

## Fresh air with cool insulation

### RATAPLAN Architektur ZT GmbH and University of Natural Resources and Life Sciences

A vertical garden on the facade of the building in the Grabnergasse 4.

What is the potential of greened facades in densely populated urban areas of Vienna? What does it mean for the urban microclimate, or for the welfare of residents? How much do vertical green areas enhance the quality of an area? In the greening of a building which existing architecture features need to be kept or left in their original appearance? Should they even be saved? These were the questions that followed in the case of Grabnergasse 4 in Viennas' 6th district.

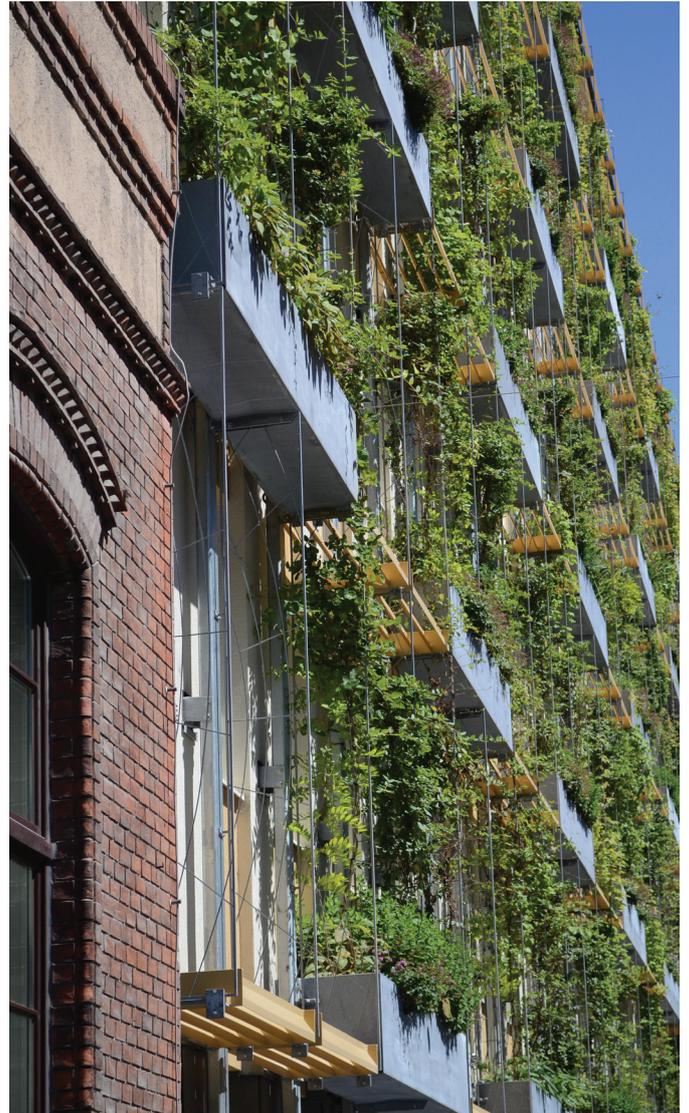
It is a radical, high vertically structured south / west façade from the 1960's that was thermally renovated with a new „green“ facade combining function with structure.



The innovative answer to the question was developed in the interdisciplinary cooperation of the landscape design, architecture, structural engineering and the irrigation technology.

For the sustainability and socio-economic and ecological added value:

The term „sustainability“ encompasses a wide range of properties and effects, mainly in the context of environmental protection. Therefore, a more detailed discussion of the most important aspects of sustainability should be focused on.



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## Background

One of the most important current challenges for the city of Vienna is the rapid population growth. According to forecasts, Vienna will grow in the coming decade around the population of the city of Graz! This, on its own, is complex and can only be achieved through big efforts of all sectors involved. The necessary consolidation or enlargement of the urban area leads to loss of habitats, for example, on the green field, and a possible reduction in the quality of life due to the higher housing density as well as the loss of recreation areas. The consequences are strong summer overheating of the city, noise and pollution of the citizens, local flooding, increasing cooling energy demand, etc.

The problem is further exacerbated by global climate change, which has a disproportionate effect on conurbations such as Vienna. As the Meteorologist Formayr (BOKU Vienna) shows, the annual average temperature in Vienna could rise to 15 ° C by the turn of the century. The frequency of summer, heat and desert days as well as the tropics will increase sharply.

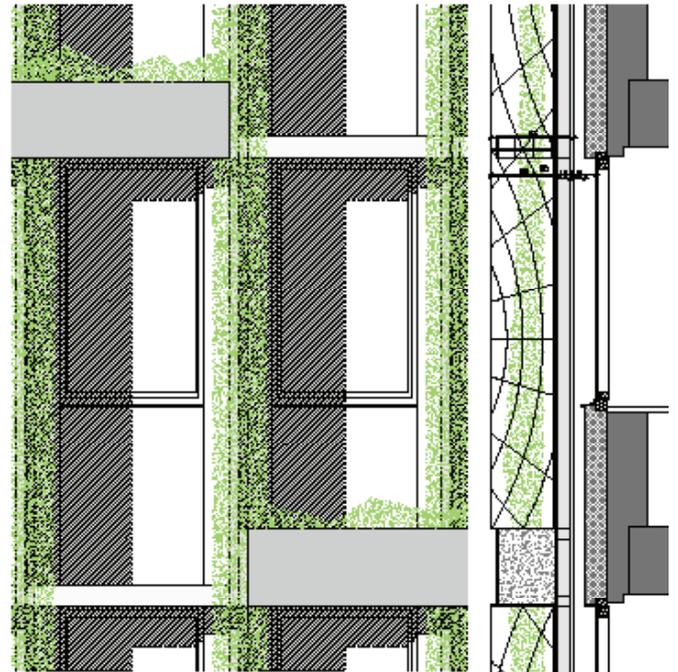
Experts worldwide use green infrastructure, such as facade greening, as a key to cities Climate-fit. The European Commission also takes account of the strategy for green infrastructure. The City of Vienna has published the UHI Strat Plan this year, which is intended to improve the climate resilience of urban areas and serve as a planning recommendation. However, the implementation of climate adaptation measures by green infrastructure is still slow. Competitions - tree vs. Parking - as well as construction and maintenance costs, as well as technical deficits and low dissemination of the necessary know-how are central barriers.

## The „vertical garden“ of the MA 31

The environmental department of the City of Vienna and the MA 31 decided in 2015 to renovate the district offices in Grabnergasse 4 due to the poor structural condition. From the beginning a exemplary project was pursued, which goes far beyond the mere fulfillment of existing building engineering and building physics requirements.

## Structural physics

In addition to „passive“ thermal insulation, an „active“ climate-friendly facade greening should be implemented. Therefore, the project team, led by RATAPLAN architecture office, developed a vertical greenery using climbing plants based on light field studies and shadow studies. The climbing plants grow from galvanized steel bars along finely graded shafts and so it provides the vertical shadow on the facade. The system is complemented by horizontal shading panels above the windows. With this elegant solution, the windows can be shaded in the best possible way during summer and at the same time its minimizing the solar heat input which caused a high overheating of the building. On the other hand, in winter, solar gains can be achieved in the leaf-free vegetation rest. The „Vertical Garden“ helps to save cooling and heating energy; To what extent, a current study of the TU Vienna and the University of Natural Resources and Life Sciences will show.



View Facade

Section

## Microclimate

When it comes to renovating a building the thermal insulation gets high attention. Heating and cooling costs should be reduced as much as possible. Thermal rehabilitation is also seen as a key element in the sustainable use of energy and the „Near-Zero-Energy“ Building Directive of the EU is underpinned. However, the energy conservation rate is not taken into account on the individual object. The Energy what the Building do not need to store will be thrown back in the urban space. As researches from the University of natural resource and live sciences showed, thermally insulated facades can reach surface temperatures of 60° Celsius in the summer. So the urban space of a city is intensified „heated“ and so the urban head effect gets even further aggravated. Plants, on the other hand, absorb more than 80 percent of the solar energy and consume them for the photosynthesis process in the course of which plant water evaporates. This effect protects plants against overheating, so they are usually barely warmer than the surrounding air temperature. On the other hand, the evaporation of the atmosphere removes a lot of energy and cools the air.

For its immediate environment, the „vertical garden“ will bring a sustainable improvement of the energy balance of the airborne body and the thermal comfort for the citizen. On the basis of the developed construction technology, it can serve as a „copying template“ for Vienna and cities around the world and so it could contribute to a super-local improvement in the city climate.

## Natural area

In addition to the physical and microclimatic properties of the vertical garden of the MA 31, it is also a natural habitat for the rich species of fauna and flora. The planting concept includes numerous climbing plants and perennial perennials. On one hand it is a habitat, on the other hand the flowers and fruits of this natural surrounding offers Food for hundreds of pollinating insects, such as wild bees and also birds. Some evergreen plants were chosen to offer „shelter“ especially for birds in the winter period. In connection with other green spaces, the vertical garden gets also a Tangttein biotope.



Foto © RATAPLAN

## Social sustainability

The „vertical garden“ represents a defining element in the area of Grabnergasse and creates an identification with the location for the employees of the MA 31 as well as the residents. When approaching the building through Reinprechtsdorferstraße or Reinprechtsdorferbrücke, the facade moves more and more into the center of the view, until reaching the intersection Grabnergasse / Mollardgasse. This fact gives the facade a very good publicity.

The road area is clearly revaluated and so it gets significantly appreciated. Especially the elements of identification with the region, the place of residence or the place of work and the appreciation for it, are essential elements of social sustainability.



Foto © RATAPLAN

## Architecture

The vertical structure of the building is from the 1960s and was taken in consideration of the Task. The rhythm of the reliefs of pilasters, parapets and window levels remain largely intact and are strengthened by steel supports and trellises. Staggered planters over two window axis produce a new pattern in conjunction with the existing vertical structure. Depending on your location and viewing angle, the visibility of the original plaster facade changes. From vis à vis you will see more of the rhythm of the 60's façade but by changing the angle of view, especially from a distance, condenses the added garden structure to a dense green wall, obscuring the underlying plaster facade.

## Construction

The calculation provided by the civil engineer indicated that it was not possible to add any load to the existing structure of the façade. However, it was possible to build the new carrying structure on it's own foundation directly in front of the building.

On the hollow rectangular supporting columns, planters were directly attached, which helped to stiffen and strengthen the supporting structure, as well as provide a large container for plants and provide shade from above.

The large planting area also makes it possible for vines and other climbing plants to grow larger on the trellises from floor to floors and heights beyond. These vegetated trellises produce lateral shade during the vegetation period of spring and summer. The addition of evergreen vines produces lateral shade even in winter, although to a lesser extent. The division of the trellises are so formulated that they create the best support for the plants as well as a visually appealing facade.

The planters are offset with fixed sunblinds and result in a changing constellation with an extensive overall pattern beginning at the Facade above the ground floor.

The plants, planters and sunblinds provide optimum shading and at the same time allow an open view from the inside of the building out.

### Plant trough

- 1 8mm steel plate
- 2 additional anti-corrosive coating primer + 2 lay inside
- 3 nub ground | drainage
- 4 3 cm hart mineral insulating material | mineral wool hart
- 5 protection fleece
- 6 foil pan 15 cm high
- 7 drainage substrate 15 cm high
- 8 filter fabric
- 9 spezial substrate mixture
- 10 Gravel mulch
- 11 edge protection | plastic
- 12 2 sapazitive Sensors in referenz trough
- 13 drip hose, water | fertilized

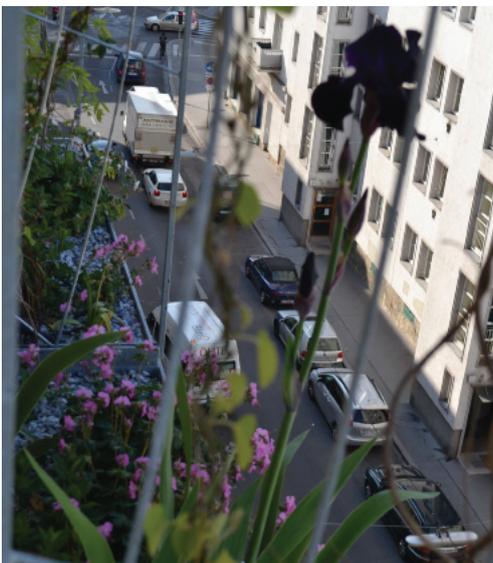
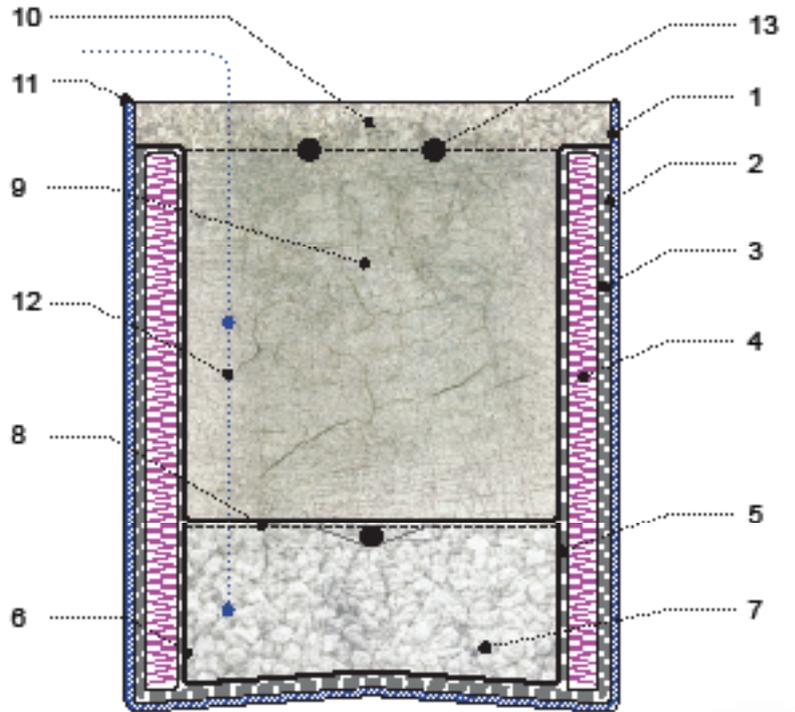


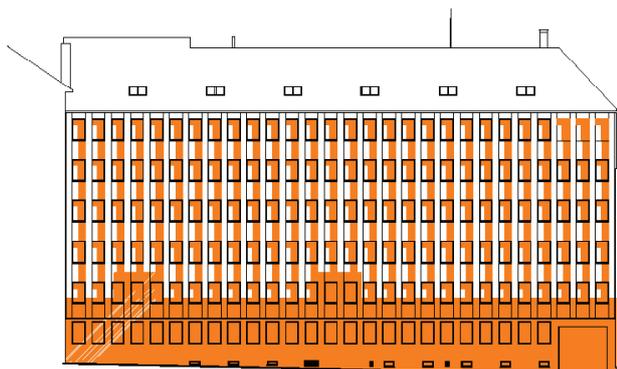
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### Selection of vine plants

- Akebia quinata, „Akebie“
- Aristolochia macrophylla, „birthworts“
- Lonicera tellmanniana, „woodbine“
- Lonicera henryi, „honeysuckle“ evergreen
- Lonicera japonica, „japanese woodbine“
- Wisteria floribunda, „wisteria“

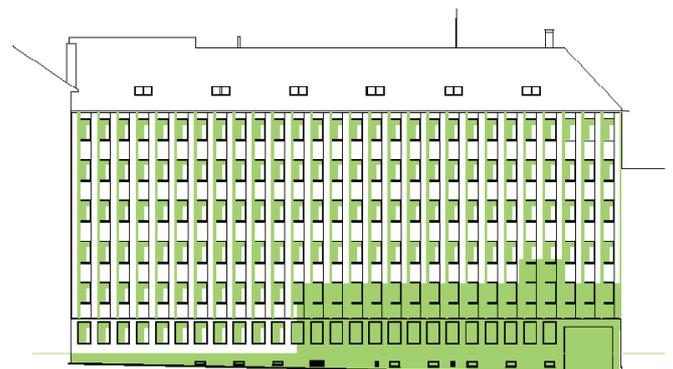
Additionally, „spring greetings,, Summer flowers and „late flowering,, are growing out of the troughs.

All plants are characterized by a sophisticated Watering and fertilization system.



Silhouettes

01.März 12:00 Uhr



01.Juli 16:30 Uhr

## Lighthouse

The city of Vienna has seen the renovation of the office building of the MA 31 in Grabnergasse as a lighthouse project from the very beginning and has been operating with great attention. The „vertical garden“ of the MA 31 shows how a significant improvement in the building fabric itself, energy consumption, microclimate, the cityscape and social sustainability can be achieved in the area of the city core. In the sense of a sustainable development of the city of Vienna, it is therefore extremely desirable to have this prototype „copied“ and applied extensively and finally to develop a lasting effect even in the context of the successive urban renewal.



Foto © Anna Stoecher

## Facts & Figures

Office Building MA31, Grabnergasse 4, A-1060 Vienna

start of planning:	2014
start of construction:	2015
completed in:	2015
client:	MA 31 Vienna Water
design:	RATAPLAN – Architektur ZT GmbH
vegetation:	University of Natural Resources and Life Sciences
structural engineer:	GB-Consult
irrigation equipment:	raintime
technical engineer:	Schöberl und Pöll

## Curriculum vitae

### RATAPLAN Architektur-ZT GMBH

Since 1989, we have been working together, since 1993 under the name RATAPLAN, since 2005 we are RATAPLAN-Architektur ZT GMBH. Together we pursue a path in our architecture that reflects in openness, diversity and flexibility. The mobility to react to the most diverse tasks is demonstrated by open space experiences and clear pathways.

We are looking forward to every new topic with great interest, above all it is building tasks in the tension field of the urban spaces, in the world cultural heritage and under monument protection. In architecture, we look for clarity, inspire us through the peculiarities and atmosphere of the place, and put an intervention that enhances its potentials.

### Institute of Engineering and Landscape Engineering, Department of Civil Engineering and Natural Hazards, University of Natural Resources and Life Sciences Vienna

The Institute of Engineering and Landscape Engineering was founded in 1994 with the three departments of Engineering-Biology, landscaping and vegetation technology at the BOKU in Vienna. The use of plants in urban areas to improve climate resilience and the quality of life has been a research-In national and European projects, new building techniques, measurement and planning methods and Knowledge about the diverse effects of nature in the city. The focus is on the combination of city and nature as well as the harmony between plants and technology in urban areas. With implementation projects like the MA 48 Climate protection facade or the Austrian EXPO Pavilion 2015, this could also be demonstrated.

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