DESIGN PRECEDENTS
GENZYME CENTER

Project Owner:
Lyme Properties / Tenant: Genzyme Corporation

500 Kendall Street
Cambridge, Massachusetts, 02142
United States

Submitting Architect: Behnisch, Behnisch & Partner
Project Completion Date: November, 2003
Project Site Context/Setting: Urban, Brownfield Site
Project Type: Office – 10,001 to 100,000sf
Building or Project Gross Floor Area: 344,000 sqft.
Other Building Description: New
Energ Use Intensity: 49.2%

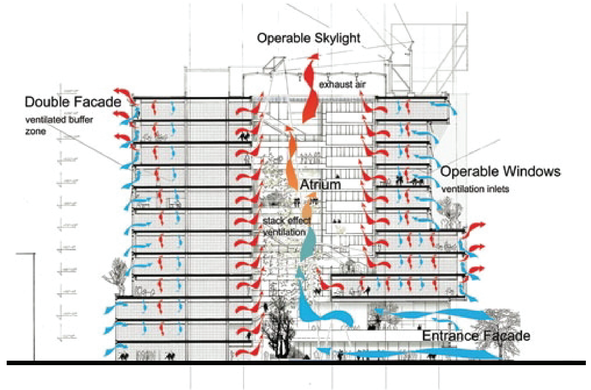
CHANGE

-The building's main daylight and airflow systems can function in the case of a power outage because of the solar pv system integrated with the building. This system provides more than enough electricity to power the basic functions of the building, however, productivity would still be significantly impacted because all of the computers and artificial lights could not be powered alone by the pv system.

-The building maintains an open ground floor to be occupied by various potential retail or restaurant locations, or they can be modified as more office space.

DISCOVERY

- by paying attention to the individual, we can do greater good for the whole
- approach to this building was to design "from the inside out"
- the design team then continued to enlarge the focus to the department, company, building, development, city, environment, etc.
- many "un-programmed" spaces throughout the building—including coffee bars, interior gardens, and seating areas—that are available for employee interaction
- This has been a very successful situation for communication and work productivity



ECOLOGY

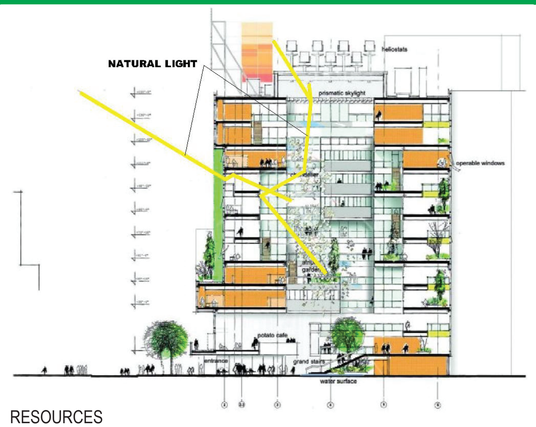
-All the electricity supplied to the building has been supplemented (or replaced) by Green-e certified renewable sources.

- The central heating and cooling systems are powered with steam from an adjacent power plant. The steam drives absorption chillers for cooling during the summer and is exchanged directly into heat for heating during the winter. This local energy cycle avoids distribution losses. As a result, peak summer electrical demand remains low and doesn't burden the aging electrical grid.

- One hundred percent of the Genzyme Center's purchased electricity is from renewable sources, currently a mix of 10% wind, 12% landfill gas, 40% small hydro, and 38% biomass.

- Prioritizing reducing disturbance to the site, maximizing open space, reducing erosion and storm water runoff (which can pollute rivers), and protecting wetlands. Open space on the site, which exceeds city requirements by 50 percent, was planted with either native or adaptive plants and trees. All onsite parking of the Kendall Square development is below grade, eliminating the high albedo factor caused by asphalt parking lots. The roof of the building uses plant materials and a reflective surface to reduce heat absorption. This vegetated roof, along with a skylight rainwater collection system, reduces storm water runoff by 25 percent. As part of a pollution prevention plan, filters were placed in the piping systems to reduce pollutant levels and stop soil erosion during construction. Light pollution is controlled by reflective lighting, controlling indoor lights, and shading with an automated blind system after dark.

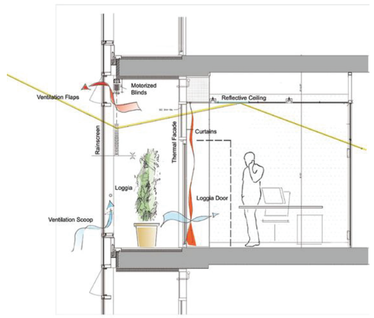
- Eco-friendly furnishings were obtained from Steelcase, a company that applies a life cycle approach to its manufacturing processes. Steelcase built the first LEED certified manufacturing facility and has eliminated nearly all hazardous waste from its manufacturing process and almost all VOCs from one of its metal furniture lines. Steelcase was also the first to test its furniture for indoor air quality impact. All wood used in the furniture purchased for the Genzyme Center was FSC certified and made with recycled content, most pieces were finished with a water-based finisher. Steelcase reduced related packaging by either wrapping products in blankets or shipping them in flat boxes and assembling them onsite.



RESOURCES

- More than 500 square feet in the building is devoted to the collection and storage of recyclables
- Greater than 90% of all construction waste was diverted from landfill for reuse
- Greater than 75% of all materials contain recycled content
- Greater than 50% of all materials are assembled and greater than 20% of all materials were harvested from within 500 miles of the building site
- More than half of all wood materials used were Forest Stewardship Council (FSC) certified to come from wellmanaged forests

ENERGY

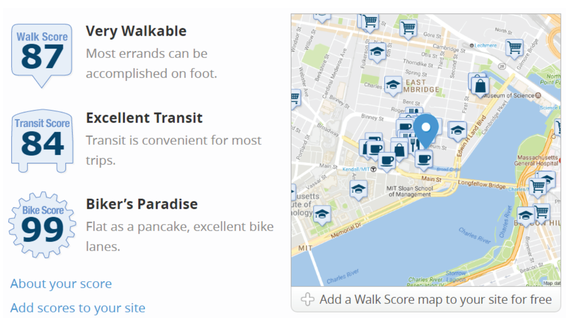


- 42% better than new energy standard (~$400K annual savings)
- Steam heat and chiller, efficient systems, building control, use of natural ventilation
- Commissioned systems: verified operation
- Use of "green" power from renewable source
- Solar photovoltaics

EUI Rating: 49.6 kBtu/ft^2 / YEAR

COMMUNITY

- Location is very walkable
- 7 minute walk from Kendall / MIT station
- Location is in the Kendall Square Neighborhood



INTEGRATION

The twelve-story, 350,000 square foot building is located in Cambridge, Massachusetts. While designing the headquarters facility, Genzyme considered site development, water use, energy efficiency, material use, and indoor environmental quality, the five core features of the LEED standard's framework. The main highlight of the building is the abundance of daylight that is disbursed throughout as a result of a collection of daylighting technologies and an intricate management system. Other sustainable features include urban infill redevelopment, filigree slab construction, use of internally- and externally-generated renewable energy, energy efficiency systems, water conservation tec nologies, stormwater mitigation, and promotion of public transportation. The Genzyme Center, which was completed in 2003, proves that green buildings can be creative, beautiful, and functional.

WELLNESS

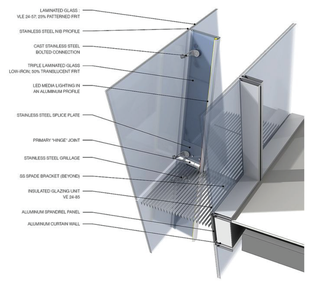
- As a result of the building design and lighting technologies installed, 75 percent of the employees have an outside view and 90 percent of the workplaces have sufficient natural light. Lighting engineers from Bartenbach LichtLabor from Austria were employed to fulfill Genzyme's goal of maximizing the amount of natural light available to the employees.

- Genzyme also chose urea formaldehyde-free wood composites. Urea formaldehyde, which is used as an adhesive in pressed wood products, causes many health problems in humans and is a suspected carcinogen. Wood with wheat board core, which is a renewable, agricultural byproduct, was also used.

- A survey found that 58 percent of the employees based in the Genzyme Center believed that they were more productive in the new headquarters. Additionally, the sick time recorded for employees based here was five percent lower than the collective average in other Massachusetts facilities.

- Superior indoor air quality was of high importance to the design team, as it is one of the main ways of ensuring that the building is a healthy work environment for employees. The strategy called for low-VOC or VOC-free materials such as in paints, adhesives, wood preservatives, carpets, and plastics, to minimize related off-gassing. Carbon dioxide (CO_2) monitors that adjust airflow levels as needed were installed throughout the building. Operable windows on all twelve floors give employees control over their work environment and allow fresh air to be easily brought into the building.

-Temperature and humidity monitors throughout building.



WATER

- High efficiency irrigation using soil sensors
- Rainwater collection systems
- Low flow fixtures – waterless urinals, dual flush toilets
- 34% less water usage
- 525,000 gallons per year saved

ECONOMY

-The Genzyme Center cost $140 million (including fit out), with $107 million for construction; the square foot cost is estimated to be $400. Approximately $23 million, or 16 percent of the total cost, was invested in sustainable features. Savings of 42 percent off energy costs and 32 percent off water costs are expected.

-In 2002, the Massachusetts Technology Collaborative awarded Genzyme a $321,750 grant for the photo-voltaic system and reflective metal wall panels. The organization also provided Genzyme with a second grant of $30,000 to create two interactive educational kiosks where visitors could learn about the environmental aspects of the building.

- The facility is expected to use 34 percent less water than is used in a similar sized building. Exact numbers are unavailable, but it is estimated that the building's conservation measures are saving more than 500,000 gallons annually in internal water use.

- It is estimated that the energy saving strategies implemented throughout the building in will reduce energy usage to be 36 percent lower than the average for comparable buildings and 25 percent less than a new building that meets the Massachusetts state energy code requirements. International engineering firm Buro Happold of New York used DOE-2 to model the energy efficiency of the building. The DOE-2 software program considers a building's layout, construction, usage, heating and cooling systems, weather data, and utility rates to predict the facility's energy use and cost. This tool predicted that energy costs for the base building (shell with heating and cooling) would be 42 percent less than a conventional building's.

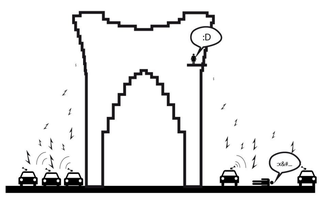
- PowerLight designed and installed a 1,650 square-foot array of roof-mounted photovoltaic panels in the summer of 2003. The photovoltaic system has a peak output of 20kW and produces about 24,000-26,400 kWh per year.

TEHRAN TOWER, MAHDI KAMBOOZIA, TEHRAN, IRAN

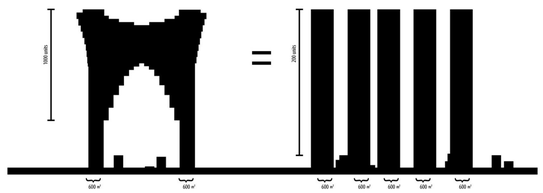
WINTER/ Building needs mor daylight and sun heat

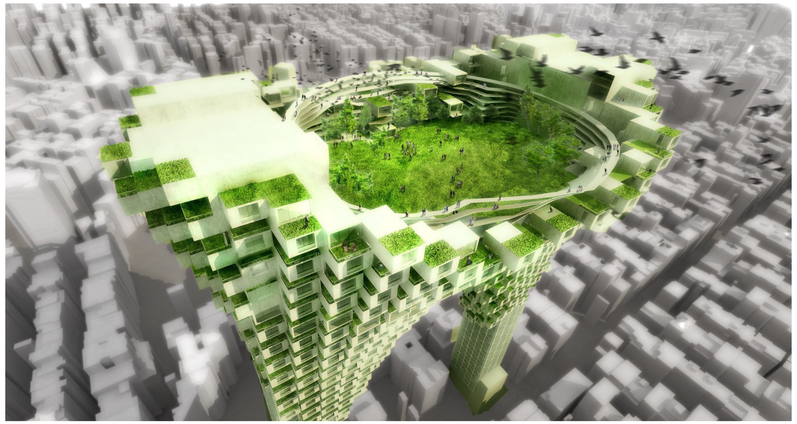
SUMMER/Building needs shaddow on openings to reduce energy consume

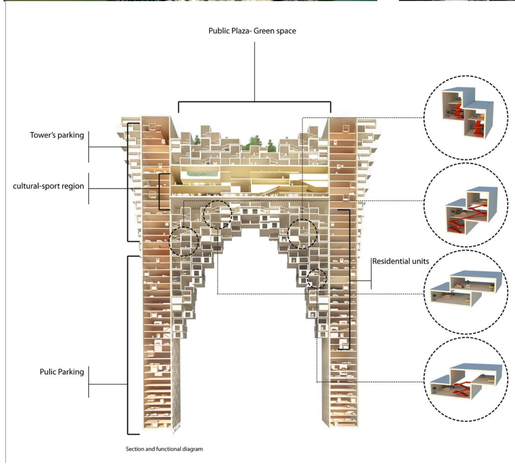
In order to make the building sustainable we have to protect the building from the summer sun.in the winter because of the sun angle all units will receive sun light



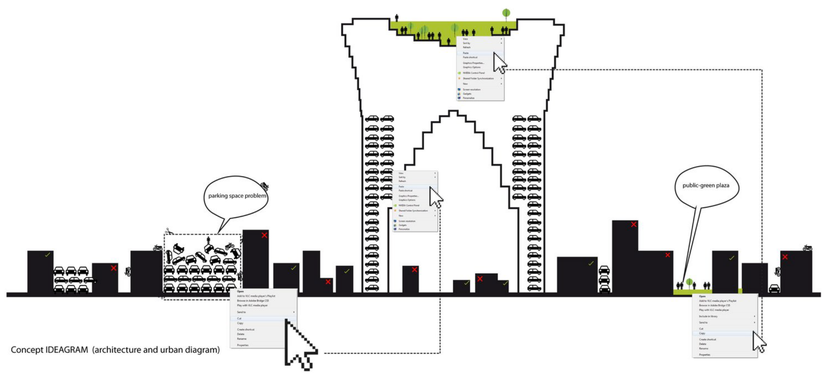
Noise pollution is one of the problems of cities like Tehran ,in order to avoid it we will assemble the units from the 50 meters above the earth.





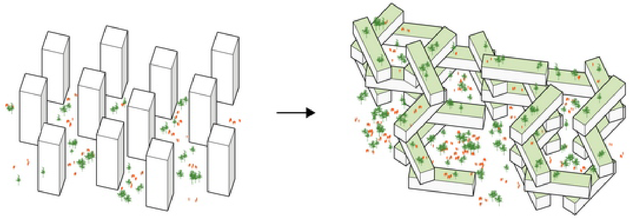


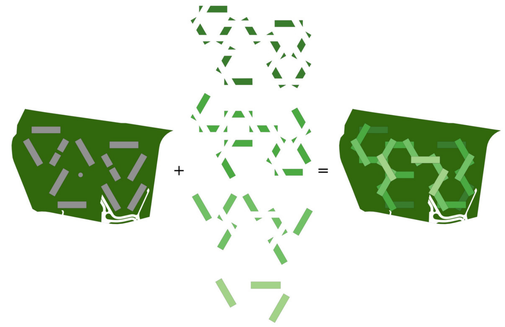
Section and functional diagram



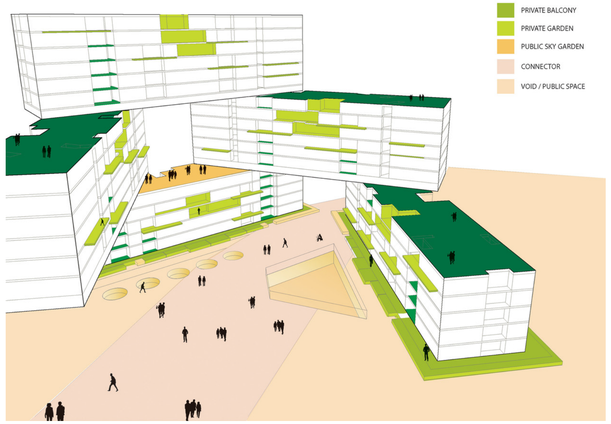
Concept IDEAGRAM (architecture and urban diagram)

THE INTERLACE, OMA, SINGAPORE





MAXIMIZED GREEN AREA



PRIVATE SKY GARDEN
PROTRUDING BALCONY
PRIVATE BALCONY
PRIVATE GARDEN
PUBLIC SKY GARDEN
CONNECTOR
VOID / PUBLIC SPACE