Construction strategies for high energetic standard in Switzerland

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The presentation aims to give an overview of the building method which is spreading in Switzerland, following the criteria of sustainability, in particular with respect to high energy standards, primarily seen from a compositional angle so that the architect is aware of the potential that is inherent in his work. As a premise, however, it is not possible to speak of ecological responsibility, which allows us to maintain an intact ecosystem in the long term, without including social justice, considered nowadays the most important goal of sustainability, and economic efficiency, which is able to support the needs of the other two sectors.

Our living standard increased widely in the last half century, radically changing the needs of space and of course the ever-increasing need for energy to perform daily tasks. Some researchers at the ETH Zurich have therefore developed the model of the «2000 Watt Society» whose primary purpose is to reduce the use of energy without reducing the quality of life. This can be obtained through a careful analysis of the needs, for example, of livelihood, transportation, food and consumption. An increasing number of actors, both private real estate and public sector, have realized the potential of this approach, and it happens more often to see the development of entire neighborhoods projects planned taking into account the requirements of the «2000 Watt Society». This is a trend that concerns the reuse of brownfield sites in the vicinity of the city center in particular in the German-speaking part of Switzerland. Note that the promoters are often real estate companies and not public bodies.

Sustainability assessments at the building scale, such as MINERGIE P ECO®, require a simultaneous control of both energy and health issues. In order to achieve these high standards of construction, before approaching the design process, it is necessary to inquire which the best strategies are. These conditions are not absolute but rather facilitate the ambition to meet the requirements. In other words, it is possible to speak of the «high energy standard» building philosophy.

The first tip is to, simultaneously, minimize heat losses by transmission and maximize the gains. The thermal coat becomes more and more performing with a thickness of thermal insulation that far exceed those of the structural parts, forcing to handle the thermal bridges. From the point of view of the designer this dual challenge can be achieved for example by keeping the orientation, proportion, or the composition of the facades. A building needs a glass surface big enough to allow a good natural lighting and a penetration of the heat during the winter, as well as a connection to the outside world.

For a smart balance between energy losses and gains it is important to take into account climate conditions. Switzerland has a temperate climate with hard winters and pleasant summers, where so far it was a priority to protect from the winter cold rather than from the summer heat. With the evolution of the climate there are increasingly hot summers in which the risk of overheating is higher. This requires an ability...
to control large glass surfaces that are required for our living standard. Beyond the technical possibilities to reduce the risks of overheating of fully glazed building, which however require a consumption of energy resources, the designer has the possibility to find a careful composition of architectural elements which can create the shading needed for glass surfaces without blocking the view.

Another aspect is to give the right proportions of distance between buildings, to control shading by adjacent buildings, as well as to maintain the quality of the outdoor spaces as meeting places.

Last but not least, the research of the energy carrier has its own importance; in fact, heating systems using renewable energies, such as solar, heat pumps or wood, are clearly better than those with non-renewable energy such as oil and gas.

The health of the end-users of a building is an aspect that needs more attention. The main aim is to give priority to sufficient natural light through the openings. In addition, they determine the relationship that is created between internal and external environments.

Some factors that may affect the interior comfort are the sound insulation and the protection from radiation. Many phonic problems can be solved with careful design, for example the noise coming from inside, such as from the necessary technical installations, on the other side the noise coming from the outside, such as by roads with heavy traffic.

In Switzerland another hot topic is the issue about the natural gas radon, whose high concentrations can lead to health problems. The designer’s task is to integrate these demands into his/her work.

For the purpose of air quality, the air exchange is very important, as well as the right choice of materials that compose the constructive elements to prevent loads of chemicals such as formaldehyde. For the choice of materials it is necessary to give particular attention to the use of recycled concrete aggregates, for the use of locally produced wood or eliminating the use of heavy metals in particular for coatings.

As a rule, the lifespan of a building, in the context of Switzerland or Europe, is quite long and for planning it is necessary to address possible changes of destination, the most easily obtainable with a flexible project, both in its supporting structure and its facades composition. In addition, careful positioning of the facilities, the vertical circulation and a structure that brings linear loads to the foundation, are the premise of reduction of building resources, as a result of lower costs and reduced air emissions.

The life cycle of a building is calculated as the time from «cradle to grave» considering how it will be easy to dismantle or demolish it. The purpose of this effort is to create less waste in the future.

Given the life expectancy of a building, to reach a Minergie ECO® certification it is now necessary to provide a justification of embodied energy.
Some examples:

**Multifamily house in Liebefeld (“love field”)**
In walking distance, the funicular railway to the belts, few bus stops to Central Station, the three-family house on the Gebhartstrasse in the Bernese Liebefeld promises urban living. Surrounded by multifamily homes from the 60s and Villas from the turn of the century, the Minergie P ECO® construction resembles a modern houseboat.

The construction was built on the site of former garage sheds and a part of a green area of the adjacent apartment building. In the 60s, during the planning of the surrounding apartment buildings, the placement of identical houses in series was on the priority list. They were used to construct on a greenfield site. The former suburb is nowadays located in the city center ring, a desirable building site. The demolished garages have been replaced by a small underground car park below the green area.

The load-bearing wall construction (wood construction) allows loft-style layout of the homes with spacious light-filled space which can be freely divided and adapted over time. The three floors are accessible by a common, open staircase. Passive solar, renewable energy, durable and natural materials, are important aspects of the overall ecological consideration.

**Sustainable Campus SUPSI**
During the last three years SUPSI started some important challenges regarding its structures: for example in 2012 it launched an International Design Competition in two phases for the creation of a new University Campus in Mendrisio.

SUPSI wishes to highlight its commitment to sustainable development with the construction of a new campus in line with its role in informing, educating and promoting innovation, regional and international research and know-how. The project is part of the logistics strategy of SUPSI which involves the construction of two more Campus in Lugano, aiming to give to the new locations the most appropriate destination for the activities of the University of Applied Sciences by making it more attractive to all students and employees.

The location of the Campus SUPSI in Mendrisio in the immediate proximity of the railway station highlights the commitment that the institution wants to bring in favor of sustainable development: from urban planning, mobility, energy planning to eco-efficient and sustainable management of its buildings.

This Campus is intended to accommodate the activities of the Department of Environment Construction and Design - DACD, in an area currently occupied by the buildings of an old Zipper Factory. The transfer of disciplines offered by SUPSI to Mendrisio in the fields of architecture, design, construction and land use planning, will increase the synergies and collaborations already in place with the Academy of
Architecture (USI), and will create a real university for architecture and construction on the canton’s territory.

The winning project of the architects Bassi and Carella has been chosen for its clear desire of merging into the landscape. In fact, the jury particularly appreciated the simple approach of integration of the new body in the urban contest: a clear presence along the axis of the railway and a volume decreasing towards the front of the neighborhood. It is convincing by its clear and simple planning response.

The project achieves high standards of sustainability, more precisely Minergie P ECO®, in line with the SUPSI and City of Mendrisio visions of development. A team of experts on sustainability, led by myself, pointed out that this project gives the most convincing answers.

**Sustainable Green City district**

Only a few minutes away by train from Zurich’s center an urban vision is now a reality: in the Green City, life, work and sustainable, environmentally conscious behavior merge into a new form of urban lifestyle. The aim of this development is to transform the area from an industrial area into an attractive mixed-use neighborhood.

It is the first district in Zurich, which is strictly built according to the objective requirements of the «2000 Watt Society». To ensure the sustainability goals from the start, all buildings meet the latest energy standards. Furthermore, a private small hydro power plant supplies residential and commercial buildings with CO2-neutral electricity.

A protected monument, an old mill, is reminiscent of the past of the neighborhood. Green City is a contemporary, integrated form of living and working environment. Apartments for singles, couples, families and seniors, many shops and a school form an inspiring living mix along with attractive service buildings.

In terms of mobility, the Green City’s environmentally conscious lifestyle can be combined with perfect comfort: thanks to its own S-Bahn stop the center is just 11 minutes far away from the Zurich Main Station.

With its holistic, consistent focus on sustainability design, Green City has the character of a lighthouse project: a model for the city of the future that is widely set on the Zurich city limits pulses.

The Image below shows one of the different plots that have been distributed with an invited international competition.

**Interventions in the historical center of Vernate**

So far, we treated examples focusing on the design of a new building. In this way certain types of indicators, especially energy-related ones, can be easily reached. One of the greatest challenges of modern times is dealing with a good part of the existing built heritage without conducting demolition or highly invasive interventions.

I was lucky enough to be able to design three differ-
ent interventions in the historic core of Vernate, a village in Ticino, which has about 600 inhabitants.

The first intervention in chronological order is the refurbishment of a double house that has been certified Minergie P®, the first building in Ticino to reach this milestone.

The work is characterized by the interdiction to demolish the walls in natural stone, which on the one hand has allowed us to preserve the character outside of the building, but on the other hand has greatly complicated the achievement of energy standards. The conservation status of the interior horizontal carriers was much worn out, forcing the building of a new wooden structure that houses the required thermal insulation.

The second contribution concerns a building that accommodates a public room on the ground floor while the upper two floors house a duplex apartment.

The similarities of this object with the previous one are obvious but received only a Minergie® certification. In this case, the facade facing the street, characterized by a much worn out plaster, was released from the lining, bringing to light a natural stone masonry of a bill as it was used in the last century.

In the third intervention it was possible to replace an independent old house characterized by a very unfavorable orientation.

The characteristic of the building in the core of the village is to be realized with natural stone walls. The new building was therefore designed with heavy materials but with current energy standards. Due to the shift of volumes and the connection with the building next door, a small and sunny private court has been created, well protected from the eyes of intruders. An intervention to a single part of a building cannot be certificated, in spite of this, the design choices and the materials have led to a higher standard than the two building seen before.