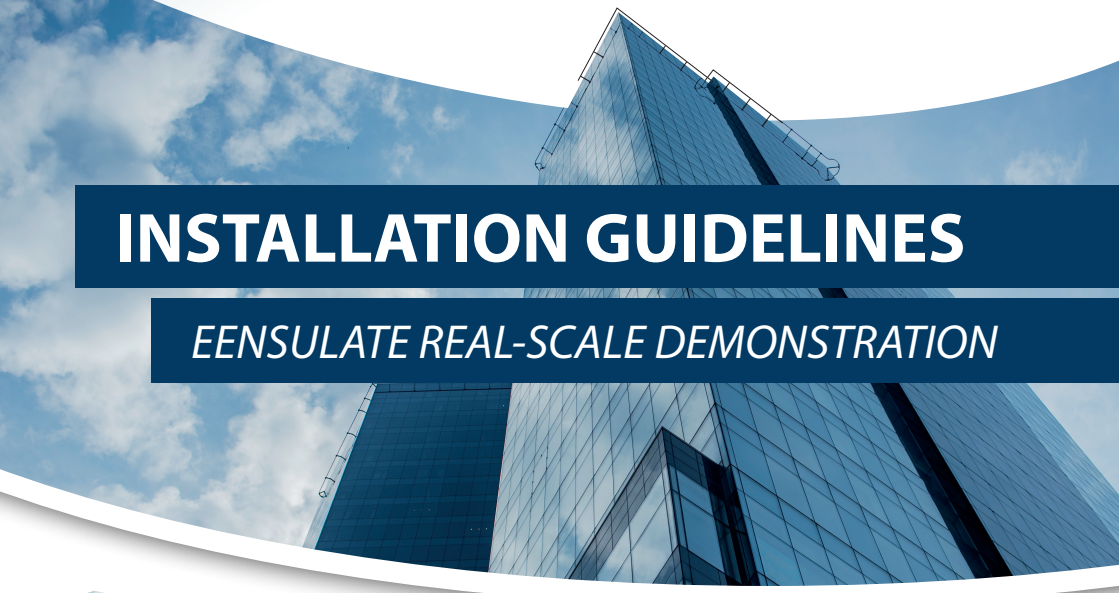
EENSULATE

HIGH END MATERIAL FOR MODERN BUILDINGS

Development of innovative lightweight and highly insulating energy efficient components and associated enabling materials for cost-effective retrofitting and new construction of curtain wall facades.



INSTALLATION GUIDELINES

EENSULATE REAL-SCALE DEMONSTRATION

PROJECT PARTNERS

RINA · EVONIK INDUSTRIES · SELENA GLOBAL EXPERIENCE · UCL · Dzierżoniów nastraja pozytywnie

Innovative facade solutions BGTec Sp. z o.o. Innowacyjne rozwiązania elewacyjne · saes group · Ulster University · AGC GLASS UNLIMITED · UNS UNSTUDIO · FOCCHI SINCE 1914 · FENIX.TNT tvořivost nad technologií

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EENSULATE PRODUCTS

1. EENSULATE façade module

The EENSULATE façade module is a part of the curtain wall system which integrates VIG and BCF (Bi Component Foam) for the spandrel part, in combination with a customized profile.

2. EENSULATE VIG

The EENSULATE Vacuum Insulated Glass (VIG) is a lightweight and thin Vacuum glazing suitable for new, existing and historical windows as well as for curtain wall modules.

There were two installation approaches followed during EENSULATE demonstration:

- Façade installation consisting of building preparatory works, supporting system fixing and modules installation, taking into consideration all connections, sealing and finishing.
- Substitution of existing glazing with vacuum glass only by window sash dismounting.

POLISH SCHOOL - DZIERŻONIÓW, POLAND

The Polish school resides in a curtain wall building which the Dzierżoniów municipality aims to refurbish to improve the façade performance. The EENSULATE renovation intervention consisted of introducing curtain wall modules to enhance the building profile to zero energy in line with EU and national targets for public buildings. After the implementation of EENSULATE solutions, the building became a demo case proving the project results to both national and international stakeholders and enhancing the image of Dzierżoniów municipality.

INTERVENTION DETAILS

The renovation intervention consisted of the full substitution of the curtain wall façade (including frame) of the school building. The selected façade was one of three façades of the building. The refurbished building area is organized as an open space where students spend their free time during breaks.

In order to compare the performances of the project developed solution, the façade was partially covered by EENSULATE modules with VIGs and partially by the same module but using standard TGU (Triple Glass Unit).

Demonstrator	Location	Total area	Type of intervention	Note
School	Dzierżoniów, Poland	115,5m^2	facade system, VIG modules	1 facade with VIG and TGU

MUZEUM MIEJSKIE DZIERŻONIOWA - DZIERŻONIÓW, POLAND

The Muzeum, built in 1897, originally belonged to Hermann Cohn, Cohn Gebrüder co-founder and was one of the first mechanical weaving mills in Dzierżoniów. The building has undergone many renovations and adaptations in order to adjust the space for museum purposes. Preserved elements of the interior gradually returned to its former state thanks to conservation work. Today the museum hosts permanent exhibitions, including cartographic collections concerning Dzierżoniów and the surrounding area. A large collection of artefacts illustrates the development of the region since the late Paleolithic times.

INTERVENTION DETAILS

The intervention and the implementation of EENSULATE glass based on VIG technology was done in a selected number of museum windows. Being a historical building, renovation works, including the ones related to the windows, are subject to several and severe restrictions to preserve its artistic value. For this reason, the implementation of VIG directly in the original windows minimised the impact of the intervention increasing the insulation capacity with a benefit for the people inside the room. This kind of operation is possible thanks to the low thickness (12.2 mm) and light weight of the VIG, perfectly adapting to the original windows increasing their performance without changing neither the materials (the window frame is the original) nor the aesthetic aspect.

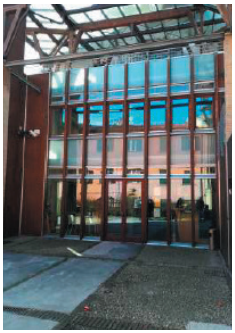
Demonstrator	Location	Total area	Type of intervention	Note
Museum	Dzierżoniów, Poland	3,25m^2	windows	3 windows, substitution of old single glass with VIG

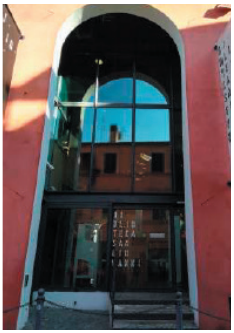
PUBLIC LIBRARY SAN GIOVANNI - PESARO, ITALY

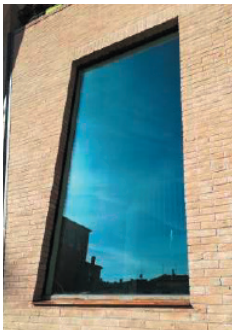
Hosted by the ancient monastery of the Frati Minori Osservanti, once annexed to the church of San Giovanni Battista (one of Pesaro's most beautiful architectural works) and planned by the Della Rovere family's architect Girolamo Genga, the library San Giovanni is an example where the historical (the façade facing the access street) and contemporary architecture elements coexists. Those elements are a large-windowed eyelet for the lighting of the public spaces and a curtain walling façade in the building main entrance. The building acted as a demo for testing EENSULATE glass in one door-window along the main corridor of the Library. Although Pesaro municipality is not a project partner, they made this building available as demonstration case of the EENSULATE project.

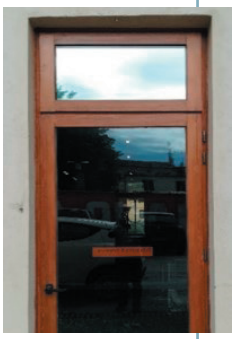
INTERVENTION DETAILS

The intervention was done by implementation of EENSULATE glass based on VIG technology in a door-window located in an area of the building organized as an open space hosting a kid-library. The VIG was installed directly in the original frame of the door-window, minimizing the work carried out as well as the waste of material. The simple substitution of the glass part of the door-window with a high insulating VIG increases the thermal insulation of the window system with a consequent benefit for the visitors. The door-window is composed of two parts, the above one is fixed (without the possibility of opening) and the bottom part is an emergency door exit leading directly outside the building.









Demonstrator	Location	Total area	Type of intervention	Note
Public Library	Pesaro, taly	2,20m^2	door	1 door, substitution of DGU with VIG

EENSULATE RETROFITTING INSTALLATION PROCESS

The following retrofitting scenarios were defined in order to demonstrate the applicability of EENSULATE components in different building retrofitting cases.

1. Curtain Wall Façade
(façade replacement):

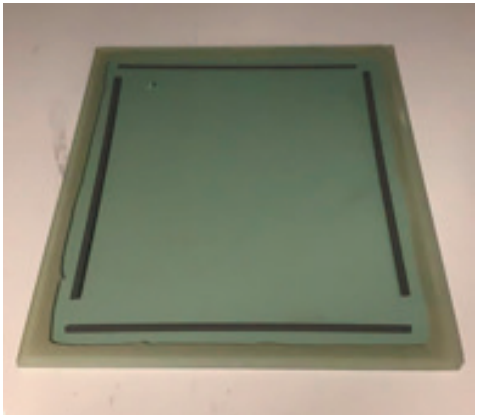
EENSULATE module replacing existing Curtain Wall Façade (Polish Primary School case); the module is part of the curtain wall system which integrates VIG and bicomponent foam to fill the spandrel volume in combination with a customized profile. This lightweight solution contributes to reduce the weight on the load bearing structure of the building and to increase its energy performance.

2. Windows
(historical and contemporary):

EENSULATE VIG is a light and thin Vacuum glazing suitable for historical and existing windows.

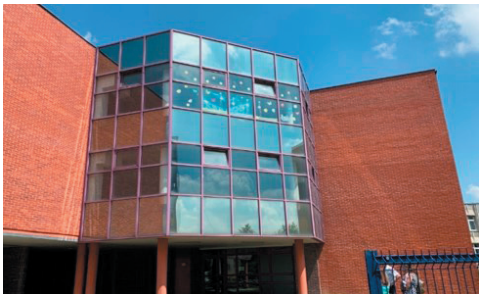
Historical window – VIG for replacement of old single glass with improvement of energy transmittance without affecting the overall view of the window.

Contemporary window – VIG for the replacement of standard DGU/TGU in existing window with improvement of performance without affecting the overall configuration of the window.



PRIMARY SCHOOL IN DZIERZONIOW - CURTAIN WALL

The building has been built in 80's and it has a total curtain wall façade area of around 500 sqm. One of the three existing façades with surface of around 115 square meters was dismounted and the new EENSULATE façade was installed. The requirement of the building was to keep the same appearance in regards of shape, divisions and colours as existing aluminium façade, to be compliant with the two other façades.

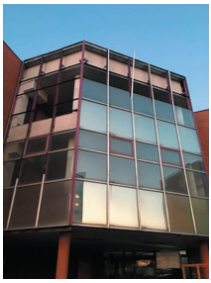


School façade before intervention– external and internal view.

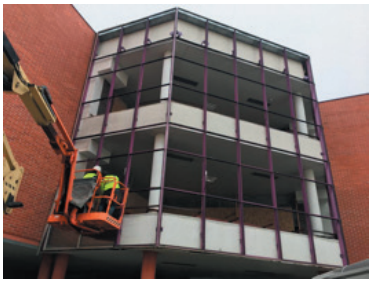
CURTAIN WALL FAÇADE RETROFITTING

Existing façade dismantling → **Wall surface preparation** → **Installation of supporting system** → **Modules installation** → **Joints and finishing**

THE INTERVENTION



Disassembly of existing façade elements - glass



Dismantling of façade elements- aluminium profiles

Old façade dismounted

Installation process begins with proper positioning of the brackets located on the front of the floor slabs. Location of the anchors at the building interface is conducted according to position signed on a drawing. Proper brackets installation is crucial for undisturbed units mounting.

Fixing elements installation – brackets

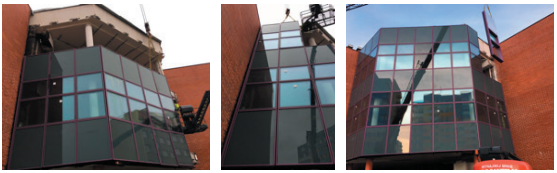
The façade units are then fastened to the brackets installed to the building slab. To settle the modular curtain wall units into position and securing to the bracket installed on the slabs are performed from the outside of the building.

The units are lifted from a placement area on the ground near to the façade.

Unit installation direction

Particular modules are lifted and directed to the appropriate location by means of crane then guided and hosted into position by the crew in order to be secured to the preinstalled anchors.

Modules are attached sequentially following instruction marked on prepared documentation. To guarantee that the units are correctly in position and for preserving permeability of the façade wall, it is necessary to pay attention that gaskets, sealants and joints are properly applied.



Unit installation progress

Façade view - after intervention

The new Eensulate façade is keeping the same divisions to be in line with existing facades.

DZIERŻONIOW CITY MUSEUM – WINDOW RETROFFITING

EENSULATE activities in this demo include substitution of three glazing panes with vacuum glazing in windows located in one room on the ground floor.

Museum - external and internal windows view

INSTALLATION STEPS:

Due to the historical character of the building, the scope of activities was limited to works connected with substituting existing old single glass with EENSULATE VIGs, by dismantling the window sash and without affecting window construction and its appearance.

WINDOW RETROFITTING:

Windows sash dismantling → **Sash renovation and VIG insertion** → **Sash installation**

Existing windows were old box windows with double sash opening to the inside, filled with a single glass.

Scope of intervention: replacement of old single glass with EENSULATE VIG of thickness 10,2mm (6+0.2+4mm), by dismounting the window sash.

As the windows constructions were deteriorated, to be able to insert the new glass, each sash is renewed by sealing, painting, using the most similar materials as existing ones and performing all necessary works required for its proper functioning.

THE INTERVENTION

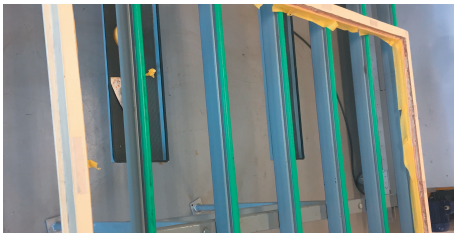
Window sash is removed carefully in order to perform renovation works.

Window sash dismounted

The old glass is removed, and the wooden sash elements are cleaned and renovated.

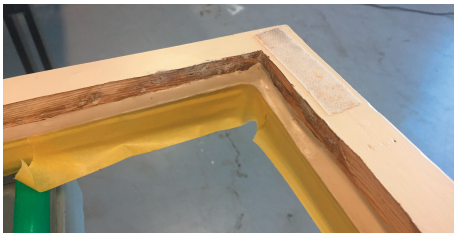
Old sash before renovation

Before glazing putty application, wooden elements parts are protected with tape.



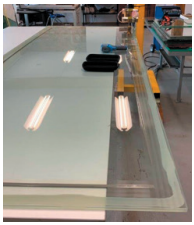
Window sash protected before glazing putty application

After cleaning the area for inserting VIG, the new glazing putty is applied.



Application of the glazing putty

The Eensulate VIG is prepared with tailored dimensions for particular window sash.



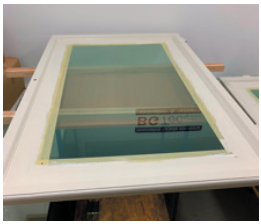
Vacuum glass preparation

VIG glass to be inserted in the old sash

Previously manufactured EENSULATE VIG is inserted into existing wooden window sashes by using vacuum holders.

To cover sealant and getter, the VIG edges are painted with special coating with the same colour as window construction. Then, window sashes is repainted using the same colour as existing windows.

VIG glass inserting



Window sash painted

To preserve the existing details of the window, old accessories like handles are renewed and reinstalled in the same combination.

Existing window handle renovated

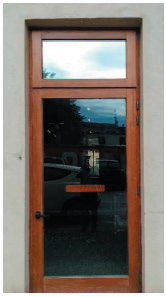
Finally, the same sashes with EENSULATE Vacuum glass are installed in the existing frame on site.

Museum windows after renovation

SAN GIOVANNI PUBLIC LIBRARY

In the Library, one of the doors along the main corridor was retrofitted. The wooden construction hosted double glazing. The retrofitting activities didn't affect the aesthetic of the building and included the replacement of the existing DGU with EENSULATE VIG.

The scope of intervention in library included one door as an example of VIG application in contemporary joinery frames. The retrofitting of the door consisted in maintaining the overall wooden frame and replacing only the DGU, with thickness of 28 mm, with the VIG, of thickness of 18 mm. The intervention was conducted by removing the internal aluminium profiles which restrain the existing double glazing, cleaning the area from the old sealant, placing the VIG, sealing the edge to create air and water tightness performance and repositioning the aluminium. All operations were performed on site with the sash mounted.



Pesaro library building – internal and external view

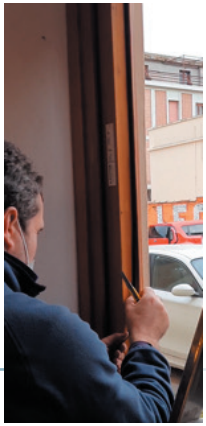
THE INTERVENTION

The dismantling of existing glass is performed using vacuum holders, after removing aluminium elements.

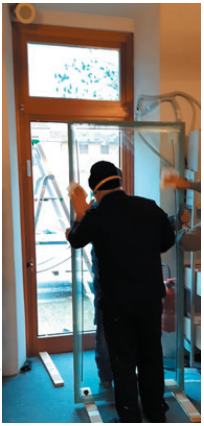
Existing glass dismantling

Old glass removing

Before inserting the new glass, window sash is cleaned from existing sealant.



Cleaning the glazing area



Preparing the VIG for installation

Then, the VIG is prepared and positioned into the existing frame.

Placing the VIG

Glazing bead installed

After Vacuum glass placement, aluminium glazing bead is installed.

As the selected door is emergency exit door, anti-panic handle is reinstalled.

Handle installation

EENSULATE VIG is also applied in the fixed upper part of the door.

Door with VIG after intervention – external and internal view

CONCLUSIONS

Activities performed within EENSULATE project led to the installation of developed solutions such as **façade modules** and **Vacuum Insulated Glass** (VIG) on real demonstration buildings. Developed products are suitable both for new and retrofit constructions. Moreover, they can be applied in such demanding constructions as historical buildings.

The EENSULATE products are innovative but the installation process does not differ from state-of–the-art façade and windows units installation.

The EENSULATE VIG product is a lightweight solution with thin structure that can be easily hosted by existing construction of the windows from different materials. Thanks to its thin structure, profiles of the new construction can be further reduced. This leads to easy installation process and logistic by reducing the weight, and less space needed during the transport and storage.

EENSULATE Vacuum glass can be used in different configurations depending on safety and thermal requirements of the building.

The installation process can be compared to standard façade units and glazing application but thanks to the light construction handling on site requires less effort.