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Further information
Skanska AB
www.skanska.com

Contact
Noel Morrin,
Senior Vice President
Sustainability
noel.morrin@skanska.se

MIT Stata Center – a benchmark for 'green standards'

Case Study 23

Aspects of Sustainability

This project highlights the following:

Social Aspects

Human Resources

Corporate Community Involvement

Business Ethics

Health and Safety

Environmental Aspects

Energy and Climate

Materials

Ecosystems

Local Impacts

Economic Aspects

Project Selection

Supply Chain

Value Added

Beacon Skanska turned the environmental building ambitions of MIT into reality with the construction of the MIT Stata Center. The development of this building set new 'green standards' which MIT now use for all its construction projects.

Project Introduction

The unique and impressive building was designed by Pritzker Prize winning architect, Frank O. Gehry in collaboration with Cannon Design. The Center was designed to support the Massachusetts Institute of Technology's (MIT) sustainable design initiative which ensures the environmental integrity of the construction of all of its buildings. MIT wished to develop these standards further with the assistance of the contactor Beacon Skanska.

The Client consisted of four University departments each vying for space and with divergent interests. The Stata Center houses four MIT departments plus an auditorium, four classrooms, a child care facility, a food services facility, a fitness center, outdoor gathering spaces, two levels of below grade parking and a service facility.

Environmental Standards Leadership

MIT has an international reputation as a global leader amongst research universities and MIT recognizes its role in providing leadership in promoting environmental awareness and concerns. It was this role that led to MIT developing a set of green standards to promote environmental best practice in the construction industry.

Silver Plus LEED™ building design standard

The MIT green standards are based on the US Leadership in Energy and Environmental Design (LEED™) Program, a nationally recognized building sustainability rating system. The LEED™ Green Building Rating System is a priority program of the US Green Building Council; the System is a voluntary, consensus based and market-driven rating system. The System is based on

existing proven technology that evaluates environmental performance from a 'whole building' perspective – i.e. over a building's entire life cycle, from construction to demolition. The Stata Center was designed to the LEED™ Silver Plus certification level, in addition it was customized to accommodate MIT campus needs in conjunction with the existing facilities management programme, building systems and procedures.

Energy consumption

The creation of zero- or low-carbon buildings that are sustainable and inexpensive to operate is an increasing requirement of all building designs. MIT showed leadership in this arena by the design of its:

- air conditioning systems
- landscape and exterior designs to reduce heat islands
- low velocity ventilation systems
- high performance lighting and occupancy sensors for most offices
- harvesting of site energy by maximizing light penetration

A standard minimum level of energy efficiency was applied to all major building systems and the base building itself. The design, installation and operation of all the main elements of the building were verified to ensure the operation of the building as intended.

Efficient heating and cooling systems

The Stata Center employs an innovative method for mechanically heating and cooling the building using a displacement ventilation system which utilizes raised floors, an air plenum ventilation system. This method of heating and cooling a building is highly energy efficient in terms of the operation of the equipment required. As a consequence, it is highly cost effective and sustainable in its consumption of power and reduces the associated carbon emissions or 'carbon footprint' of the building.

Minimizing heat islands

The thermal gradient differences between developed and undeveloped areas were reduced to minimize the site's effect on the microclimate and wildlife habitat. In order to reduce the potential for heat islands, more than 50% of parking space was developed underground. Light colored, reflective surfaces were used for roofs so that they reflect solar radiation in a natural way. The roofs have insulating benefits too, need lower maintenance, enhance the look of the building and are a part of the stormwater management system. These strategies have all assisted in minimizing the creation of heat islands, plus they help to reduce the costs of cooling the building in summer.

Emissions

Public transport has been made as accessible as possible in order to reduce emissions from car exhausts. The Stata Center is conveniently located on a number of bus routes and close to the subway. Bicycle racks for securing bikes provide an incentive to use an alternative form of transport to the car. The provision of changing and shower facilities further encourages the use of bikes. Parking space for alternative fuel vehicles in the garage area was introduced as an additional way to reduce vehicle emissions.

Efficient use of water

The priority of effective and efficient water management is as high a priority in the construction of buildings as energy. Water efficiency at Stata was enabled by the site's design for the management of stormwater which incorporated innovative and sustainable solutions for wastewater, plus the use of sustainable landscape planting.

Stormwater management

The effects of stormwater at the Stata Center was reduced by decreasing the site's non absorbent surface area, typically the paved or cemented regions. Stormwater was managed by a variety of means:

- the absence of outdoor parking areas which typically require paving
- garden roofs which provide vegetation to absorb stormwater
- pervious paving

As a result, Stata minimized the rate of stormwater runoff from its site into the Charles River by 50% and reduced the amount of solids in stormwater runoff by 80%.

Innovative wastewater technologies

The careful management of stormwater enabled the collection of rainwater runoff from the building and the surrounding areas. This water is channelled into a retention basin planted with vegetation that filters and purifies the water. Purified water from the retention basin is then pumped into the building for the flushing of toilets. The pump is driven by the electricity

generated from solar panels on the roof of the building thereby providing a wholly sustainable solution to modern living standards. Any unused water is released into the city's storm drains and eventually flows into the Charles River.

Landscaping – minimizing potable water use

The use of potable water for landscape irrigation was strictly limited. The Stata Center has been designed to capture rain water whilst the utilization of recycled water has reduced potable water consumption for irrigation by 50% compared to conventional designs. A significant factor in the landscaping of the site was the use of indigenous plants that are adapted to the conditions of the site and don't require watering with potable water.

Healthy Indoor environment

Air quality standards were established at the beginning of the design process and the minimum requirements of the voluntary consensus standard were guaranteed. Fresh air intakes were specified and installed far from possible sources of contaminants, while outside air capacity was measured to ensure that it met the requirements of the referenced standard. Operational testing was conducted after the project was completed to ensure standards were met and a high quality indoor environment was thereby ensured.

Emissions minimized

The use of components that produce chlorofluorocarbons (CFCs) was eliminated in the construction of the building. Man-made CFCs are the primary cause for stratospheric ozone depletion. As a consequence, building equipment that was using CFCs was converted or removed or replaced with CFC-free components.

Low-emitting materials used

Materials and products with low pollutant emissions were used throughout the Center. These low-emitting materials were used for paints, adhesives, carpets and wood products; all these materials met the LEED requirements. To further ensure occupants' health and comfort, water-based products were chosen over lead-based.

Daylight maximized

An extensive use of daylight in the Stata buildings provided a healthy indoor environment. Studies show that daylight has a positive impact upon workers' productivity and reduces air pollution. In addition to the health giving properties of daylight, it also reduces the requirement for electrical lighting, decreases the consumption of energy and reduces carbon emissions.

Sustainable use of resources

Stata is located in the center of Cambridge, at the heart of the MIT Campus, due to careful planning the building did not require the use of any greenfield land. Attention to the sustainable development of the site minimized construction waste and decreased the use of new materials.

Certified construction materials

In the building of the Stata Center, at least 50% of the wood used was certified by the Forest Stewardship Council.

Designed for recycling

The building design enabled easy recycling of materials for its users with an easily accessible area dedicated to recycling on the first floor in the hall. The recycling point facilitates the separation and collection of a number of materials including: glass, plastics, paper and metal.