

Habitat Lab - high energy efficiency


Corsico - Milan, Italy 



Achieving LEED certification standards while enhancing quality of life and sustainability

The built environment has a profound impact on our natural environment, economy, health, and productivity. Breakthroughs in building science, technology, and operations are now available to designers, builders, operators, and owners who want to build green and maximize both economic and environmental performance. The United States Green Building Council (USGBC) is changing the built environment through the LEED green building certification program. The aim is to spread the concept of sustainable building and to promote good practices of design and construction. In this sense, the green movement offers an important opportunity to respond to the challenges of our time, including climate change, dependence on non-renewable and expensive energy resources, and threats to human health [1]. Habitat Lab was built at an existing site, blending renovation and new construction to create a 1,200 square meter facility with the goal of achieving LEED certification standards. It involves some building solutions and technologies to help ensure an optimal combination of operational efficiency, indoor comfort, and sustainability. With the highest LEED Platinum score in Italy, it exemplifies a good manner to create the sustainable cities of tomorrow.

Country/ City Profile

	Country		City	
	Population (2014)	61.34 million [2]	Population (2014)	1,350,680 (city) [4] 7,585,200 (metropolitan) [10]
	Land area (km ²)	301,340 [2]	Land area (km ²)	181.76 (city) [4] n/a (metropolitan)
	GDP per capita (2014, current international \$, at purchasing power parity)	34,706 [3]	GDP per capita (2014, US\$, at purchasing power parity)	n/a (city) 41,147 (metropolitan) [10]
	Region	Europe	Region	Inland
City's physical geography		Location <ul style="list-style-type: none"> ✓ It is located on the north side of Italy, latitude 42° 47' 00" N, longitude 12° 36' 00" E ✓ The landscape is mostly flat, with irrigated areas and intense cereal growing activity within the park's agricultural areas (<i>Parco Agricolo Sud Milano</i>) ✓ Low altitude (121 m above sea level) 		
	Climate	<ul style="list-style-type: none"> ✓ Temperate, moderate continental (average annual temperature: 13,1 C°); ✓ 1,013 mm/year annual rainfall [4] 		

Initiating context

Following the creation of the USGBC in 1993, the organization's members quickly realized that the sustainable building industry needed a system to define a measure "green buildings". So, USGBC began to research existing green building metrics and rating systems.

LEED, or Leadership in Energy & Environmental Design, born in 2000, is a green building certification program that recognizes best-in-class building strategies and practices. Today LEED includes nine rating systems, each one developed for specific building typologies, sectors, and project scopes. These include: LEED for Operation and Maintenance; LEED for Core and Shell; LEED for New Construction; LEED for Schools; LEED for Neighborhood Development; LEED for Retail; LEED for Healthcare; LEED for Homes; and LEED for Commercial Interiors [5].



Source: [11]

Each rating system is organized into eight environmental categories: integrative process, location and transportation, materials and resources, water efficiency, energy and atmosphere, sustainable sites, indoor environment quality, innovation, and regional priority credits. To receive LEED certification, building projects must satisfy prerequisites of each of the categories and earn points to achieve different levels of certification [1].

Project description



Source: [11]

Located in Corsico, in the province of Milan, Italy, Saint-Gobain's Habitat Lab is a multipurpose research center that showcases the company's innovative philosophy of building design, one that achieves a carefully calculated balance between quality of life and environmental sustainability. The Habitat Lab was built at an existing Saint-Gobain site, blending renovation (700 m²) and new construction (500 m²) to create a 1,200 m² facility with the aim of achieving LEED certification standards. The Habitat Lab is highly energy efficient. It provides superior energy savings, lower emissions and maximum comfort. In fact, its actual consumption is close to zero thanks to a solar photovoltaic system that generates 22 MWh of on-site power. Further energy savings come from the use of special glazing (*SageGlass*), which allows clear exterior views and maximum natural light while controlling heat gain in an intelligent way. Depending on outside temperatures, light levels, and the time of day, the colour of the glass can be automatically adjusted to minimize the need for additional heating and cooling all year long without compromising the comfort inside. The center is available to organizations, universities, and others interested in researching and developing new materials and construction solutions in collaboration with Saint-Gobain [6]. The building design contributes both to the reduction of 116 MW/h in energy savings and of 62.5 tons of greenhouse gas emissions in the atmosphere, the equivalent of saving 5.5 hectares of forests each year. Inside the building, an innovative, real time, domotic-system measures energy performance, indoor air comfort, and CO₂ reduction performance. In this manner, all parameters are continuously under control [7]. Habitat Lab aims to spread the concept of sustainable building and to promote good practices of construction.

LEED credit categories [7, 8]

The number of points a project earns in each of the eight environmental categories determines the level of LEED certification (*Silver, Gold, Platinum*) that the project will receive. With a final score 90/110, Habitat Lab currently holds the highest Platinum score in Italy. In this sense, it is a premier training and innovation center that has achieved net-positive energy for the building.

ENERGY AND ATMOSPHERE	<ul style="list-style-type: none"> ✓ Exterior wall U-value = 0.11 W/m²K ✓ Triple glazing Ug value = 0.6 W/m²K - g = 0,24 ✓ Electronically tintable glass Ug value = 1.1 W/m²K - g = 0,006±0,40 ✓ Roof U-value = 0.09 W/m²K
SUSTAINABLE SITES	<ul style="list-style-type: none"> ✓ Heat island reduction thank to the roof = SRI 96% ✓ Electric vehicle charging station to reduce pollution impacts from automobile use
WATER EFFICIENCY	<ul style="list-style-type: none"> ✓ Uses 20% less water than the water use baseline calculated for the building
MATERIALS AND RESOURCES	<ul style="list-style-type: none"> ✓ Retrofit of an existing building built in the Fifties ✓ Wood certified, in accordance with the Forest Stewardship Council's (FSC) Principles and Criteria ✓ Sourcing of materials on-site ✓ 82% of recycled glass is used for glass wool insulation production
INDOOR ENVIRONMENTAL QUALITY	<ul style="list-style-type: none"> ✓ Products certified, in accordance with the GEV EMICODE EC1 standards ✓ Low-emitting materials ✓ Use of a domotic-system to control ventilation, air-conditioning, lighting and energy performance
INNOVATION	<ul style="list-style-type: none"> ✓ <i>Activair</i> technology is able to absorb more than 70% of the volatile organic compounds (VOC) present in the air, transforming them into inert elements

Implementation process

Habitat Lab is the first example of the *multi-comfort* concept developed by Saint-Gobain to achieve an optimal combination of operational efficiency, personal comfort, and sustainability through building solutions. To realize this aim, Saint-Gobain brought together the latest and most advanced building materials and practices from the companies in the Saint-Gobain family that serve the construction sector, including *SAGE Electrochromics Inc.*, developer and manufacturer of *SageGlass* electronically tintable glass. The use of this particular glazing contributed to the nearly net-zero energy usage in the innovative building, and achieved the important goal of providing comfort to the building occupants. In addition to this, all parameters are continuously under control thanks to a real time domotic-system used to evaluate energy performance and show associated emission reductions [7]. As part of its research mission, the project has been developed to serve as a “building workshop” where the effects and outcomes of new building materials and techniques can be closely evaluated. In this sense, it provides valuable field training opportunities for designers and application engineers that can explore both theoretical and practical uses of the construction materials and techniques.

Results

Final Energy Performance [7, 8, 9]

ANNUAL HEATING DEMAND - before the project	260.00 kWh/m ² per year
ANNUAL HEATING DEMAND - after the project	4.4 kWh/m ² per year
FINAL ENERGY DEMAND (2014)	16.25 kWh FE/m ² per year
ACOUSTICAL INDOOR PERFORMANCE	≥ 50 dB
CO ₂ REDUCTION IN THE ATMOSPHERE	62,5 tons
RENEWABLE ENERGY	22 MWh per year
SAVING IN ENERGY CONSUMPTION	51% (heating, cooling, lighting)



Source: [11]

Lessons learned

Habitat Lab is highly energy efficient. It provides superior energy savings, lower emissions, and maximum comfort. In fact, its actual consumption is close to zero thanks to a solar photovoltaic system that generates 22 MWh of on-site power. Further energy savings come from the use of electronically tintable glasses, which allow for clear exterior views and maximum natural light while controlling heat gain in an intelligent way. Depending on outside temperatures, light levels and the time of day, their colour can be automatically adjusted to minimize the need for additional heating and cooling all year long without compromising the comfort of the building's occupants. Habitat Lab monitors energy performance and other quality of life factors, all in real-time, day by day. It exemplifies the way through which the construction sector can offer great potential for energy savings in building low-carbon and sustainable cities.

References

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- [2] World Bank: Data Italy: <http://data.worldbank.org/country/italy>
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- [4] City of Milan webpage: <https://www.comune.milano.it/wps/portal/ist/it/amministrazione/datistatistici>
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- [10] Global Metro Monitor, Milan (2014): <http://www.brookings.edu/research/reports2/2015/01/22-global-metro-monitor>
- [11] Photos and images: <https://www.saint-gobain.it/habitat-lab.php> ; <http://www.habitatsaint-gobain.it/habitatlab/il-centro>

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