ENERGY PARK BUILDING 03 – Certified Under Platinum LEED for Core & Shell v2.0

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Abstract. The Energy Park of Vimercate, just outside Milan, stands as the true answer to all the companies operating in Hi-Tech, telecommunications and IT, and which are planning to rationalize their rents and energy bills while improving the environmental and working conditions of their employees.

The Building 03 of the Energy Park is the first Italian building ever to be issued the LEED Platinum certificate.

There are only six more Platinum-certified buildings in Europe, more precisely in Sweden, Finland, Luxembourg and Germany.

The Building is part of the Technology Park of Vimercate and it was built by SEGRO, an investment and development firm, the European leader in the supply of flexible spaces and business solutions. It is a project for the development of an area that was already known for its industrial/manufacturing vocation, in order to achieve a modern, sustainable transformation that is mandatory if this area is to survive in the future.

The building won the LEED Platinum certificate thanks to the optimum solutions regarding energy consumption, lighting, use of water and of other materials, and thanks to a wide range of strategies aimed at enhancing the sustainability of this structure, which is the subject of this paper.

Keywords: Environmental certification · LEED for Core & Shell · Technology campus · Sustainability · Energy saving · Investment strategies

1 Introduction

In the past decades, manufacturing undertakings have turned from heavy industrial activities that occupied large plots of land, to lighter, smaller and "cleaner" units. Many of these have adapted or based their factories in old industrial buildings, which are unsuitable for the technical and operational realities of the new enterprises.

These industrial buildings, therefore, have to be able to meet the requirements of the activities they host in a more modern fashion.

To prevent these areas from becoming abandoned, a drastic renovation of former industrial factories must be planned to gradually replace the existing buildings [1].

This is exactly what happened in the industrial area of Vimercate, the historical headquarters of Alcatel Lucent and other Italian divisions of multinational companies,

A. Leon-Garcia et al. (Eds.): Smart City 2015, LNICST 166, pp. 830–841, 2016.
DOI: 10.1007/978-3-319-33681-7_74

which together cover a floor area of approximately 50,000 sqm of office space and research laboratories.

The existing buildings have all the features of old-generation buildings: they are true industrial factories, usually one-floored; they often have a much higher energy consumption than that of "technologically advanced" buildings, and do not meet current working requirements.

1.1 Energy Park: "Green Building" Philosophy as an Investment Strategies

The operation of the Energy Park stemmed from the intention to build highly technological and performing buildings, with a minimum pre-let percentage of 80 %. In the past three years some service buildings were developed, like the multi-storey car park and the kindergarten, while the canteen was renovated; in parallel there came the construction of Building 03, which is now the headquarters of SAP Italia S.p.A. among others, and of Building 04, the headquarters of Esprinet S.p.A. The new Campus of Alcatel Lucent S.p.A. is under development for an overall floor area of 33,000 sqm for office space and research laboratories.

The decision to develop an operation like Energy Park was influenced by the location of the site, which rises in a suburban area endowed with many infrastructures (car parks, shops, motorway junctions, etc.) and located not too far from Milan. This territory has a historical bent to technology, so much so that it is the headquarters of the leading international companies in this business.

The investor is Segro PLC, which has a property portfolio of 5.5 million square meters for a value exceeding six billion euros. Segro PLC ranks among the leading companies in Europe for real estate development and investment.

The company has its offices in England and is listed in the London and Paris Stock Exchanges; it operates in ten countries with over 2,000 clients performing their activities in various fields of the economy: from latest-generation technology parks to office buildings in suburban areas, from logistic platforms to light industry plants.

Segro was able to redevelop an existing industrial area by constructing new-generation "green" buildings without occupying any new parcel of land. The wish to develop a site that is economically viable and environmentally sustainable for the final user was crowned by the grant of the Leed Platinum Certificate to Building 03 (the first building in Italy, and the eighth in Europe), while the pre-certification phase for LEED Platinum is already started for Building 04 and for the Campus of Alcatel Lucent S.p.A. The success of the negotiations aimed at preserving the historical factory of Alcatel inside the same site, which is being turned into a modern Campus, materialized in the rational use of spaces and lower operating costs. Such a highly attractive area with performing buildings has roused the interest of other international companies operating in the same business sector, and which appreciate the Energy Park operation and have therefore based their Italian headquarters here.

The operation was funded directly by Segro PLC.

2 Methodology for LEED Certification

LEED is one of the largest environmental certification systems in the world and has been developed by the U.S. Green Building Council (USGBC). LEED is an abbreviation for Leadership in Energy and Environmental Design [2]. LEED certification provides independent verification of a building or neighborhood's green features, allowing for the design, construction, operations and maintenance of resource-efficient, high-performing, healthy, cost-effective buildings. LEED is the triple bottom line in action, benefiting people, planet and profit [3].

LEED for Core & Shell development is a green building system that was designed to provide a set of performance criteria for certifying the sustainable design and construction of speculative developments and core and shell buildings. Broadly defined, core and shell construction covers base building elements, such as the structure, envelope and building-level systems, such as central HVAC, etc. The LEED for Core and Shell system recognizes that the division between owner and tenant responsibility for certain elements of the building varies between markets [4].

LEED for Core & Shell ratings are awarded according to the following scale [4]:

There are 100 base points; 6 possible Innovation in Design and 4 Regional Priority points
Certified 40–49 points
Silver 50–59 points
Gold 60–79 points
Platinum 80 points and above (Table 1)

Table 1. Key areas with examples of credits used to provide an overall picture of what is assessed in LEED systems [2].

Sustainable sites – Site selection – Alternative transportation – Stromwater design	**Water efficiency** – Water efficient landscaping – Innovative wastewater Technologies – Water use reduction
Indoor environmental quality – Indoor air quality – Low-emitting materials – Lighting – Thermal comfort – Daylight and views	**Materials and resources** – Construction waste management – Materials reuse – Regional materials – Sustainable purchasing
Energy and atmosphere – Optimize energy performance – On site renewable energy – **Green power** – **Energy-efficient building systems**	**Innovation in design** – LEED Accredited Professional – Innovation in design – Exemplary performance
Regional priority – Regional priority	

A certain number of points can be scored in each key area. These points vary depending on which rating system is used [2].

3 The Building 03 Inside the Energy Park of Vimercate

The Building 03, located inside the Energy Park of Vimercate, is the first building in Italy to be issued the LEED Platinum Certificate for Core & Shell.

Garretti Associati, the author of the masterplan, produced the project as well and supervised the construction of Building 03. Sustainability and energy saving were the pillars of this building since the concept stage, when much attention was bestowed on all the elements that are required to favour interaction between the users of the building and other types of users/consumers on the campus. The aim was to offer them a higher quality of life during the time they spend on the workplace (Figs. 1 and 2).

Fig. 1. The whole masterplan of the Energy Park – Garretti Associati

The buildings of the Park rise along a main road backbone, in the fulcrum of which are the buildings providing common functions; along this axis large green islands shape a rhythmic, dynamic morphology that underlines the identity of the area as a “campus”.

The Building 03 consists of an underground level serving as a car park, and three levels above the ground as office space. It is composed of two rectangular bodies

Fig. 2. Bird view Energy Park – Garretti Associati

arranged to form an "H". These two bodies are slightly offset to optimise exposure to the sun and are interconnected by two glazed units. Office layout is flexible and can be arranged into three configurations. Technologically, the design choices made for the facade include a frame in pre-engineered reinforced-concrete panels, and ventilated walls with steel (Aluzink) and wood (Holzbau) cladding. Glazed surfaces are protected with a sun screening system and with blinds operated by bio-climate sensors. System and installation networks are integrated in the false ceiling and in the raised floor.

Despite the vocation of the building as office space, meeting areas are present as well in the form of winter gardens with glazed walls located in the central areas (Figs. 3 and 4).

The building was granted the LEED Platinum certificate because of the wealth of its sustainable solutions, the most striking of which being [2]:

- optimization of water resources;
- re-use of demolition debris and use of locally-manufactured materials;
- less issues related to air quality, hence higher environmental wellbeing of the building users;
- special and flexible operation of the temperature control system, which is made available to the users of independent areas as well;
- optimization of natural light;
- the supply of 100 % certified electricity, obtained from renewable sources;
- use of wood with certification of origin and manufacture.

Fig. 3. The outside of Building 03 - Garretti Associati

Fig. 4. The outside of Building 03 - Garretti Associati

The main features of the buildings are listed below:

- min. net height of rooms is 3.00 m;
- the floor load-bearing capacity is suitable to host also laboratories, IT rooms, training rooms, test rooms, an auditorium and much more;
- the façade module is 1.5 m wide;
- the underground park has 95 places with monitored access;
- the efficiency of office space is 84.5 %;
- excellent flexibility for use by a single tenant or multi-tenants;
- special and flexible operation of the temperature control system, which is made available to the users of independent areas as well;
- a wide common courtyard inside the building;
- a triple-height entrance lobby, with stairs taking to the various floors and two lifts;
- storage/archive rooms on the underground level;
- latest generation air-conditioning and heating systems with a condensed heat pump using underground water;
- high efficiency, low energy consumption;
- balanced ratio between opaque parts and transparent parts, with fully glazed elements;
- use of natural materials with a certificate of origin, as is the case of the wood used for the frame of the lobbies and indoor finishes;
- ventilated facades made of prefab reinforced-concrete panels, exterior insulation achieved with rock wool and bored steel sheet;
- the sunscreening system is installed outside the building;

Fig. 5. The inside of Building 03 - Garretti Associati

- glazed openings are equipped with an awning shading system remotely controlled by a BMS system, in order to optimize the natural lighting of rooms;
- re-use of condensation water for garden watering and toilet flush;
- rainfall is conveyed to the water table not to burden the sewer system;
- fewer heat islands to curb the environmental impact on natural micro-climates and on human habitat;
- re-use of demolition debris and use of locally-manufactured materials (Figs. 5 and 6).

Fig. 6. The inside of Building 03 - Garretti Associati

4 A Description of the LEED Approach – Building 03

4.1 Sustainable Sites - 15/15 Points

The building was constructed within the framework of the redevelopment project of a former manufacturing site at Vimercate (MB, Italy), which had been reclaimed of polluting waste before the construction works began. In order to encourage sustainable transportation the project integrated a pre-existing cycle-lane, while bicycle storage

areas were created with their relevant changing facilities and showers solely reserved for the occupants. To reduce the negative impact from automobile use, connection with the nearby villages and towns is guaranteed by a private shuttle bus service to integrate the public bus lines that have their stops at a short distance. The project site is well served also by the motorway/orbital road and by county roads.

The "E-mobility Italia" project was implemented on this site too, to promote the use of electricity-driven public transportation means or the rental of electric cars. Preferred parking lots are reserved to low-emission vehicles in the area allocated to the car parks of this Building.

The planned green areas were planted with native and adapted vegetation, in order to safeguard the habitat and promote biodiversity. To ensure occupants' wellbeing and reduce heat islands, the materials chosen for the covers and for external paved surfaces have a low solar reflectance index. Specific measures were adopted to avoid light pollution and some guidelines were drafted to promote the sustainable use of the building by its occupants.

4.2 Water Efficiency - 5/5 Points

In order to reduce potable water consumption and favour the conscious use of water resources, specific design choices were made: the heating and cooling systems of the building use underground water; native trees with low water consumption were planted, and a rainwater storage tank was installed to provide water to toilet flushing and to the irrigation system of the green areas. Buildings are also equipped with timer-controlled faucets with a reduced water flow, or double-flow toilet flushing, both fixtures proving useful in curbing overall water requirement further. Rainfall is also captured on the roofs and re-used for irrigation.

4.3 Energy and Atmosphere - 9/14 Points

A dynamic computer simulation of the energy requirement of each building was performed for both summer and winter. This simulation quantified that the energy cost savings in the first certified building, or Building 03, will be 27.4 % compared with the baseline building performance rating.

The whole core and shell system is optimized by an electronic metering network that separates the energy consumption from lighting, motive power and the mechanical ventilation system with a heat regenerator. The connections to sub-metering equipment for future tenants have been created as well. The buildings are equipped with the BMS (Building Management System), which makes global operation easier and constantly monitors the systems. By means of this system, the user can monitor the single areas of the building in order to improve overall energy savings over time, since temperature control management is flexible to adapt to users and to the duration of use. To deter the release of stratospheric ozone, the HVAC systems use low-pollution refrigerants. An agreement was entered into with a local power supplier to provide the building with electricity produced 100 % from RECs-certified renewable sources; this is to foster the

development and use of zero-impact renewable grid technologies. Some photovoltaic installations are on the site, as well. The long side of the building looks west, which allows good capture of the light and of solar energy in the central hours of the day, when the building is going to be used. In order to curb excessive overheating, a sunscreening system was installed along with powered external blinds. The balance between opaque surfaces (the ventilated wall) and clear surfaces (greenhouses and entrance lobbies) is positive to limit energy consumption, and to optimize natural lighting use. To avoid excessive overheating in summer caused by sunbeams, the electrical installation is equipped with a modulation system based on the natural light that penetrates the facility.

4.4 Materials and Resources - 6/11 Points

To reduce the amount of waste produced during the construction process, waste management plans were prepared for the waste produced on the construction site, while specific areas on the site were designated for segregated collection of waste from the construction process. This gave the opportunity to divert all reusable materials to appropriate collection sites, and to recycle and/or salvage a very high percentage of non-hazardous construction and demolition debris. During the construction phase, most of the materials obtained from the demolition of pre-existing factories on the site were reused. To increase use of materials that are manufactured and recycled in the region, the project team selected some building products that are extracted and manufactured within a distance of 800 km from the project site. The team also checked that these products contained a high percentage of recycled content. Construction materials made of wood are certified as being from responsible forest management (FSC and PEFC).

4.5 Indoor Environmental Quality - 6/11 Points

Smoking is prohibited inside each building, and outside them within 8 meters of operable windows and doors, in order to guarantee the minimum performance of air quality and thereby safeguard the health of occupants. Outside the non-smoking boundary some areas were created purposely for smokers. To achieve reduced use of artificial lighting, each building is equipped with the BMS system that automatically adjusts the external shading devices and artificial lighting of rooms and offices in order to maximize daylighting and offer optimal view opportunities. To reduce the presence of pollutants and improve indoor air quality, an air-treatment system has been installed with adjustable airflow depending upon the number of occupants in a room, and upon the concentration of CO2 in indoor air as is monitored by purpose-made sensors. To promote the comfort and wellbeing of construction workers and building occupants, dirt-absorbing barriers are placed at the entrance points of the building. The adhesives, primers, paints and flooring materials used during the construction comply with the limits for volatile organic compounds (VOC). Moreover in order to reduce the air contaminants inside the building that are odorous, irritating and/or harmful for the comfort and wellbeing of construction workers and building occupants, adequate carpet was installed.

4.6 Innovation in Design - 4/5 Points

The building earned points for its exemplary performance in the conservation of natural areas and in the promotion of biodiversity, and also in the use of local materials and resources with considerable reduction of transportation impacts on the environment.

The project of Building 03 allocates 75 % of the green areas to native vegetation and lawn species; the value of the building products extracted and manufactured within a limited distance is equal to 44.57 % of the overall cost of the construction materials used for the project.

More model performances were achieved with the smart use of groundwater.

4.7 Cost Monitoring

The project's economic sustainability rests both on the design choices made, and on the operational methods applied. LEED certified buildings guarantee energy saving, volume benefits and tax deductions for their owners, final users and enterprises. The volume advantages and tax deductions available to owners depend upon the amount of technological solutions adopted for energy saving (insulation) and use of renewable sources (100 % RECs-certified sources for the production of electricity from renewable sources of energy). The lower water consumption achieved by recovery of rainfall, and lower energy consumption by monitoring the actual energy requirement, have positive repercussions on the building management costs. Also the presence of recycled materials manufactured at a short transportation distance adds to this advantage. During the construction phase work was optimized by monitoring realization costs and times, and requiring a guarantee on the duration of the materials used.

4.8 Social Sustainability

Special attention was placed on the anthropocentric vision of the project, i.e. to create an office-space building where environmental conditions are favourable for workers. The strategies concerning indoor air quality and temperature, visual and sound comfort make the working environment healthier and more pleasant. The presence of green islands and of recreational areas within the building enhance the degree of satisfaction of internal and external users.

5 Conclusion

Sustainable building construction and long-term energy efficiency are among the most important trends in real estate development in Italy. This is confirmed by the amount of certified buildings and buildings that are currently undergoing the certification process. They are increasingly decision driving for investors, developers and end users when selling or leasing commercial spaces [6].

During the projecting and construction of sustainable buildings economic and ecological factors play equally important role as well as quality and durability of the building. In Italy the driving force behind green building construction begin be the developers who attempt to satisfy the demands of real estate investors and mainly tenants.

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