建築思潮評析

Sustainable Design- Case Study

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- 從本學期學習《The Philosophy of Sustainable Design》的內容，衍生出一套檢視、觀摩永續建築的方法。並從案例分析來了解書本知識在實務上如何應用。
- 針對辦公建築做案例分析，探討永續議題與人的關係。

Case Study 3

Genzyme Center

Behnisch, Behnisch, and Partners

Location
Concept
Space
Strategies
Employee Satisfaction

Analysis

Genzyme Center

Behnisch, Behnisch, and Partners

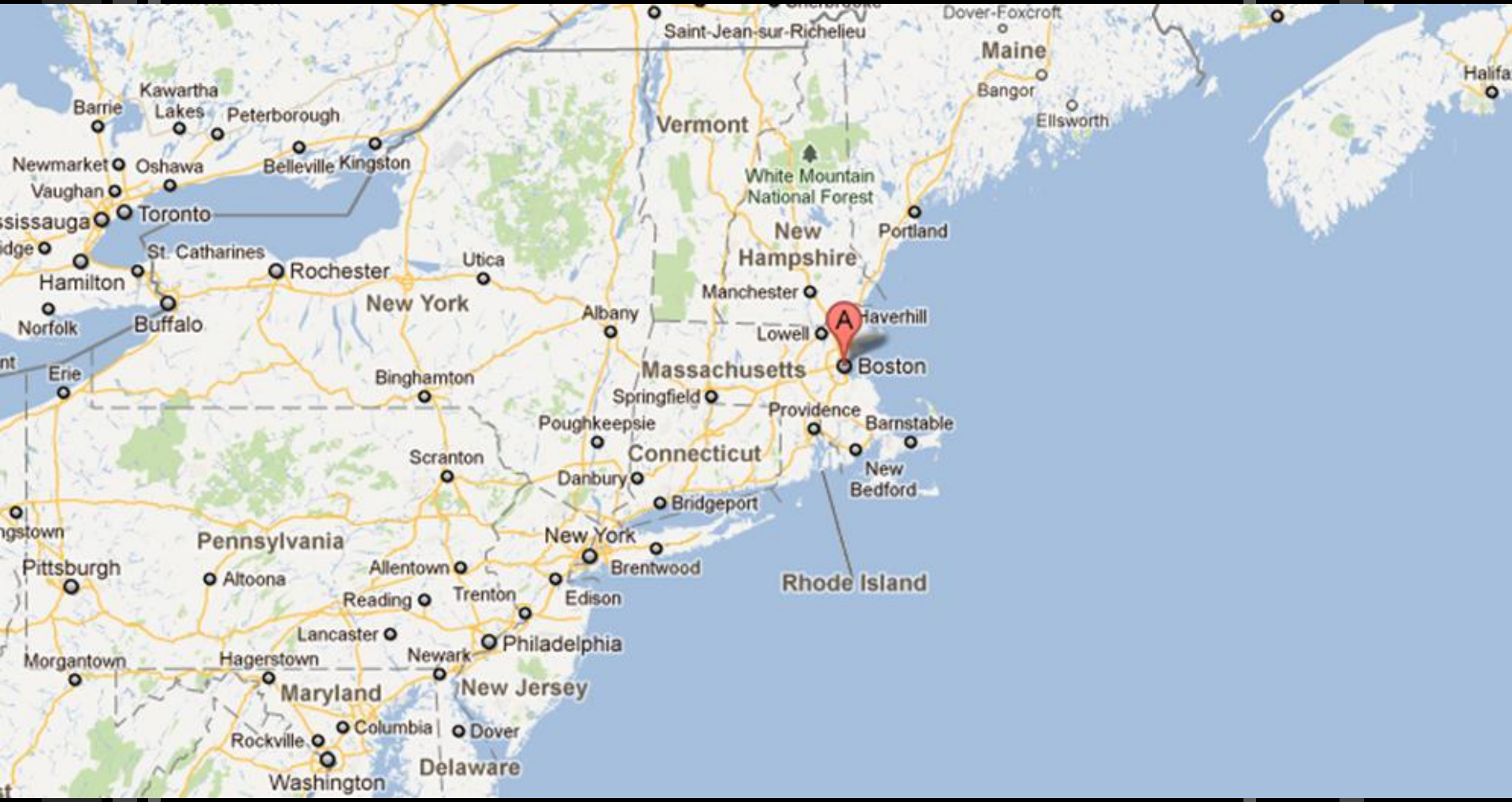
建築師 Behnisch, Behnisch, and Partners
結構工程師 Buro Happold
地點 Cambridge, MA, USA
建造期間 2000~2004
樓層 12層
總樓地板面積約 32,500 m^2
LEED Level Platinum (52 points)

The LEED Platinum rated Genzyme Center, located in Cambridge, Massachusetts, plays host to over 900 of the biotech company's employees and more than 400 weekly visitors.

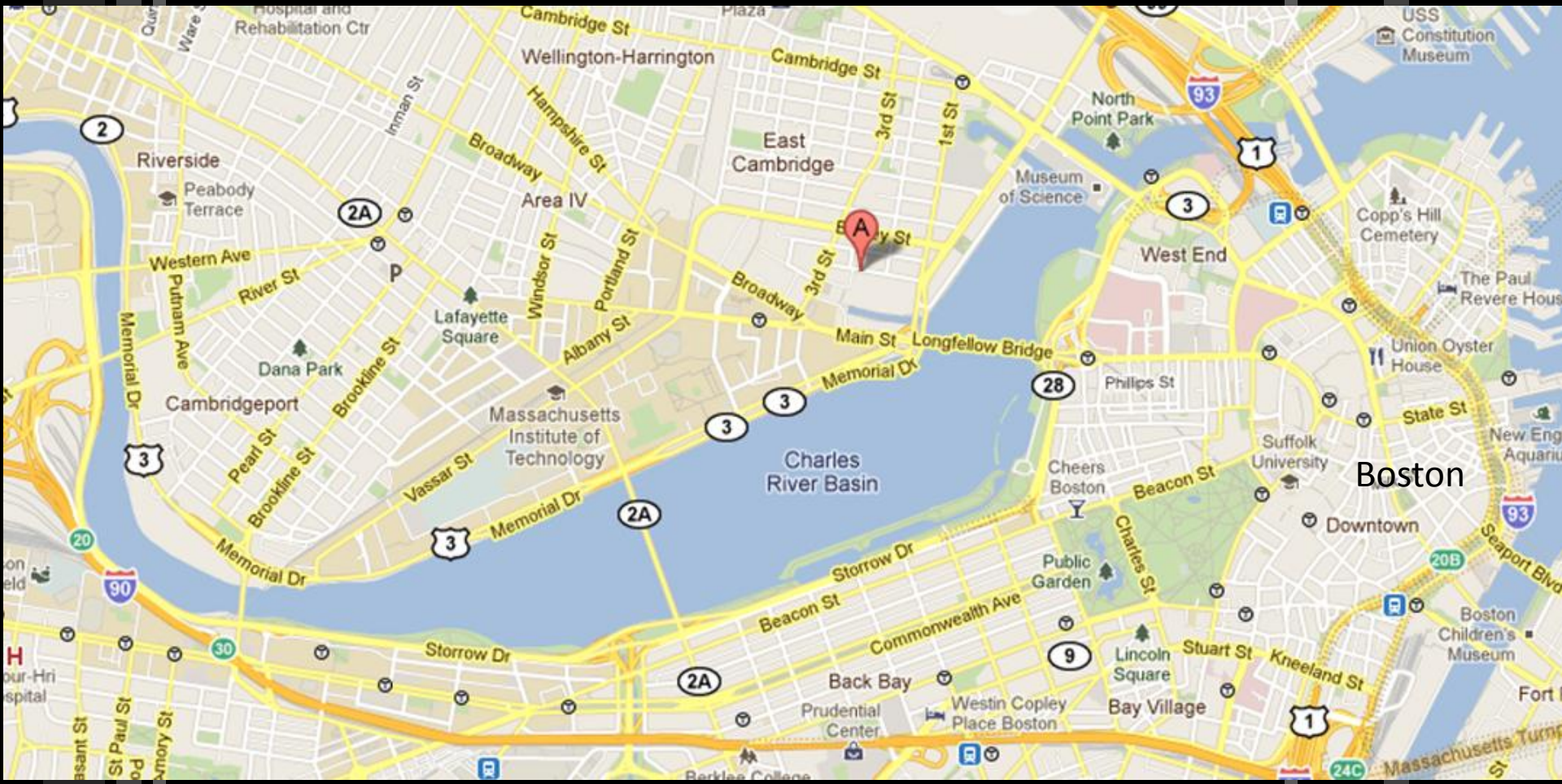
Location


A
Canada
United States
México
North Pacific Ocean
North Atlantic Ocean
South Pacific Ocean
South Atlantic Ocean
Iceland
Suomi
Sverige
Norge
United Kingdom
Polska
Deutschland
Україна
France
Italia
España
Türkiye
Kazakhstan
Iraq
Iran
Afghanistan
Pakistan
Algeria
Libya
مصر
Saudi Arabia
Mauritania
Mali
Niger
Chad
Sudan
Nigeria
Ethiopia
Kenya
DR Congo
Tanzania
Angola
Namibia
Botswana
Madagascar
South Africa
Venezuela
Colombia
Brasil
Perú
Bolivia
Chile

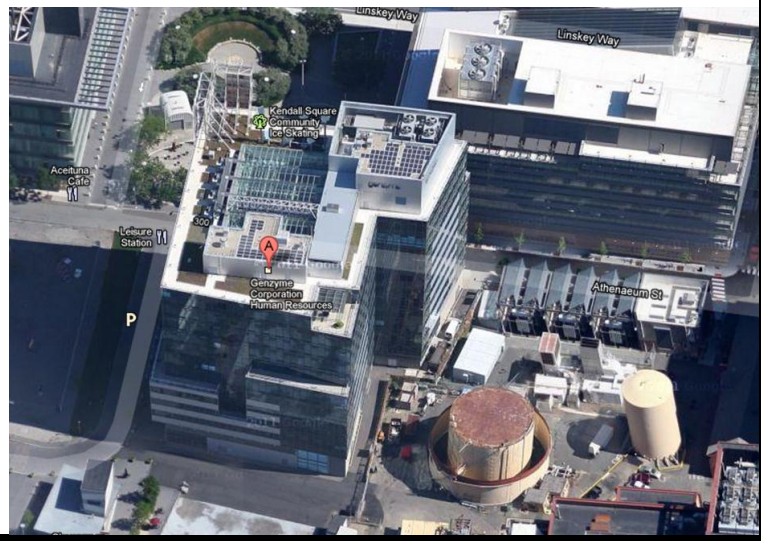
Location


Saint-Jean-sur-Richelieu
Dover-Foxcroft
Maine
Bangor
Ellsworth
Halifa
Barrie
Kawartha Lakes
Peterborough
Vermont
Newmarket
Oshawa
Belleville
Kingston
White Mountain National Forest
Vaughan
Toronto
New Hampshire
Portland
St. Catharines
Utica
Rochester
Hamilton
New York
Manchester
Albany
Haverhill
Norfolk
Buffalo
Lowell
A
Massachusetts
Boston
Erie
Binghamton
Springfield
Providence
Barnstable
Poughkeepsie
Connecticut
Scranton
Danbury
New Bedford
Bridgeport
Pennsylvania
New York
Pittsburgh
Allentown
Brentwood
Altoona
Rhode Island
Reading
Trenton
Edison
Lancaster
Philadelphia
Morgantown
Hagerstown
Newark
Maryland
New Jersey
Columbia
Dover
Rockville
Delaware
Washington

Location


Cambridge St
Wellington-Harrington
Cambridge St
East Cambridge
Hampshire St
Broadway
Area IV
Inman St
3rd St
1st St
North Point Park
USS Constitution Museum
Museum of Science
Riverside
Peabody Terrace
2A
Western Ave
River St
Putnam Ave
Memorial Dr
Lafayette Square
Windsor St
Portland St
Albany St
Broadway
3rd St
Main St
Longfellow Bridge
West End
Copp's Hill Cemetery
The Paul Revere House
Union Oyster House
Dana Park
Cambridgeport
Brookline St
Massachusetts Institute of Technology
Charles River Basin
Memorial Dr
Philips St
28
State St
Suffolk University
Cheers Boston
Beacon St
Boston
Downtown
Pearl St
Vassar St
Storrow Dr
Public Garden
Charles St
Seaport Blvd
Commonwealth Ave
Back Bay
Prudential Center
Westin Copley Place Boston
Lincoln Square
Stuart St
Kneeland St
Bay Village
Boston Children's Museum
Massachusetts Turnpike

Location



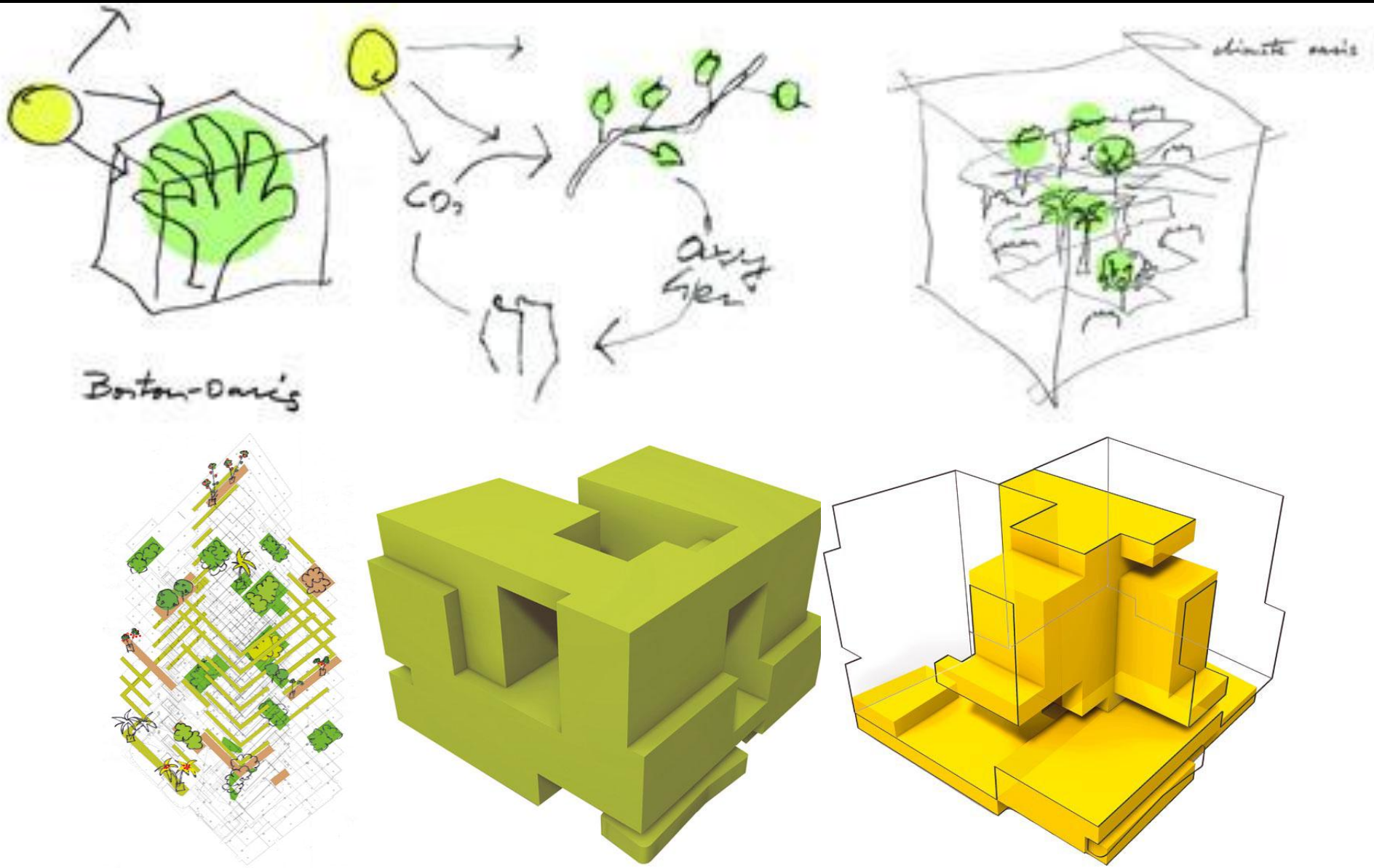
The Genzyme Center is located in the midst of other dynamic research institutions on a former brownfield site close to the Charles River.

Concept

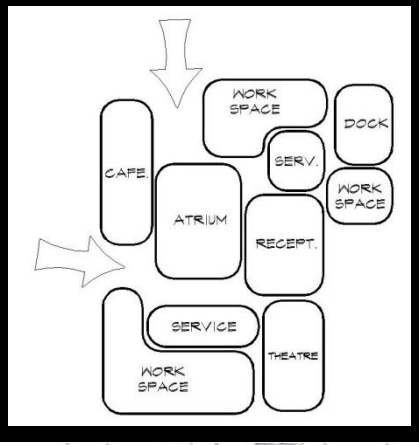
Behnisch proposed that the building be designed from the inside out in a way that would reflect Genzyme's work style. They studied how Genzyme and their employees interact and used this insight to inform the building design. There are three key concepts that reflect Genzyme's ethos and are the cornerstones for the design: innovation, collaboration, and transparency:

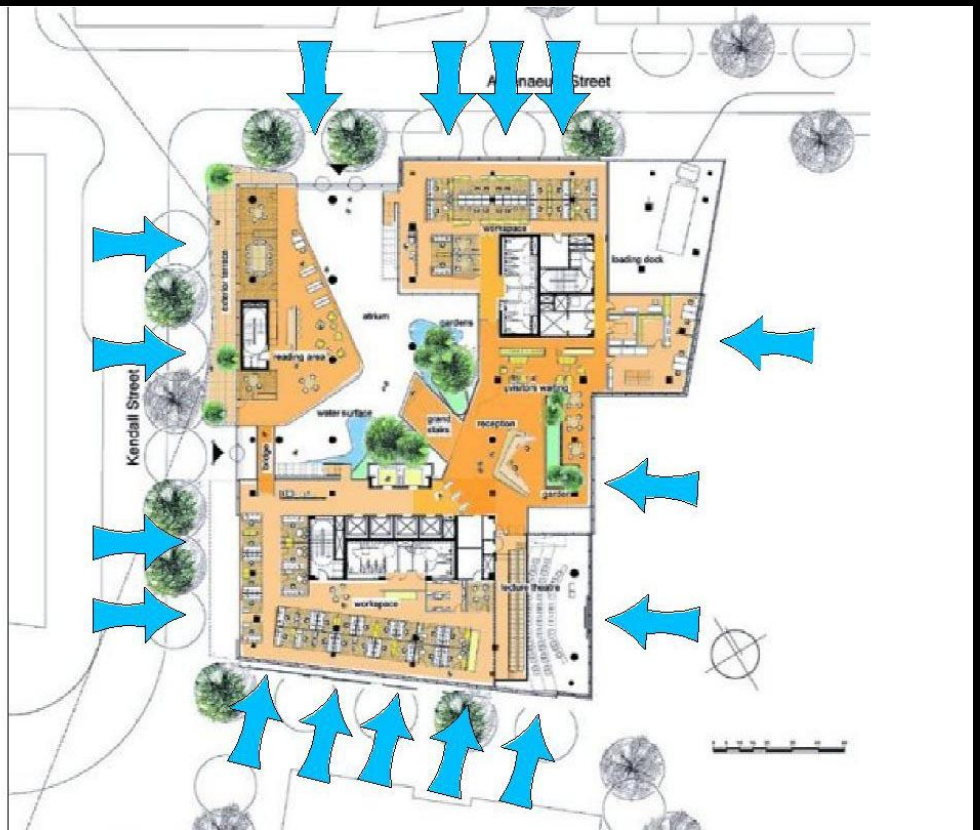
- Innovative use of daylighting technologies brings sufficient natural lighting to 90 percent of the workspaces
- The high proportion of open space naturally facilitates collaboration among employees
- Glass walls, on the outside and inside, make the building literally transparent

Space



Space


WORK SPACE
DOCK
CAFE.
SERV.
WORK SPACE
ATRIUM
RECEPT.
SERVICE
THEATRE
WORK SPACE


Kendall Street
workspace
loading dock
exterior terrace
atrium
gardens
reading area
visitor's waiting
water surface
grand stairs
reception
bridge
garden
workspace
lecture theatre


Kendall Garden
W.C.
W.C.
Technical Room
Atrium
Conference
Boston Window
Garden
Lobby
Reception
Kitchenette
TELEPHONES
Lounge space

Strategies

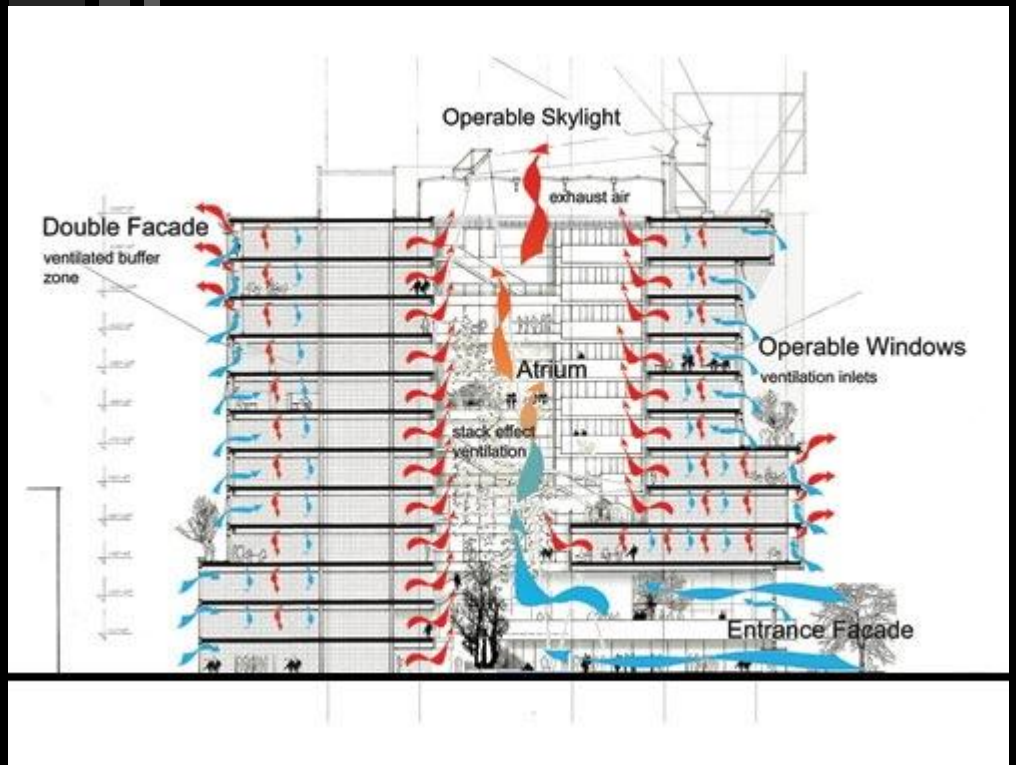
The design team focused on LEED's five-part framework to organize their environmental strategy:

- Site development
- Water savings
- Energy and efficiency
- Materials selection
- Indoor environmental quality.

Strategies

Temperature and Air

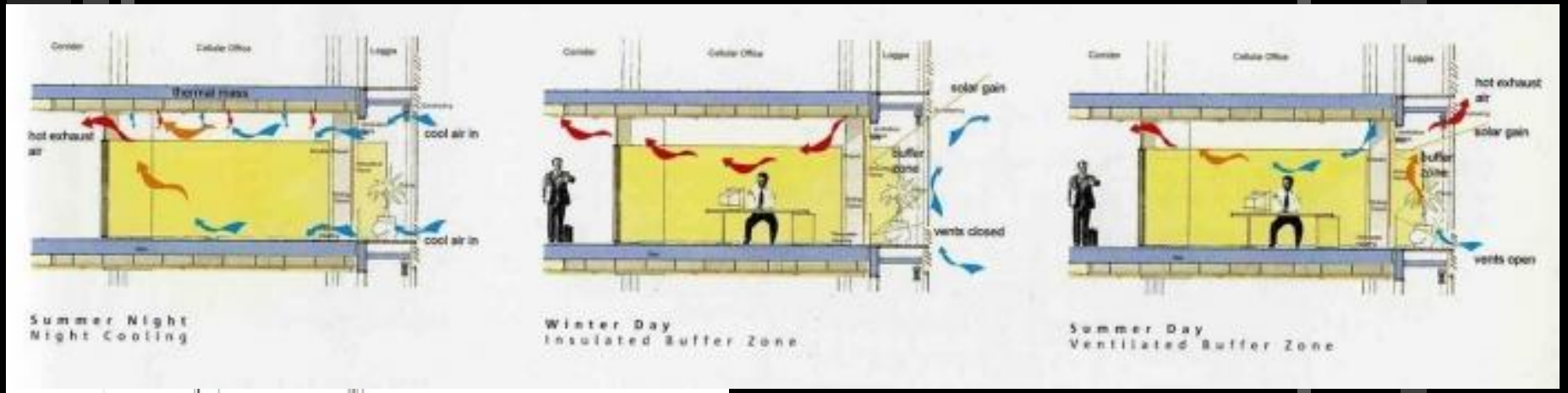
- Air flow - air monitoring system
- Vegetative Roof - reduce storm water runoff and absorb heat
- Loggia 涼廊
- Operable Windows
- Prismatic Louvers 分光的天窗

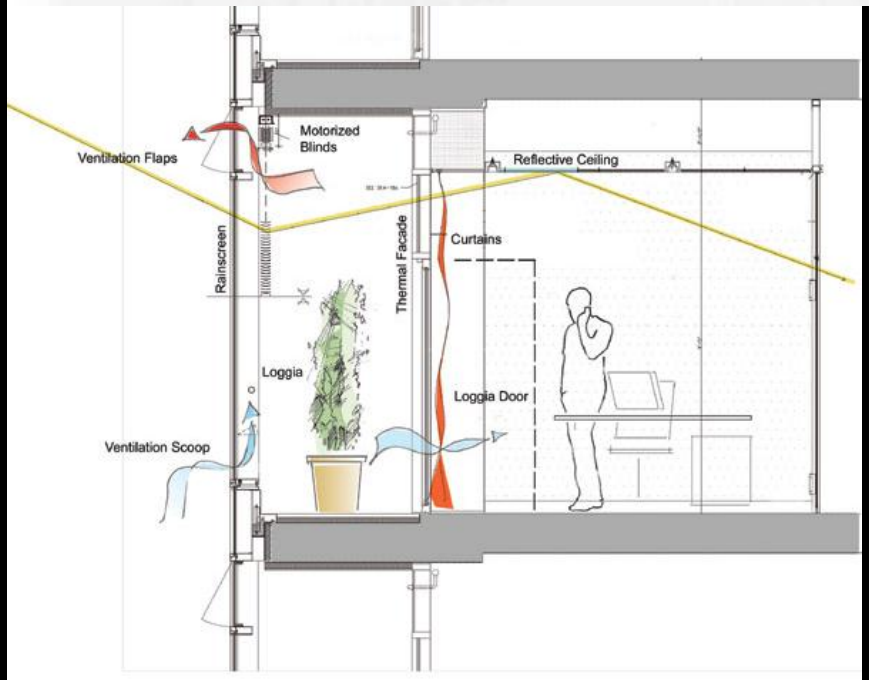


arid succulent plants

Strategies

Temperature and Air - Loggia

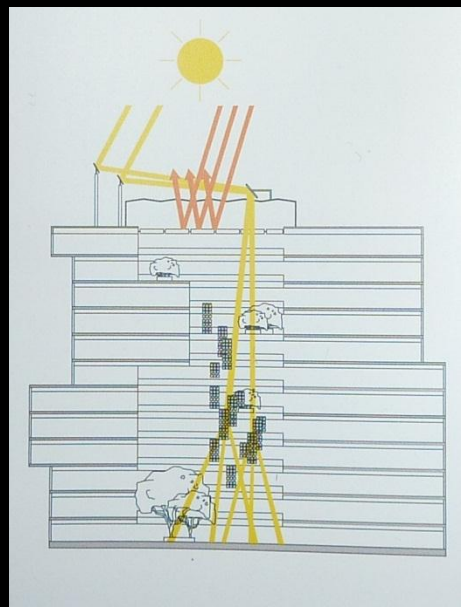


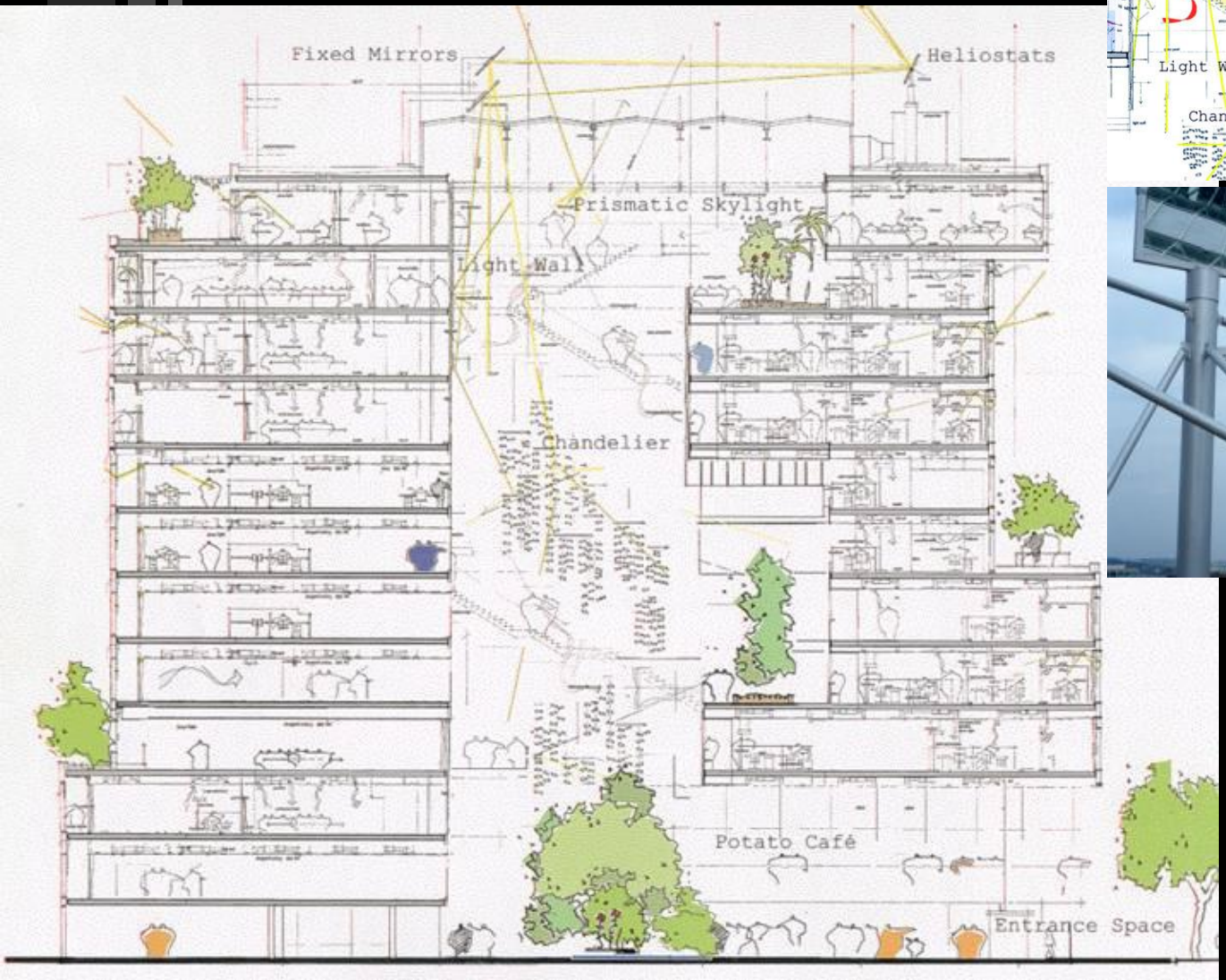


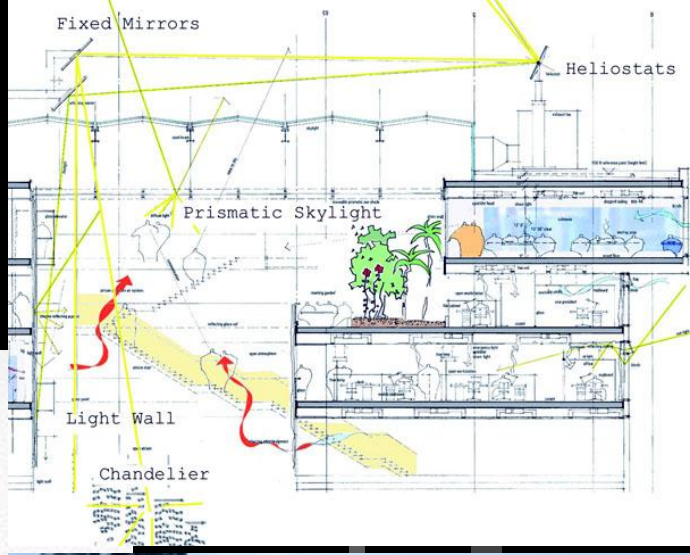
Strategies

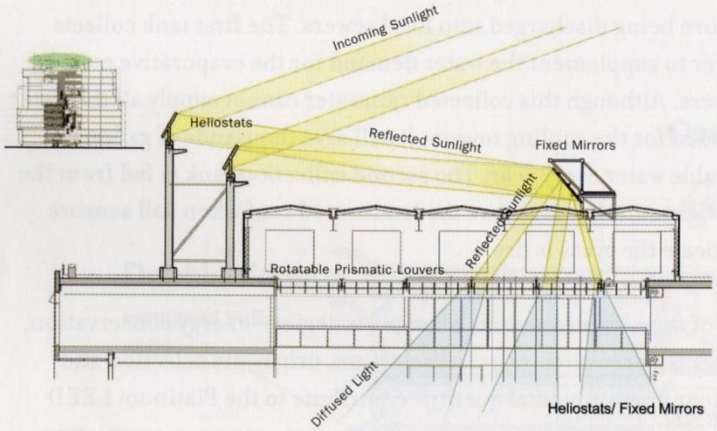
Light

- Heliostats 定日鏡
- Skylights
- Reflecting Pool
- Light Wall
  - made of polished aluminum strips
- Chandelier - 768 animated prismatic plates
- Reflective Ceiling Panels
- Perforated Blinds 百葉




Fixed Mirrors
Heliostats
Prismatic Skylight
Light Wall
Chandelier
Potato Café
Entrance Space


Fixed Mirrors
Heliostats
Prismatic Skylight
Light Wall
Chandelier



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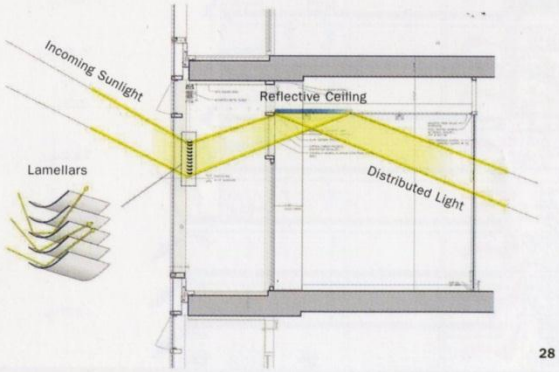

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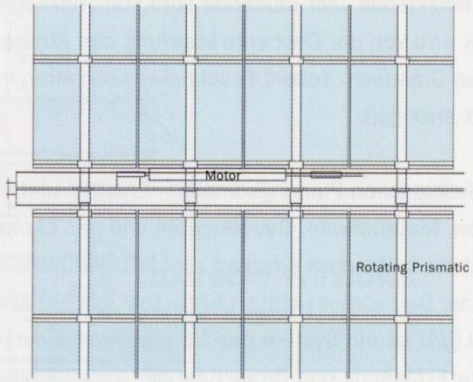

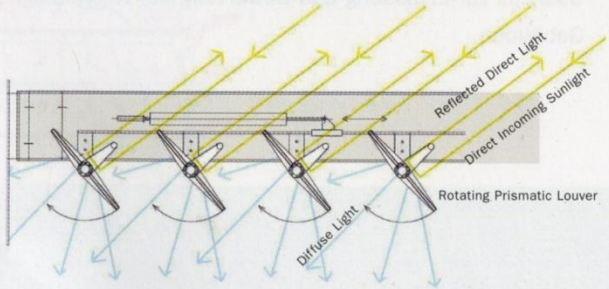

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Along the glass exterior, computer-controlled blinds automatically track the sun's position and open to desired angles to let light in while deflecting heat. All of the blinds close automatically at night to prevent light pollution in the surrounding neighborhood.

Strategies

Water

- Water Sensors - in the landscaping reduce unnecessary watering
- Vegetative Roof - absorbs heat and reduces storm water runoff
- Smart Plumbing - including low-flow fixtures, waterless urinals and dual-flush toilets

Strategies

Renewable Resources

- Heating and Cooling – Power Plant
- Photovoltaic Panels

Building Materials

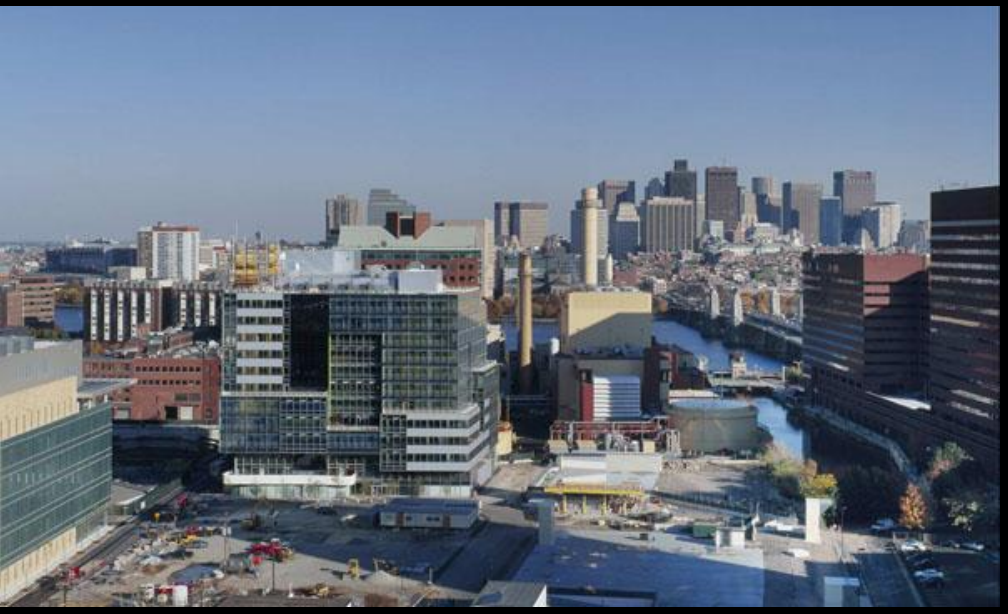
- Materials used in the building such as carpets and paints meet or exceed the highest standards for the emission of volatile organic compounds
- 75% of all materials came from local sources within 500 miles
- Most of the wood used in the project comes from renewable forests.
- More than 90 percent of all waste from the Genzyme Center construction site was recycled or reused.

Transportation - public transportation、 bicycles、hybrid vehicles

The Concrete Structure Design

- much of the concrete is exposed, providing a passive heating/ cooling benefit that helps reduce energy costs

Energy Conservation



Summary

- More than 32% of the exterior envelope is a ventilated double-facade that blocks solar gains in summer and captures solar gains in the winter.
- Steam from a nearby power plant is used for central heating and cooling.
- The building's central atrium acts as a huge return air duct and light shaft. Fresh air moves into the atrium and up and out exhaust fans near the skylight.
- Natural light from the fully glazed facade and from the atrium (brought in by solar-tracking mirrors above the skylight) is reflected deep into the building.
- The building uses 32% less water than a comparable office building by using waterless urinals, dual-flush toilets, automatic faucets, and low-flow fixtures.
- Stormwater supplement the evaporative cooling towers and irrigates the landscaped roof.
- Building materials were chosen for their low emissions, recycled content, or local manufacturing. Nearly 90% of the wood was FSC certified.

Employee Satisfaction

To track the effect of the new building design on employees, Genzyme administered a survey 18 months after it opened. Comparing Genzyme Center to their prior workspace, employees responded to the survey as follows:

- 72 percent said they felt more alert and productive.
- 88 percent said having direct views and access to the interior gardens improved their sense of well being.
- 75 percent said the building's clear glass design has increased their sense of connection with colleagues.
- 92 percent said the building has increased their sense of pride about Genzyme's commitment to the environment.

Analysis
about Sustainability

- 針對《The Philosophy of Sustainable Design》一書中永續設計之觀念(Sustainable Design is a design philosophy that seeks to maximize the quality of the built environment, while minimizing or eliminating impact to the natural environment.), 及對未來建築The Living Building 的展望，以此為前提來分析Genzyme Center。

- 從辦公建築的角度出發，歸納出
  - 空間安排　　---商辦空間量大
  - 內庭花園空間 ---人與自然、環境間的互動
  - 科技運用　　---建築物愈高、量愈大，維持運作所需能源愈多
  - 地域性　　---考慮氣候、地理人文等條件因地制宜的設計

  等四個項目

Analysis

		空間安排	內庭、花園	科技運用	地域性
Sustainable Design	提升建築環境品質	●	●	●	●
	降低自然環境衝擊			●	●
The Living Building	彈性適應性	●		●	
	與自然之連結	●	●	●	
	降低能源使用	●	●	●	
	提升人類福祉	●	●	●	
	自然美感		●		

Conclusion

about Sustainability

- Genzyme Corporation是國際性的生物科技公司，致力於研發藥物、產品及提供服務，對重病患者(如癌症、遺傳性疾病等)有正面影響。而Genzyme Center 成功反應此公司的工作態度與理念。
- 透過12層樓高的中庭，引入光線並幫助空氣流通，再搭配四周的涼廊，大大減少能源的消耗，並提供好的工作環境品質。
- 定日鏡配合固定鏡面及稜鏡天花的運用，在建築物內展演了光的各種表現。且建物內多為開放、穿透性隔間(玻璃)，讓視野更通透、空間更明亮。
- 即便一開始便以LEED評分項目來做設計考量，仍不失設計的表現性，創造出節能卻不呆板的有趣空間。

Reference

- Behnisch Architekten
  http://behnisch.com/projects/104
- inhabitat
  http://inhabitat.com/genzyme-center/
- http://www.solaripedia.com/13/294/3278/genzyme_center_exterior.html