

# Ecologically efficient office building – Synergy building, Viikki Campus area, Helsinki

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## Summary

Senate Properties, one of the biggest organizations providing workspace services in Finland is leading a project “Ecologically efficient office building – Synergy building”.

The task is to have built a pilot office building which is designed and constructed according to the newest knowledge of ecological efficiency.

Another aim is to make benefit of the ecological achievements that are gained of this pilot project and to create good practice and models which also can be used in similar other buildings in public building sector in Finland.

The project will be planned and realized in close co-operation with the user of the building, the Finnish Environment Institute (also known as SYKE, a research institute and a centre for environmental expertise). The expertise of SYKE is going to be used as much as possible in determining the aims and in choosing the design conclusions.

The project started with workplace planning in August 2009 and will end in September 2013 when the building is going to be ready.

The building project is closely accompanied by Senate Properties-led development project which is focused in ecological topics.

**Keywords:** Ecological, efficient, building, energy, sustainable, agreement and environment.

## 3. Introduction

The Finnish Environment Institute (also known as SYKE) is both a research institute, and a centre for environmental expertise. SYKE's research focuses on changes in the environment, and seeks ways to control these changes. SYKE's expertise is based on long-term environmental monitoring, wide-ranging research results and the Institute's highly-qualified staff.

SYKE's premises are now in three different places in Helsinki area. The aim is to concentrate the premises in one place and a suitable place has been found in Viikki situated in North East Helsinki about 10 km from centre of the city. Viikki Campus area (also called Viikki Science Park area) is a

place where there is a concentration of institutes, enterprises and university faculties concerning environment so it is an ideal place for co-operation and synergy.

The new building being designed as the head office of SYKE contains office premises for approximately 625 persons as well as laboratory facilities. The programme area of the building is 12 855 m<sup>2</sup> which consists of office space (80 %) and laboratories (20 %). The laboratory facilities can be roughly divided into general laboratories (bio sector and chemistry) and special laboratories as well as condition and support facilities.

The task of the project is to achieve an emergency-efficient and ecologically sustainable building forming an excellent working environment, as well as to be an example of office building construction outstanding in terms of its cost-effectiveness and overall economy.

Another aim of the project is at the same time think what is the best way to succeed in reaching the goal. The process how to achieve ecologically sustainable buildings must also be in order.

In SYKE's case it has been decided that the best way to reach the goal is to organize a design competition. Through an EU-wide competition can best be found the newest innovations in the area of ecologically sustainable building.

An additional purpose of the composition is to function as a designer selection process. The design composition is organized 5.5. - 8.10.2010.

## **4. Ecologically sustainable building process – case: Synergy building**

### **4.1 The targets of the Synergy building**

The goal set for the Synergy building project is to find an innovative and integrated comprehensive solution that optimally meets the the goals set for it and:

- is ecologically sustainable and energy-efficient
- forms a workable and effective working environment that promotes well-being at work while supporting the many types of continuously evolving working methods suiting the nature of operations
- is high-level from the townscape and architectonic perspectives
- is cost-effective and feasible in terms of its overall economy

In the design competition, ecological sustainability means (in order of importance):

4. Energy efficiency
5. Materials efficiency, life cycle environmental impacts of buildings' surface materials
6. Local renewable energy production

In further planning, environmental classification systems will be exploited as tools to ensure the project's overall environmental favourableness. During the project stage, a preliminary clarification of environmental classifications for the Synergy Building was carried out; on that basis of which the following environmental classification levels have been set as project targets:

- Breeam Europe 2009 Office: Outstanding
- Leed New Construction 2009: Platinum
- Hanke-PromisE: A-Class

During the competition stage, it will not be necessary to take the above-mentioned environmental classification levels into account as the basis for implementation. The environmental classification systems' targets considered most important have been written into the competition programme.

#### 4.1.1 Energy efficiency

The primary objective in achieving ecological sustainability relates to the building's energy efficiency.

The competition entries' energy efficiency will be assessed as a savings in the energy design solution's total energy consumption compared to the conventional solution. The energy design solution means a calculated, simplified design solution that will not take the special characteristics of laboratory facilities into account; in energy efficiency assessments, laboratory facilities will be treated as a landscape office. The comparative solution describes a calculated "conventional solution" according to Finnish design practice.

The competition entries must comply with the indoor climate required. To achieve this, the intent should be to keep the cooling capacity need as low as possible, which will also require the use of passive means in the control of excess heat. The objective is a minimisation of room-specific cooling capacity, or even the elimination of the cooling need.

Fulfilling the stated requirements shall be verified with condition simulations in measurement situations. The simulation shall be carried out for the typical spaces 1) from the most typical compass direction, as well as 2) from the direction (south or southeast) providing the greatest external load. The starting point is a target cooling temperature of 24 °C (indoor temperature), from which a dimensioning day summertime temperature will be allowed to rise to a maximum of 27 °C (indoor temperature).

The design of the Synergy Building will pay special attention to moisture technical factors.

#### 4.1.2 Materials efficiency

The second most important objective when seeking ecological sustainability is materials efficiency and the ecological longevity of the building's materials. This is measured with respect to the greenhouse emission resulting from the materials' manufacturing and maintenance over a 100-year review period (carbon footprint).

When designing the competition entries, the intent should be to minimise the carbon footprint generated by the building's main materials.

Life cycle assessments during the competition stage will include only the following main structural types and material quantities significant in term of their scope:

- Base floor
- Exterior wall construction
- Windows and glass walls
- Load-bearing partitions
- Frame (columns and beams)
- Floor slabs
- Roof/roof construction, insulation and roofing materials

To ascertain materials efficiencies, competitors should present the aforementioned quantities and carry out a carbon footprint review using the given emissions factors. The carbon footprint review should take into account the possible need to renew or replace façade or roofing materials over a 100-year review period.

The assessments will take into account the imprecision of calculations made during the preliminary design stage. The results of materials quantities and carbon footprint calculations will be considered only as indicative, and they will be used as a support for expert evaluations.

### 4.1.3 Local renewable energy production

The third objective when seeking enhanced ecological sustainability relates to the utilisation of local renewable energy production solutions. The aim in the competition will be to find alternative heating, electrical or cooling energy production solutions, based on local renewable energy sources that supplement or even replace conventional energy production solutions such as district heating and grid electricity. When presenting these, competitors should however confirm their suitability to the urban area in question (external appearance, need for service traffic, emissions and noise levels, space needs, environmental permits and other similar considerations).

When calculating the design solutions, 15% of the annual total electricity consumption (property and user electricity combined) should be generated at the site with, for example, solar panels or wind generators. In calculations it will be assumed that locally produced electricity can be joined directly to Helsinki Energy's power grid, and that any possible surplus can be fully exploited.

The objective is to achieve an "almost zero-energy building" criteria applied to the location.

## 4.2 Research work

The Synergy building project is closely accompanied by research work.

The development project "Practise for eco-efficient public building; case Synergy building" led by Senate Properties focusing in ecological topics is going on beside the building project. The development project gives detailed aid to Synergy building process and also forms new ways to lead an ecologically sustainable building process overall.

This development project has four main research areas:

- eco-efficient building process
- developing a suitable green lease model
- comparing different environmental classifications
- developing the control and calculations of energy

In eco-efficient building process the focus is on the acts which must be made beside the normal investment process.

Green lease is a new way to make the lease agreement in Finland and rather new also internationally. In Synergy building project both the landlord Senate Properties and the tenant SYKE are willing to make a green lease and want to be a pilot also in this sector.

Several environmental classifications are used in building sector. In this development project those classifications are examined and in Finland mostly used PromisE, Leed ja Breeam-classifications are more thoroughly inspected. The aim is to use all those three classifications in the Synergy building project, compare them and make decisions which classification(s) should be most suitable in building processes in Finland.

Different methods of control and calculate energy are used in real estate business. The results are not easily comparable with each other and that makes it difficult to estimate for instance how energy-efficient the building concerned in fact is. The result of this development project's area is to make common and clear direction for calculations.

## 4.3 Agreements between the parties involved the building process

Important area in the ecologically sustainable building process is to elaborate ecological contracts between the parties.

It was former mentioned the green lease model. Lease agreement is very crucial when we think how the whole process will succeed and also how the building is going to be used.

In order to manage in all areas should the landlord reassure that all the parties in the building chain aim to reach the same target – an ecologically sustainable and energy-efficient building. For instance the targets of the contractor may be to minimise the construction costs, not the life-cycle costs if the model of the agreement is not right.

The main agreements are following:

- agreement with the tenant
- agreement with the consultants
- agreement with the contractor
- agreement with the real estate maintenance company

These agreements should make the parties co-operate in order to achieve mutual good targets and the terms of agreements should preferably have economical incentives.

In the other way round – the agreements should at least not inspire to part-optimization.

#### **4.4 The ecological use of the building**

In order to succeed in the whole ecologically sustainable process it is important to take care of the ecological the use of the building.

The design and construction process should make it possible to measure the important ecological quantities in the building. When the facts are known also the control will be possible.

This creates requirements for the measurement – the buildings will be provided much more with the meters than nowadays.

When the consume is known the user of the building can for instance be rewarded of ecological use of the building.

#### **4.5 Conclusions**

It can't yet be estimated and make conclusions how this ecologically efficient building process is going to be succeeded because the project is still in early stage but results up this time have been encouraging.

The preliminary work for the project has been thorough and the design competition has aroused great interest and altogether 30 working group applications were achieved from seven different countries in Europe.

The competition is held between six working groups which contain expertise in architecture, structural engineering, HVAC design, electric and lighting design, the design of laboratory facilities, and the design of ecologically sustainable buildings as well as energy and condition simulations.

Competition entries shall be delivered no later than 8 October 2010 and the decision of the winner is scheduled to be 16 December 2010.

Senate Properties is also updating the investment process due to this pilot project. One of the key points is to have expertise of sustainability and energy in the designers' working group. This expertise can be brought by an extra person compared to the former model of the team or at least the team members should have the expertise needed in these ecologically important areas.