of offices, as well as 2100 public parking places.

Multiple services are at your fingertips: inter-company crèche open 5 days 7 from 7:30 to 21:30, restaurants, gyms, ATLANTIS commercial center, (151 shops), medical center and clinics, 26 movie theaters, banks, hotels, cultural space, theaters (ZENITH Nantes Métropole and Onyx Theater), ...

And the beaches of La Baule are only 47 minutes ...

## Products

### Product

#### PHOTOVOLTAIC PRODUCTION

AR MOR GREEN

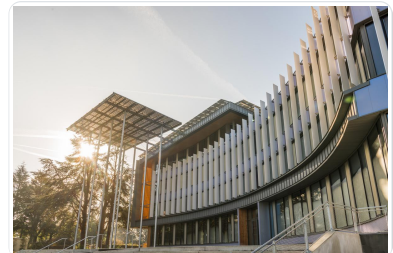
Nicolas ROLLAND

<http://www.armorgreen.fr>

Product category : Management / Others

Photovoltaic production: part of the production is used for self-consumption, the rest is reinjected into the network. The entire periphery of the roof of the building is equipped with panels. A roof was also intentionally created and covered with photovoltaic panels.

YES



#### Hydrogen station

POWIDIAN

Bertrand Chapuis - Bertrand.chapuis@powidian.com - 06 70 16 60 05

<https://www.powidian.com>

Product category : Management / Others

Hydrogen station: under certain conditions; the surplus of photovoltaic production intended for self-consumption is injected into a hydrogen station: by electrolysis of hydrogen is then produced and stored. In low sunlight conditions (mainly winter), hydrogen is then used as a fuel in a hydrogen cell to reinject electricity into the building.

YES



## Costs

### Construction and exploitation costs

Reference global cost : 1 100,00 €  
Renewable energy systems cost : 300 000,00 €  
Reference global cost/Work station : 1100  
Cost of studies : 50 000 €  
Total cost of the building : 6 570 000 €  
Subsidies : 23 000 €

## Energy bill

Forecasted energy bill/year : 21 400,00 €  
Real energy cost/m<sup>2</sup> : 4.64  
Real energy cost/Work station : 56.32

## Health and comfort

### Water management

Consumption from water network : 427,00 m<sup>3</sup>  
Water Consumption/m<sup>2</sup> : 0.09  
Water Consumption/Work station : 1.12

### Indoor Air quality

No measurement of the air quality in the building. Operation of dual flow plants during the day and on reduced time intervals at weekends

## Comfort

### Health & comfort :

A very important focus has been on natural lighting in DeltaGreen. 78% of the surface of the trays is in natural light, but better, 100% of the workspaces are, whatever the type of disposition chosen (closed offices or open space). In addition to the reductions in energy consumption allowed by the decrease in artificial lighting, it is also the gain in user comfort that has been thought out. Caps on the south facade reduce summer solar energy intake while allowing the building to capture a maximum of solar energy in winter. To achieve these results, here are the main design factors:

- the optimizations of orientations of the facades, the maximum north and south
- cutting the building, varying the thickness of the trays from 12.2 to 14 meters maximum
- the height of 3.3 m between slabs to penetrate the light to the furthest
- the absence of lintel on the facade thanks to the system neither wall nor posts

Calculated thermal comfort : 20 ° C in winter 25 ° C in summer

Measured thermal comfort : 20 ° C in winter 25 ° C in summer .The GTC settings have been adapted to provide comfort to the occupants

### Acoustic comfort :

In order to improve the inertia of the building, only the central part has acoustic false ceilings. The rest of the surfaces are raw concrete. Acoustic correction is provided by hanging baffles planned according to demand.

The spines (in 10cm x 20cm concrete steel) of the Stabalux type frames, combined with 98/48 type partitions with wool of RA<sup>3</sup> 47 dB index, make it possible to achieve isolations between offices of 42 dB which is the objective regulation between offices.

## Carbon

### GHG emissions

GHG in use : 3,00 KgCO<sub>2</sub>/m<sup>2</sup>/an  
Building lifetime : 25,00 année(s)  
GHG Cradle to Grave : 946,00 KgCO<sub>2</sub> /m<sup>2</sup>

Estimating GHG emissions in the use phase for the building per m<sup>2</sup> and per year can be feasible on energy, with this detailed 4-step methodology: Computational scope: building energy consumption (indirect energy emissions)

## Contest

## Reasons for participating in the competition(s)

POINTS FORTS Du point de vue énergétique

- 3 champs photovoltaïques :

-En toitures pour de la revente.

-En acrotère pour de l'autoconsommation et du stockage

-En ombrière pour de la revente.

- Une ombrière propulsée à 16 mètres de hauteur un champ photovoltaïque, vrai signal des ambitions environnementales et énergétiques du programme. Le confort thermique :

-Le chauffage et le rafraîchissement est assuré par un complexe de dalles actives et par un système PAC sur sondes verticales en géocooling. Ce mode d'émission assure un confort très élevé pour les occupants (pas de courant d'air, échange par rayonnement).

-Bilan global énergétique annuel La production photovoltaïque annuelle est évaluée à 520MWh d'énergie primaire quand la consommation annuelle du bâtiment (tous usages) atteint 476 MWh d'énergie primaire. -Lissé sur l'année, le bâtiment est autonome en énergie et même excédentaire.

POINTS FORTS Du point de vue environnemental

- Pour optimiser les ressources naturelles, les orientations Nord et Sud ont été privilégiées avec des façades largement vitrées et protégées de l'ensoleillement direct par 4 dispositifs de brise-soleils différents selon l'exposition.
- Pour préserver la nature, les arbres existants et l'aspect « sous bois » de l'environnement ont été préservés. L'ensemble des matériaux utilisés pour les façades s'inscrit dans une logique de pérennité et d'un entretien simplifié.
- A long terme, tous ces matériaux sont recyclables. Des avancées technologiques pourraient inciter à faire évoluer ces façades aisément en interchangeant les panneaux sans intervention structurelle.
- Adaptabilité totale grâce au concept « Ni poutre, ni poteau » Soit 92% des espaces libres de structure et ayant accès à la lumière naturelle (92 % de la surface avec FLJ > 2.5%)

Du point de vue digital (BIM, etc.) : -Un travail fin de 10 mois pour mettre en lumière ce concept unique en modélisant tout le bâtiment sous maquette BIM.

Du point de vue des usages, des pratiques : -Un système de gestion technique centralisé du bâtiment (GTC) assure le pilotage du bâtiment, la gestion des équipements, les mesures et contrôles des données qui permettant le suivi du site de manière optimale pour atteindre et optimiser la performance escomptée dans une logique d'amélioration permanente. -Un livret d'usages « Welcome Home », à destination de tous les usagers. -Un écran d'accueil qui informe en temps réel usagers et visiteurs sur les données énergétiques du bâtiment accessibles à distance

## Building candidate in the category



Energie & Climats Tempérés



Coup de Cœur des Internautes



Grand Prix Construction Durable





Prix des Etudiants



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