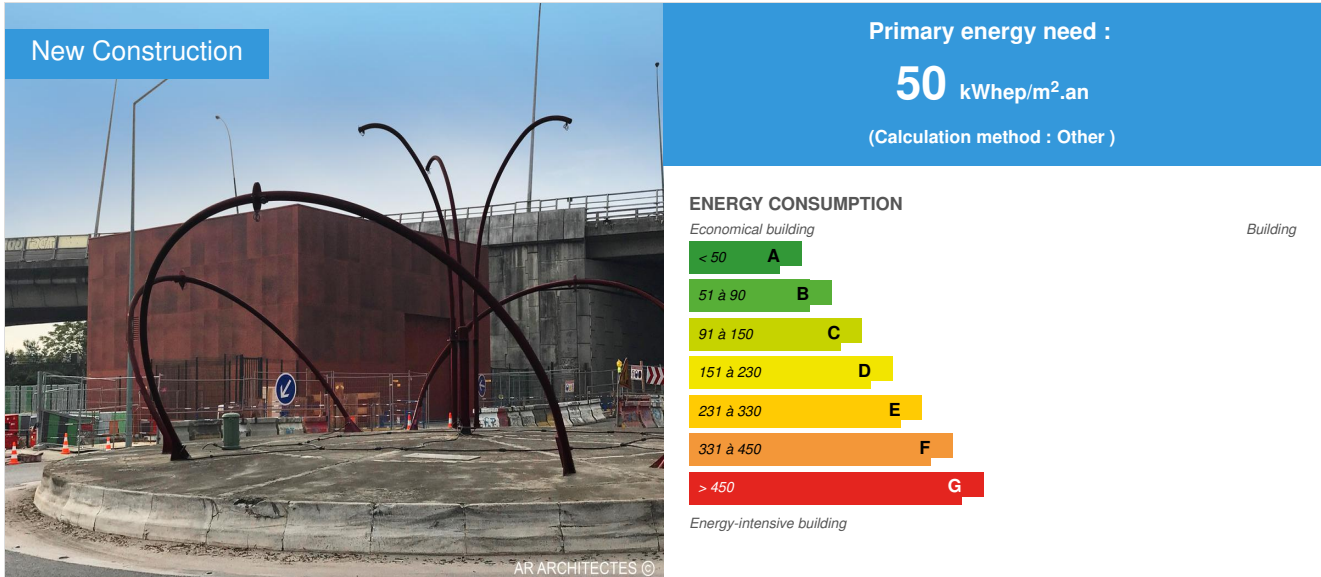


# The anti-flood pump station building of the Seine, an invisible giant

by AR ARCHITECTES / 2020-05-07 10:14:25 / France / 7669 / FR



**Building Type** : Other building  
**Construction Year** : 2016  
**Delivery year** : 2019  
**Address 1 - street** : Rue Léon Geoffroy 94400 VITRY-SUR-SEINE, France  
**Climate zone** : [Cfb] Marine Mild Winter, warm summer, no dry season.

**Net Floor Area** : 215 m<sup>2</sup>  
**Construction/refurbishment cost** : 14 500 000 €  
**Number of none** : 3 none  
**Cost/m2** : 67441.86 €/m<sup>2</sup>

## General information

The Vitry-Sur-Seine anti-flood pumping station is a HQE building located in an urban context marked with the railways to the East, to the North, the future SMI (Infrastructure Maintenance Site managed by the SNCF), to the South the A86 which overhangs the field and to the West, an industrial zone. It is the southern end of the ZAC (activity zone) Gare des Ardoines, on the edge of Léon Geoffroy street. This architectural and landscaping project is a strong link between the buried civil engineering works allowing the anti-flood pumping of the Seine and the urban district in full renewal. Sign of a green mesh in the landscape, it recreates biodiversity and synergy with the surrounding ubiquitous flows.

The pumping station is an exemplary sustainable building on several points:

- The harmonious relationship of the building with its environment near and far.
- The restoration of biodiversity in an urban and dense environment.
- Constructive choices made for the durability, adaptability and ease of maintenance of the structure
- Energy management
- Water management

- Hygrothermal comfort and acoustic comfort

- Visual comfort

## Sustainable development approach of the project owner

The project responds to the architectural competition launched in March 2015 by the Department of Val-de-Marne to work on the architectural integration of the anti-flood pumping station located at the entrance of the city. The aim was to work on architectural integration in harmony with the surrounding industrial environment, with the future SMI of Metro Line 15 of Paris (Infrastructure Maintenance Site managed by RATP), the A86 overlooking the parcel, the railways of the SNCF (RER C and lines Paris - Orleans) and the end of the ZAC Gare Ardoines. The building also has a social and educational function. Located at the entrance to the city, it helps to sensitize residents to water management and issues related to flooding and the evacuation of runoff water during floods.

## Architectural description

The architectural party takes into account the alignment of the facade with Léon Geffroy street. The volume, the heights and the coatings make it possible to harmonize the technical premises with the future Site of Infrastructure Maintenance (SIM) which borders on the North. The anti-flood pumping station is located south of Lot DK46 Lot B, access being from Léon Geffroy Street, by a truck access door equipped with a pedestrian gate. The above-ground technical rooms have a footprint area of 215.40 m<sup>2</sup>, including the following premises: - Local operating: su 155.00 m<sup>2</sup> - Local hydraulic central: su 6.60 m<sup>2</sup> - Sanitary facilities: su 4.10 m<sup>2</sup> - Electrical room: su 21.00 m<sup>2</sup> - Local access station underground part: su 7.50 m<sup>2</sup> The underground pumping station has a volume of 3660 m<sup>3</sup>. The architectural principle of this technical station is the creation of a simple volume, worked with suitable metal coatings and a green roof to integrate into a urban site in full renewal, valuing the activity zone Gare Ardoines and more specifically the SIM, enriching the biodiversity of this site and minimizing visual nuisance for residents: The total height of the structure built above ground is 8.00 m. - Substructure of the premises in thermo-lacquered aluminum cladding with a smooth and dark ochre appearance, surmounted by a thermo-lacquered aluminum cladding with braided effect, dark ochre effect rust. - Fifth vegetated facade: 147 m<sup>2</sup> green roof including 28 m<sup>2</sup> on tray. - 72 ml internal fencing with a height of 2.00 m, delimiting the heavy road. - Fence along rue Léon Geffroy of 2m50 total height in continuity with the future fence of the SMI, and in continuity of the basement of the technical premises: opaque with reliefs of random vertical stripes of ochre hue. - Access gate with double leaves of 7 ml access to the technical station in lacquered steel, ochre tone, height 2.50 m. - Access gate of 1.30 ml and height 2m50, for access to the west of the building. - Circulation areas and access to the pumping station, optimized.

## Building users opinion

The occupants of the building, the operating department of the Department of Val-de-Marne, are satisfied with this achievement which is isolated unlike this type of building usually. The insulation of the frame by the wood fiber exterior provides thermal comfort and a satisfactory working environment, there is no heat loss and the internal temperatures are well regulated. This insulation from the outside and the green roof also reduce the heat island effect that can usually be observed in dense urban environments.

## If you had to do it again?

If the building were to be redone, the agency AR ARCHITECTES would like to propose a more sustainable main structure from the dry sector, wood for example to reduce the use of concrete and the carbon footprint of the building. The AR ARCHITECTES agency would also have liked to work on renewable energies to ensure aeration of the building or even the valorization of the fatal energy in the water process in order to create a source of energy to valorize (heat pump, cogeneration ...).

## Photo credit

AR ARCHITECTS

## Stakeholders

### Contractor

**Name :** Département du Val de Marne Pôle Architecture et Environnement Direction des services de l'environnement et de l'assainissement

**Contact :** Madame Eve Karleskind directrice des services de l'environnement et de l'assainissement

<https://www.valdemarne.fr/>

### Construction Manager

**Name :** AR ARCHITECTES

**Contact :** Mme Ruba Alabed, architecte, gérante

<https://www.ar-architectes.com>

## Stakeholders

**Function :** Company

Chantier Moderne Constructions

Sébastien LE CHAPELAIN Directeur d'activités

<https://www.chantiers-modernes.fr/>

Civil engineering and assainissement

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Function : Company

Razel Bec

Alexandre CHRETIEN

<http://www.razel-bec.com/>

Civil engineering and sanitation

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Function : Company

Soletanche Bachy

Quentin MARTIN-LAVIGNE

<https://www.soletanche-bachy.com/fr>

Molded walls and soil treatment by injection

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Function : Company

Sefi-Intrafor

<https://sefi-intrafor.fayat.com/fr/sefi-intrafor>

Molded walls and soil treatment by injection

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Function : Company

SADE Travaux Spéciaux

Bruno SOLIMEO

<http://www.sade-travaux-speciaux.fr/>

Micro-tunnelage

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Function : Company

Sorecob Construction

Jean-Michel DELAMAR

Cladding and greening

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## Contracting method

Macro packages

## Type of market

Design and implementation

## Energy

### Energy consumption

Primary energy need : 50,00 kWhep/m<sup>2</sup>.an

Primary energy need for standard building : 250,00 kWhep/m<sup>2</sup>.an

Calculation method : Other

### Real final energy consumption

Year of the real energy consumption : 2 019

### Envelope performance

Envelope U-Value : 0,40 W.m<sup>-2</sup>.K<sup>-1</sup>

More information :

All the exterior joinery of the above-ground building of the Vitry-sur-Seine pumping station is insulated from the outside with wood fiber, the grid, the double-leafed sliding door, the gate and the double canopy. glazing. The acroteria are also isolated.

Building Compactness Coefficient : 0,40

## More information

It is difficult to estimate the actual consumption of this building because it has been in operation for only two months. This recent inauguration does not allow enough perspective, however outdoor insulation wood fiber and green roof can reduce energy consumption of the order of 40%. These data are confirmed at the operating balance of the pumping station.

## Renewables & systems

### Systems

#### Heating system :

- Fan coil
- VAV System

#### Hot water system :

- Individual electric boiler

#### Cooling system :

- No cooling system

#### Ventilation system :

- Natural ventilation
- Single flow

#### Renewable systems :

- No renewable energy systems

## Environment

### Urban environment

Land plot area : 20 359,00 m<sup>2</sup>

Built-up area : 215,00 %

The work of the anti-flood pumping station, rue Léon Geffroy in Vitry-sur-Seine, is built near the future Infrastructure Maintenance Site (IMS) of line 15 of Paris metro, in the immediate vicinity of engineering structures of the A86 motorway, and more precisely south of the ZAC Gare Ardoines managed by the EPA ORSA. The site is bordered: - North by the future Infrastructure Maintenance Site (IMS). - South, by the A86 motorway which overhangs the site. - To the east, by the lines of the RER lines C and main lines. - To the west, by Léon Geffroy street (RD 274). Access to the plot is from rue Léon Geffroy to the west of the parcel. The site located in the UP2 area of the PLU of Vitry-sur-Seine, belongs to the Concerted Development Area (CDA) Ardoines Station. The CDA Gare Ardoines is articulated between the inhabited areas of Vitry and the Sanofi industrial site on the edge of Seine. This CDA project consists mainly of an industrial and logistic zone, but also of a residential zone. Public spaces, shops, services, commercial center and the tertiary / residential mix will ensure the constant dynamism of the CDA.

## Products

### Product

ISOLOR

PAVATEX

François MAGUEUR

<https://www.pavatex.ch/fr/produits/toiture-isolant/>

Product category : Finishing work / Partitions, insulation

Isolair panels are insulating panels based on wood fibers manufactured using the "dry process" process. Particularly resistant due to their high densities, Isolair panels serve as both thermo-acoustic insulation but also rigid under-roofing and rainwalls behind a ventilated facade with closed joints. Their large opening to vapor diffusion gives the rigid panels a high permeability to water vapor. The Isolair range allows you to enjoy all the benefits of high-performance wood fiber insulation.



This biosourced insulation was chosen by Ar-architects from the beginning of the project design for its low carbon footprint. Other options were presented to Ar-architecture who did not wish to move towards another type of insulation.

Tress 'Design

Metal Design Concept

Jérôme PEYRON

<http://www.metal-design-concept.com/tole-effet-tresse-tressdesign/>

**Product category :** Structural work / Structure - Masonry - Facade

Tress' Design © is a new patented method that offers a "braided metal" appearance with many advantages: an aesthetic rendering of great fineness (braiding possible of different widths with or without holes), no risk of pinching or tampering paint, increased resistance.

The aluminum facade is an architectural part, an integral part of the project. The choice of the product was made by the architect who did not wish to use other material.

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ECOVEGETAL SUCCULIS

ECOVEGETAL

Romain BREISACHER

<https://toiture.ecovegetal.com/fr/solutions/vegetalisation-extensive-simple>

**Product category :** Structural work / Carpentry, cover, tightness

ECOVEGETAL SUCCULIS is a green roof, it is a creeping and resistant extensive vegetation. SUCCULIS is used for its light weight and low maintenance. The plant cover of the SUCCULIS system consists of different Sedum whose foliage color changes during the seasons. The hue can vary from green to red and the flowers are usually yellow, white, red and pink. It is an ecological protection which advantageously replaces the layer of gravel.

The agency AR-architects wanted to collaborate with Ecovégétal and therefore directed the project management towards this supplier.

## Costs

### Construction and exploitation costs

Total cost of the building : 14 500 000 €

**Additional information on costs :**

The costs presented are exclusive of taxes.

The structure is a complex comprising a part of a rainwater pumping station, a depollution works part (sand chamber and screen), a protection part of the stormwater sanitation network against floods (isolation valve ) and a rejection part in the Seine (siphon under railway tracks laid in micro-tunneling). The visible part, the building of exploitation, represents less than 10% of the final cost of the work is 1 250 000 € HT.

## Health and comfort

### Comfort

**Health & comfort :**

The atmosphere of the operating building is in contact with effluents (runoff) that could potentially produce toxic gases. The renewal of the air is continuous with a staff presence function during which the renewal of the air is forced (5 times higher).

**Daylight factor :** La lumière naturelle est apportée dans le bâtiment grâce à la verrière de 8 m<sup>2</sup> situé sur la toiture végétalisée. Cette fenêtre apporte un confort visuel et permet de faire des économies d'éclairage à l'intérieur du bâtiment.

## Carbon

### Life Cycle Analysis

**Eco-design material :**

For the building of the anti-flood pumping station of Vitry-sur-Seine, several eco-materials have been used: - Wood fiber as insulation, is an ecological and biosourced material. It allows thermal and acoustic insulation of the building above ground. - The green roof as the fifth facade also allows to isolate the building and develop biodiversity. - The aluminum facade cladding is a removable and recyclable material, it contributes to the sustainable appearance of the building.

## Contest

## Reasons for participating in the competition(s)

L'éco-station de pompage anti-crue de la Seine, une géante invisible, est un bâtiment résilient qui s'inscrit dans un contexte urbain marqué avec à l'Est, les voies ferrées et plus loin la Seine, au Nord, le futur SMI (Site de Maintenance des Infrastructures géré par la SNCF), au Sud l'A86 qui surplombe le terrain et à l'Ouest, une zone industrielle. Elle constitue l'extrémité Sud de la ZAC Gare des Ardoines, en bordure de la rue Léon Geoffroy.

Cet ouvrage de génie civil agit en tant que tampon des eaux pluviales issues de l'imperméabilisation de la ville empêchant par ailleurs le débordement des eaux de la Seine en cas de crue. Ce projet aussi bien par sa fonction de station de pompage anti-crue, que par son architecture est une réponse innovante aux risques naturels climatiques qui touchent de plus en plus le monde. L'ouvrage de génie civil permettant le pompage anti-crue de la Seine est enterré, et les locaux de l'exploitation sont mis en valeur par un bâtiment hors sol, dont la matérialité pérenne et végétale (aluminium recyclable de teinte ocre, isolation en fibre de bois, et toiture végétalisée accessible) permet une intégration harmonieuse dans l'environnement proche comme lointain. L'utilisation d'éco-matériaux, bio-sourcés et recyclables, permet à l'architecture de traduire la nature résiliente de l'infrastructure anti-crue. L'isolation extérieure en fibre de bois du bâtiment d'exploitation, rarement effectuée dans les projets industriels, démontre la nature innovante de cet éco-projet et projette l'éco-station de pompage comme un exemple à suivre. En protégeant la ville, les habitants et la biodiversité des futures crues de la Seine, ce projet architectural et paysager répond aux enjeux de la gestion durable de l'eau de la ville de demain.

La station de pompage anti-crue de Vitry-Sur-Seine est un bâtiment durable bas carbone conçu en suivant la démarche HQE et les cibles prioritaires cités ci-dessous qui ont été développées tout au long du projet :

### Cible 1 : Relation harmonieuse du bâtiment avec son environnement

Qualité des espaces extérieurs pour les usagers :

- Le parti pris est de proposer un traitement des façades du bâtiment projeté par l'utilisation de matériaux biodégradables, comme l'aluminium
- Vues sur espaces naturels : toiture végétalisée et dalles alvéolées végétalisées
- Limitation des nuisances visuelles engendrées par l'environnement immédiat
- Intégration architecturale du bâtiment dans projet global de la ZAC Gare des Ardoines
- Limitations des nuisances générées par le fonctionnement du site pour les riverains : optimisation des interfaces
- Restauration d'une biodiversité grâce à la toiture végétalisée et les bacs sur plots. Les aromates et sédum plantés favorisent la venue d'insectes et oiseaux comme les abeilles, papillons, coléoptères.

### Cible 2 : choix intégré des produits, systèmes et procédés de construction

- Choix constructif pour la durabilité, l'adaptabilité et la facilité d'entretien de l'ouvrage : Bardage en aluminium tressé de teinte ocre (2/3 des façades hautes) et en aluminium lisse teinte ocre (1/3 des façades en soubassement) (Métaldesign concept), toiture terrasse accessible et végétalisée (bacs sur plots plantations d'aromates) et toiture terrasse plantée de sedum (ecovégétal), isolation de toutes les façades et toiture en fibre de bois (de chez Pavatex)

### Cible 4 : Gestion de l'énergie

- Isolation thermique en panneaux de fibre de Bois (Pavatex) façades et toiture.
- VMC double flux (aération du bâtiment et du bassin enterré)

### Cible 5 : Gestion de l'eau

- Traitement des eaux pluviales de toiture par 2 systèmes : bacs sur plots végétalisés présents au pourtour de l'acrotère. Une couverture végétalisée en sédum recouvre la quasi-totalité de la surface de la toiture. Les eaux de pluies sont gérées par la végétalisation et acheminées vers les décentes d'eau pluviales localisées aux angles du bâtiment.
- En cas de fortes pluies les eaux de la ville de Vitry-sur-Seine sont acheminées vers la Seine ; l'ouvrage enterré en dessous du bâtiment permet de récupérer les eaux de pluie de la ville acheminées vers la Seine grâce à un pompe. Ce dispositif permet de pâlier contre les risques d'inondation de la Seine en cas de pluie et de crue. Ainsi le bassin permet de restituer l'eau pompée en période sèche.

### Cible 6 et 7 : confort hygrothermique et confort acoustique

- Le confort thermique et acoustique est garanti par la toiture végétalisée, et une isolation en fibre de bois.



Prix tertiaire & industriel



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