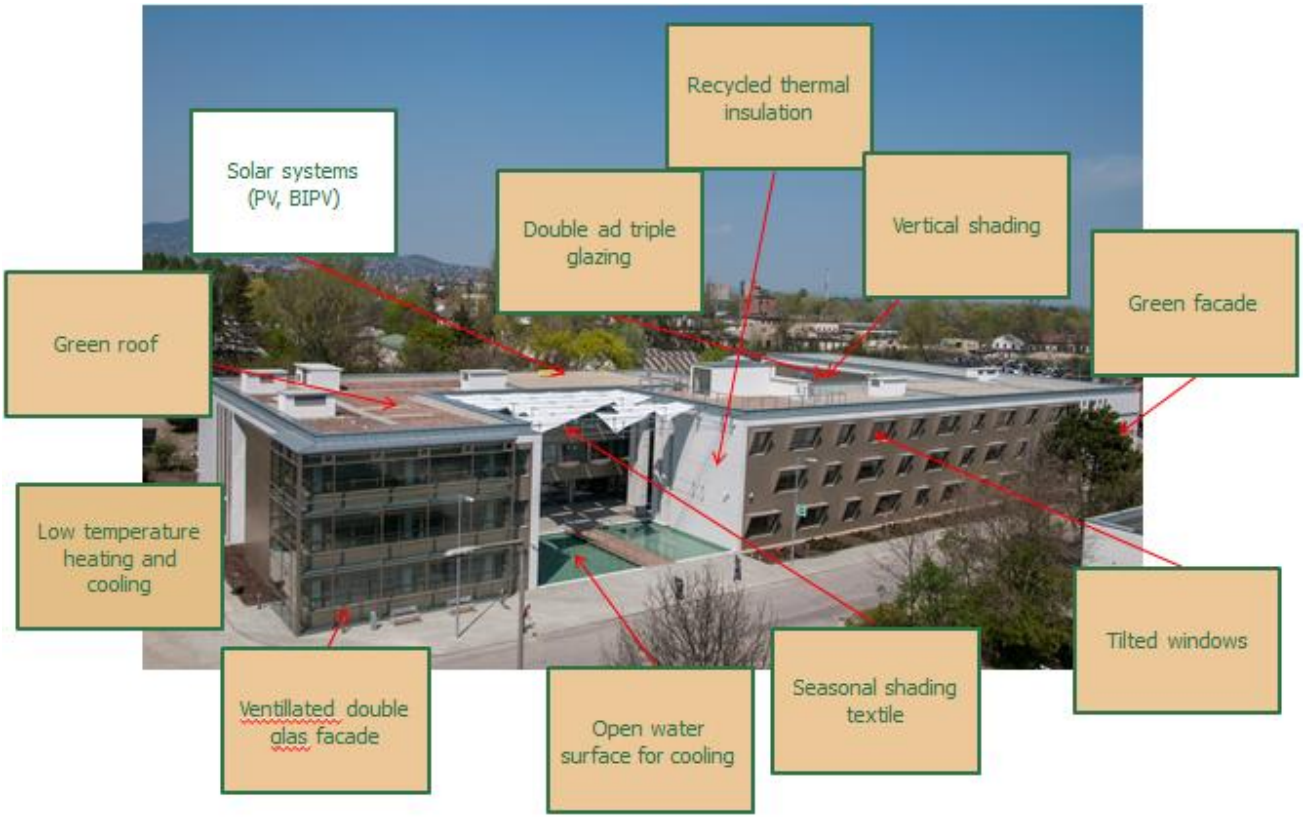
ÉMI office building and connecting infrastructure in Szentendre

The new two-storey office building of ÉMI Knowledge Centre in Szentendre has 5680 m^2 net floor area in three wings. The construction work of the building at the Industrial Park of Szentendre has been completed in March 2013.



The building is built according to the rules of bioclimatic design. The roof insulation is completed using recycled polystyrene. It is an innovative solution that the EPS insulation boards and the polystyrene part of the light-weight concrete made from recycled material.

The top of the building's "A" wing were installed an extensive green roof as an innovative solution too. The springing of the green roof installation adapted to the local climate conditions.

Recycled mineral wool was used as the thermal insulation on the façade: 10+15 cm thick thermal insulation materials were used for ventilated rainscreen claddings with closed joints. The materials

were placed to the substrate wall so tightly that there was no gap between them. The glass veil facing was on the external side. The insulation was secured mechanically with appropriate fixings. The number and arrangement of fixings were carefully designed.

In case of the shading by canopy structure the sheets are made of teflon-coated polyester fabric which has three fixed point at the top, and one fixed point at the lower level of the steel grid structure. The sheets of the shading structure can be easily changed and arranged creativelyThe artificial water surface also provides a pleasant microclimate.
The south-west corner of the building a climatic facade with double glazed is completed too. It has 55 cm wide open permeable enclosed space. The outer shell is made of aluminium curtain wall facade profiles with 8 mm thick tempered glass.
The south-east corner of the building's facade is made of about 54 m^2 run acacia green façade area , which play an important role the summer and winter energy balance of the southern facade. The green façade has got a stainless steel wire support structure.
On the South façade the tilted surface window boxes ensure the natural illumination and the shading simultaneously. Because of the reduced thickness (15 cm) mineral wool insulation around the tilted windows, it was made with special care.
The opening structures has façade orientation optimized glazing everywhere. The windows has made of three layers of insulating glass (min. 0.9 W/m^2K) on the north and east sides of the building, and there are two-layer insulating glazing windows (at least 1.1 W/m^2K) on the south and west sides.
Around the east and west facades of the building there are vertical aluminium lamella external shading which are rotatable by engine. In the offices and the large conference and meeting rooms which has north-south orientation of windows there are internal venetian blinds. In the upper third of this shading structures have separated fixed blinds, so the sunlight diverts on the ceiling providing the rooms diffused light.
The highly efficient surface heating-cooling suspended ceilings and the heating-cooling surfaces have been installed in the office building adjusting to the heat pump system. The building has four pipe system included separated heating and cooling pipeline pairs.
On the first and 2 floor of the east wing there are tempered structure slabs, the plumbing was directly incorporated into the reinforced concrete structure. The rest of the building the cooling and heating panels provided proper thermal comfort placed afterwards to the reinforced concrete slabs. The finishing works of the control system have been completed. The test run of the heating system was done, and the results were show a successfully installed and appropriately working system.
According to the previous operating experiences special attention should be paid to keep clean filters in air handling equipments.
The total hot and cold energy can be measured by heat meters in the heat receiving room of new Knowledge Centre. The meters mounted to the heating and cooling wire pairs provides a measure of the total heat energy inclusion of the building. Heat meters are measuring the entire hot water and the air handling equipments consumptions. Heat meters have been added to the heating and cooling panels too in each wing. All heat meter has M Bus outputs thereby able to connect to the monitoring system of planed microgrid.

In addition to the new office building a small solar power plant installed with 16,5 kW_{el} output electric capacity as a car shading. Thin film PV panels were placed on a steel substructure over car park. It will be integrated to the microgrid system.

During the construction a photo documentation system was set up based on hourly taken pictures.

Energy system of ÉMI Knowledge Centre in Szentendre

Regarding the energy system of ÉMI Knowledge Centre the new heat pump system is already installed on sewage water with 369,6+100 kW_{th} capacity.
The system can serve not just only the new office building but more buildings of the industrial park as well.

The completed heating and cooling system went for a trial run with successful results.
The control system software programming has been done. All the planned elements of the system will be fully monitored and controlled by the energy controlling system.

A previous operating experience has shown that special attention should be paid to clean of the sewage in the pit of the water extraction engine house. The wastewater containing solid material particles, which together can produce solid membrane crust on the top. This can prevent proper operation of the submersible pumps.

In the energy center the total produced hot and cold energy can be measured by heat meters mounted to the ∅200 and ∅65 wire pairs. The meters will be able to connect to the monitoring system of planed microgrid.

The installed power generating system components and the current and planned energy-consuming facilities will be connected to a micro-network system as a micro-grid in the EMI Knowledge Centre. The engineering units, accessories from design to the execution phase of the operation are in coordination with each other.

Refurbishment of multi-apartment residential building, Hamvas Béla street 2-10., Szentendre

The existing building has 80 apartments and 5 shops on the ground floor. The ground floor and four-storey building has a flat roof at the top. Heating is supplied from the district heating network. The heating system is a two-pipe system with radiators. Heat consumption is measured in the building. The domestic hot water is supplied also from the district heating network. Every apartment has an own individual meter. The ventilation has 46 exhaust ducts with fans.

The flat roof is now covered with 20 cm recycled polystyrene insulation boards and new PVC waterproofing made above the new insulation layer. The horizontal flat roof heat insulation was joined to the vertical attic insulation.

New plastic windows and doors have been installed replacing the old wooden structures. All windows have been changed to modern heat-saving plastic models with 5 chamber, k=1,2 insulation value (for total window). Insulation was placed to cover windows to avoid „heat-bridge". During the construction and refurbishment works great attention was paid to airtight construction and accuracy of installation, for example controls of window installation and thermography was included in this process. For the thermal insulation of the façade recycled mineral wool insulation (on the west and the east side) and polystyrene insulation on the end walls of the building (on the south and the north side) was used.

New plastic portals are applied on the ground floor replacing the old windows and metal portal structures. The new portal structures have k=1,3 W/m^{2}K insulation value (for total window). Insulation was placed to cover windows to avoid „heat-bridge".

The old fix portals are remaining structures to ensure the continuity of the shops open but the entrance portals will be changed. Part of this work is still in progress.

In front of the transparent structures of the building different shading solutions are implemented to prevent the summer warming of the inner spaces.
External plastic roller shutters have been installed on the west side of the building above the windows.
On the east façade new balcony structures were established after the demolition of the old reinforced concrete roof above the ground floor. The horizontal slab structures of these new balconies installed to provide shielding function of the flats on the east side especially but on the other hand offers more comfortable living environment for residents too.



The newly established balconies used to support the existing and remaining reinforced concrete consoles. The four-storey balconies based on the brackets strengthened with steel structure. The balcony plates are prefabricated elements, which were put in place after the completion of the steel frames.


The old curtain walls of the staircases were changed to insulated plastic structure and they were repositioned to reduce the formation of thermal bridges so the new structure has been installed to the outer facade plane.
The staircase entrance doors changed to new insulated structure with aluminium frame.
New artificial ventilation system was installed in all flats.
Instead of the old central exhaust fans on the roof new low-power, quiet and compact min. speed fans were installed at every suction point as independent equipment which can work only when it needs.
Commercial premises on the ground-floor will have separate ventilation fans.
The mounting shafts of the existing duct remained unchanged.

The top of the building a new visitor terrace will be established where the installed solar system could be observed.

Photovoltaic power plant with PV/T hybrid collectors were installed on the top of the refurbished residential.

Cogeneration heat and electricity production with 163 pieces of PV/T modules were installed on steel support structures. The total area of the panels is 223,31 m^2, they will be able to provide up to 30,97 kWp electricity. The produced hot water of the hybrid collectors reduce the DHW consumption of the residential building.
In addition a small solar power plant installed with 14,52 kW_{el} output electric capacity as a BIPV on the southern wall of the building.
An ESCO type financing was provided by the installer.

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