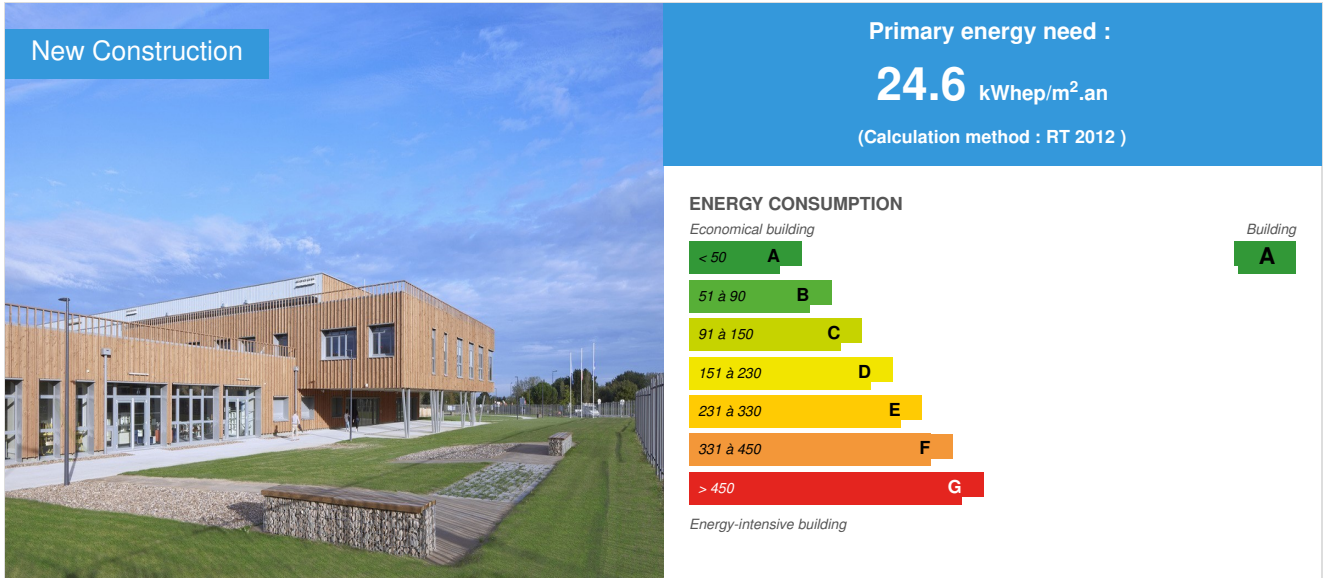


# Aizenay General and Technological High School

by Camille FAYET / 2023-02-15 00:00:00 / France / 1645 / FR



**Building Type** : School, college, university  
**Construction Year** :  
**Delivery year** : 2022  
**Address 1 - street** : 8 rue Albert Camus 85190 AIZENAY, France  
**Climate zone** : [Cfb] Marine Mild Winter, warm summer, no dry season.

**Net Floor Area** : 8 687 m<sup>2</sup>  
**Construction/refurbishment cost** : 20 232 621 €  
**Number of Pupil** : 620 Pupil  
**Cost/m2** : 2329.07 €/m<sup>2</sup>

**Certifications :**



## General information

For its general and technological high school in Aizenay in Vendée, the Pays de la Loire Region has chosen to build an unprecedented low-carbon structure.

Biosourced materials, architectural sobriety, respect for biodiversity, promotion and creation of short circuits... So many assets that reflect a real strong social, economic and environmental commitment of an entire construction industry in Pays de la Loire.

The target values of the various "low carbon" labels have been achieved: level 3 of the biosourced building label, E3C2 label and NF HQE Sustainable Building certification at the "Excellent" level for the design phase.

The establishment, with a capacity of 620 students with the possibility of extending to 830 students, has a day school for general and technological education, an administration, school life premises, a catering service for 840 rations, a gymnasium and 5 staff accommodation.

## Architectural sobriety

- Simple architectural forms
- 100% wood frame resting on a concrete base
- Large interior street serving three levels
- Large interior street heated and ventilated naturally, dressed in wood
- Zinc cladding with standing seam to the South and West and wood cladding to the East and North
- 200-seat multipurpose room that can operate independently of the high school
- Collective kitchen for 840 rations/day and dining room open to the landscape thanks to a terrace
- Technical sobriety, DF ventilation (attic rooms, wood/gas boiler room, LED lighting without dimming)

## Short circuits/biosourced materials

- 12,000 bales of straw for insulation obtained with the help of the Collectif Paille Armoricaïn, 9 Vendée farmers via the company Profibres (85).
- 90 kg of biosourced materials per m2 (instead of 38 kg/m2 to reach level 3 of the biosourced building label).
- Hemp-based interior wall insulation manufactured by the Vendée agricultural cooperative La CAVAC (Biofib).
- Algo paint produced in Brittany from 100% natural algae.
- Low-carbon concrete from Vendée, Hoffmann Green Cement Technologies, for the wall in the duty room.
- Prefabricated wooden structure by the Vendée company LCA with machined wood at Piveteau Bois (85).

## Biodiversity/outdoor spaces

- Pond of the three mills valued in an educational and ecological interest.
- Planting of 60 trees, 350 shrubs, perennial beds, natural meadows.
- Bocage hedges created or recreated with rustic and local species.
- Landscaped retention basin for rainwater planned on the West side.
- **League for the Protection of Birds associated with the project:** Nesting boxes, nests and lodgings installed for the preservation of small fauna and different species of birds.
- Establishment of differentiated management to provide a refuge for local wildlife.

## If you had to do it again?

Further reflection would be carried out on re-use materials and recycling.  
Natural light in the interior street would also be better studied.

## See more details about this project

<https://www.lca-construction.fr/construction-en-cours-du-lycee-d-aizenay/>

<https://www.lesechos.fr/pme-regions/pays-de-la-loire/le-lycee-daizenay-un-chantier-bois-paille-hors-norme-1410587>

## BIM approach

The Pays de la Loire Region is currently in charge of a heritage of more than 2 million square meters, consisting mainly of high schools and administrative buildings. To help it in the management of its assets and to promote the use of these new methods, the Region asked for the construction project of the new high school of Aizenay the realization of a "CWF (completed works file) BIM", articulated around a dematerialized Executed Works File and digital models of each building. Some data expected by the Region, such as details on the materials used or data specific to the Direction du Patrimoine Immobilière de la Région for its internal management of the estate, have also been integrated into the objects of the digital models. For the large technical equipment of the project, more complete and structured information was expected to link with their maintenance management software.

During the design studies, each design office produced a model of the trades under its responsibility (architecture, structure, HVAC and plumbing, electricity and kitchen). On site, in line with the basic missions of the market, the companies of the structural lots (the structural work and the wooden frame) as well as the technical lots (HVAC and plumbing, electricity and kitchen) took over the modeling and the information of the data expected. For the secondary lots, the architect kept control of the creation of the digital model.

All of this work enabled us to provide the contracting authority with a model of each tradesman as well as a model compiled of the whole for each building, in accordance with its expectations and "as built". Finally, the large technical equipment as well as their characteristics present in the digital models will make it possible to link the data with their internal asset management solutions and thus have the continuous updating of this one.

## Photo credit

Charles Durand

## Stakeholders

## Contractor

Name : Région des Pays de la Loire

Contact : Pascal Dublaneau

<https://www.paysdelaloire.fr>

## Construction Manager

Name : CRR Architecture

Contact : Jihen Jallouli

<http://crr-architecture.com>

## Stakeholders

Function : Other consultancy agency

EGIS

Aurélien Chené

<https://www.egis-group.com/fr>

structure, fluids, economy, external works consultancy agency

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Function : Assistance to the Contracting Authority

Collectif Paille Armoricaïn

Francois-Xavier Vandeville

<https://armorique.constructionpaille.fr>

Construction manager assistant - straw

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Function : Assistance to the Contracting Authority

BEHI ingénierie

Jérémie Proux

<http://www.behi.fr/developpement-durable/amo-environnement/>

Construction manager assistant - environment

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Function : Other consultancy agency

CRR Ingénierie

Jihen Jallouli

<https://crr-architecture.com>

Thermal consultancy agency HQE

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Function : Designer

CRR Architecture

Vincent Hervieu

<https://crr-architecture.com>

BIM management, architecture, landscape

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Function : Structures calculist

Salto Ingénierie

Kevin Marpeau

<http://www.salto-ingenierie.com>

Acoustic

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## Contracting method

Separate batches

## Type of market

Global performance contract

Energy

Energy consumption

Primary energy need : 24,60 kWh/m<sup>2</sup>.an

Calculation method : RT 2012

Breakdown for energy consumption :

- Heating: 2.5
- DHW: 2.5
- Lighting: 10.2
- Ventilation: 9.2
- Distribution auxiliaries: 0.3

## Real final energy consumption

Final Energy : 139,20 kWh/m<sup>2</sup>.an

## Envelope performance

More information :

Exterior walls (R=8.5 m<sup>2</sup> K/W): cladding + rain barrier + Farmacell + MOB straw + Biofib insulation + BA13

Low floors (R=3.8 m<sup>2</sup> K/W): BA + PS slab

Roof (R=6.5 m<sup>2</sup> K/W): steel sheet + rock wool.

Windows (Uw = 1.4 W/K m<sup>2</sup>): wood/aluminium

Building Compactness Coefficient : 0,80

Indicator : EN 13829 - q50 » (en m<sup>3</sup>/h.m<sup>3</sup>)

Air Tightness Value : 1,00

## More information

The re-entry of the occupants took place in September 2022, we do not yet have information on actual consumption and performance.

## Renewables & systems

### Systems

Heating system :

- Individual gas boiler
- Water radiator
- Wood boiler

Hot water system :

- Individual gas boiler
- Wood boiler

Cooling system :

- No cooling system

Ventilation system :

- Single flow
- Double flow heat exchanger

Renewable systems :

- Wood boiler

Renewable energy production : 7,00 %

Other information on HVAC :

The heating and the HDW function by a boiler wood + gas.

## Smart Building

BMS :

A BMS is set up for the management of technical equipment.

## Environment

## Biodiversity approach

The design teams worked on the landscaped areas to reduce the visual impact of the volumes built and give great consideration to biodiversity. The pond of the three mills, already present on the site to the north of the plot, has been enhanced in an educational and ecological interest.

- Plantation of 60 trees, 350 shrubs, perennial beds, natural meadows
- Bocage hedges created or recreated with rustic and local species
- Landscaped retention basin for rainwater planned on the West side
- League for the Protection of Birds associated with the project: nesting boxes, nests and lodgings installed for the preservation of small fauna and different species of birds
- Implementation of differentiated management to leave a refuge for local wildlife

### Mitigation actions on soil and biodiversity :

- Preservation of the pond
- Replanting of a bocage hedge to replace the destroyed one
- Permeable exterior covering (walkways, student playground)
- Installation of nesting boxes and shelters for insects

## Risks

### Hazards to which the building is exposed :

- Wind / Cyclone
- Heatwave

### Risks measures put in place :

- Strong insulation with biosourced materials (straw + hemp) known for their thermal phase shift.
- Loggia effect to protect exterior joinery.
- Students' courtyard protected from the prevailing westerly winds.
- Natural ventilation by the interior street.
- Free cooling possible by air handling units

## Urban environment

The site is located in the northwest of the territory of the municipality of Aizenay at a place called "Les Trois Moulins". The Nantes road defines the eastern limit of the land, on an area at the head of the slope, slope descending to the west, towards the D978, concretizing the western limit of the land, at the foot of the slope. It is therefore bounded from east to west by the departmental roads D978 and D2978. It is bordered on the southern limit by an Medical-educational institute project and a service road to a dwelling.

Carried out by different actors, the Pays de la Loire region, the community of Aizenay, the high school and its gymnasium will eventually allow the implementation of a new service along the RD978, a new bus platform, a public car park with more than a hundred spaces and the creation of a set of 6 houses (future staff accommodation for the high school).

Bike room in continuity with the bike paths created by the City.

Land plot area : 37 724,00 m<sup>2</sup>

Built-up area : 46,00 %

Green space : 10 900,00

## Products

### Product

Straw insulation thanks to the Armorican straw collective via Profibres

Profibres

<https://www.profibres.fr>

Product category : Finishing work / Partitions, insulation

R = 6,91 m2K/W

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Hemp produced by the Vendée agricultural cooperative La CAVAC

La CAVAC

<https://www.coop-cavac.fr>

Product category : Finishing work / Partitions, insulation

R = 1,154 m2K/W

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Algo Paint produced in Brittany from 100% natural algae.

Peinture Algo

<https://www.peinture-algo.fr>

Product category : Finishing work / paints, mural, wallcoverings

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Low-carbon concrete from Vendée Hoffmann Green Cement Technologies

Ciments Hoffmann

<https://www.ciments-hoffmann.com>

Product category : Structural work / Structure - Masonry - Facade

<https://www.ciments-hoffmann.fr/actualites/realisations-beton-bas-carbone-lycee-aizenay/>

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Nesting boxes, nests and lodgings installed for the preservation of small fauna

Valliance

valliance[a]outlook.fr

<https://www.valliance-nature-69.fr>

Product category : Management / Others

## Costs

### Construction and exploitation costs

Total cost of the building : 20 232 621 €

### Energy bill

Forecasted energy bill/year : 100 000,00 €

Real energy cost/m<sup>2</sup> : 11.51

Real energy cost/Pupil : 161.29

## Circular Economy

### Social economy

Social economy and professional integration :

The installation of the straw bales in the walls was carried out by the integration company Batinert from Treize Septiers (85).

### Additional information (PDF documents)

## Health and comfort

### Water management

Consumption from water network : 1 000,00 m<sup>3</sup>

Consumption of harvested rainwater : 860,00 m<sup>3</sup>

Water Self Sufficiency Index : 0.46

Water Consumption/m<sup>2</sup> : 0.12

Water Consumption/Pupil : 1.61

A 30m<sup>3</sup> tank set up to supply the common toilets for the students.

### Indoor Air quality

All products put have an A+ label.

## Comfort

### Visual comfort :

An ALJ study was performed.

## Quality of life and services

The interior street was designed to encourage meeting and exchange.

## Carbon

### General infos

As much as possible, the contracting authority and the prime contractor have favored biosourced materials and the territorial ecosystem, thus taking advantage of the multiple benefits for the environment, the economy and the revitalization of the territories. Straw, in particular, the flagship material for this project, was obtained with the help of the Collectif Paille Armoricaïn (35), nine Vendée farmers and the Profibres company for storage and packaging (85).

- 90 kg of biosourced materials per m<sup>2</sup> (*instead of 38 kg/m<sup>2</sup> to reach level 3 of the biosourced building label*)
- The hemp-based insulation produced by the Vendée Biofib
- Algo paint produced in Brittany from 100% natural algae
- Low-carbon concrete from Vendée, Hoffmann Green Cement Technologies, for the wall in the duty room
- The prefabricated framework by the Vendée company LCA with machined wood at Piveteau Bois (85)

### Ic Energy

Ic Energy : 45,10 KgCO<sub>2</sub> /m<sup>2</sup>

### Ic Construction

Ic Construction : 1 000,00 KgCO<sub>2</sub> /m<sup>2</sup>

### Initiatives promoting low-carbon mobility

Creation of a bicycle and scooter room.

### GHG emissions

GHG in use : 4,30 KgCO<sub>2</sub>/m<sup>2</sup>/an

#### Methodology used :

Excel calculation carried out by the project management.

Building lifetime : 50,00 année(s)

### Life Cycle Analysis

Regulatory calculation E+C- (labelling)

#### Material impact on GHG emissions :

Eges = 900 kg eq CO<sub>2</sub>/m<sup>2</sup> SDP

## Contest

### Reasons for participating in the competition(s)

Le lycée d'Aizenay est le résultat d'une démarche exigeante de performance environnementale. Autant que possible, le maître d'ouvrage et le maître d'oeuvre ont privilégié les matériaux biosourcés et l'écosystème territorial profitant ainsi des bénéfices multiples pour l'environnement, l'économie et la dynamisation des territoires.

Cet établissement représente l'un des bâtiments les plus importants en Europe utilisant ce procédé constructif bois/paille. Il se distingue également par sa sobriété architecturale ainsi que par ses espaces extérieurs valorisés dans un intérêt pédagogique et écologique.





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