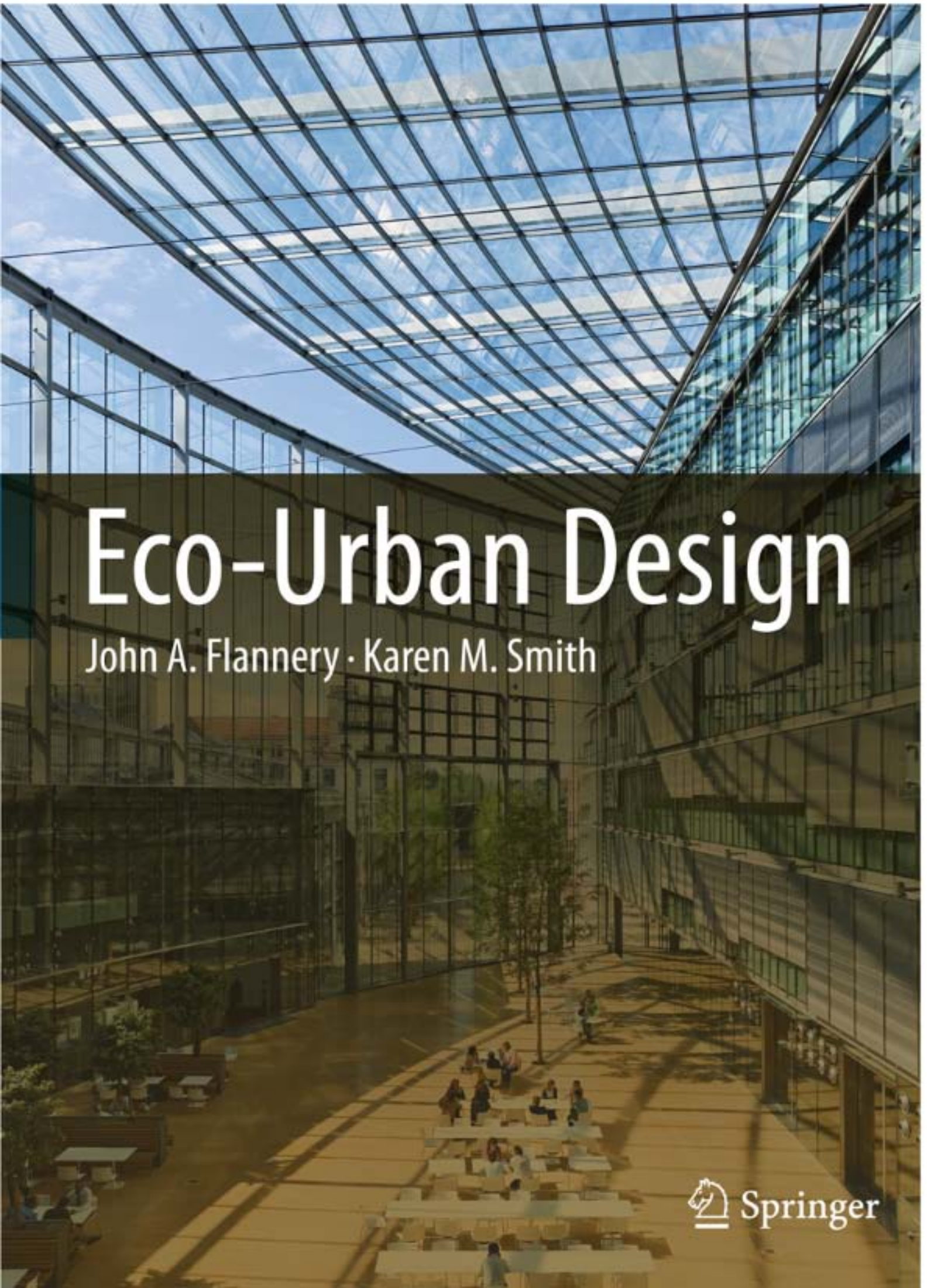
Eco-Urban Design
John A. Flannery · Karen M. Smith
Springer

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John A. Flannery
Boston Spa Media
108 High Street
Boston Spa
Leeds LS23 6DR
United Kingdom
www.bostonspamedia.com

Karen M. Smith
Boston Spa Media
108 High Street
Boston Spa
Leeds LS23 6DR
United Kingdom
www.bostonspamedia.com

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ECO-URBAN DESIGN

John A. Flannery and Karen M. Smith

ECO - URBAN DESIGN

Social Housing

Private Homes

Introduction

"I hope the next generation of architects design buildings that breathe with, work with, and make use of nature, so that it's not just architecture as usual plus a bit of green on top."

Renzo Piano, Architect (Q. and A. Miyoko Ohtake 26/12/2008)

Mankind's original primitive habitat, the cave, provided shelter from wind and rain, shade from the sun, and natural ventilation. Fuel for heat, light and cooking was found locally from sustainable sources. Successive generations of cave dwellers left minimal impact on the environment. However, since the moment early man was compelled to venture further afield in search of food and shelter for a multiplying population, subsequent building activity has gradually impacted on the resources of the planet. We have now reached the point where these resources have become seriously depleted.

The challenge now facing 21st century mankind is to provide evolved buildings that no longer endanger the Earth's fragile ecological systems. Eco-Urban Design demonstrates how design teams world-wide are rising to this critical challenge.

The featured projects consider how best to provide the basic functions of a building, air of adequate quality, controlled balance of lighting and shade, economical provision of energy and consideration of the health and well being of its occupants. Architects and engineers, mindful of the consequences of their design decisions, are now setting the precedents for both the renewed and the new built environment.

"Eco-Urban Design", reviews the full spectrum of building activity, beginning with publicly funded buildings. The more responsible government agencies now strive to commission buildings which are not only fit for purpose but are also models of energy efficiency and sustainability. A culture of waste and egocentric design is gradually being eradicated. Buildings such as the Environmental Protection Agency building in Denver epitomise this new ethos without diminishing the architectural merit of an important public building.

In the competitive world of commercial property, developers looking to gain an advantage now see investment in green technologies and energy saving designs as vital to the success of a project. This initiative directly responds to the demands of today's more discerning potential occupiers.

Similarly, increased consumer demand for affordable housing has sparked a revival in community based schemes. In many cases both public and private sectors join forces to provide value for money solutions. Many of these sophisticated residential schemes are able to trial renewable energy technologies on site, contributing greatly to the common cause.

Where a single family has ambitions to tailor a dwelling to their own individual needs, architects and designers now work closely with these clients to advise on strategies for an economical, sustainable lifestyle. It is evident that these aspirational clients need not compromise on architectural style in creating these inspired, ecologically sound, private homes.

The projects featured are extremely varied in terms of use, scale, geographical location and financial budget. Individually and collectively, they all provide a valued contribution to the evolution of good design, and positive proof that it need not cost the Earth. *J. A. Flannery*

Environmental Protection Agency Region 8 Headquarters

Denver, USA

2007

Zimmer Gunsul Frasca Architects LLP

www.zgf.com

The year of 1858 saw prospectors from Georgia begin the tenuous gold rush to Pikes Peak, Colorado. In the subsequent land grab the South Platte River formed the basis of aspirational claims on both banks. Confusion reigned, tension rose and violence was threatened by the rival prospecting camps. Eventually, a whisky fuelled agreement was brokered at Cherry Creek Bridge resulting in Denver prevailing as the predominant city in the shadow of the Rocky Mountains.

The topographical combination of mountains to the west, the Great Plains to the east and an elevation of 5,280 feet ensures that Denver has a semi-arid steppe climate with four distinct seasons.

Denver's weather is generally mild, with around 300 days of prolonged sunshine a year. The winters vary from mild to cold. Large amounts of snow fall on the mountains, west of the city, however the drying air stream passing over the Front Range (orographic lift) restricts annual precipitation to a relatively low 15.81 inches in the city.

Monitoring these climatic conditions, relative to the performance of the new Region 8 headquarters building, is high on the agenda of the Environmental Protection Agency (EPA). The Denver building was designed to serve as a living laboratory and a sustainable design educational tool for the construction industry.

Located in an urban brownfield site adjacent to the Union station (Fig. 1), the building's masonry base reflects the surrounding historic warehouses, whilst the glass and aluminium facade are characteristic of the Lower Downtown (Fig. 2).

Population | 566,974

Coordinates | 39°44'21"N
104°59'5"W

Elevation | 1,609 m (5,280')

Precipitation | 402 mm (15.81")

Temperature | Average High:
17.9 C (64.2 F)
Average Low:
2.1 C (35.8 F)

Humidity | 53.5%

6 Environmental Protection Agency | Denver | USA | Fig. 1 above | Fig. 2 opposite

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_1, © Springer Science+Business Media B.V. 2011


16TH ST
LOWER
DOWNTOWN
DENVER
HISTORIC DISTRICT

The primary design strategy was to organise and orientate the building's form following extensive daylight and thermal modelling of the site. From this study, two "L" shape buildings emerged, totalling 292,000 square feet. A southeast/southwest sunward unit designed to control solar radiation, and a northeast/northwest windward unit designed to deal with the predominant winds (Fig. 2).

Consequently, differing facade design strategies could evolve to cope with the varied heat gain, and glare. External shades and interior blinds were customised appropriately.

Between the two "L" shaped units, a central atrium was formed to bring daylight into the building's interior and create an informal gathering space for EPA employees and the visiting public (Fig. 4).

In considering the challenge of reflecting the daylight within the atrium into the building's core and also preventing glare, mirror installations were abandoned at the research stage. Subsequently, a developed series of sail-like reflectors with a "C" plan shape and a parabolic structure were produced. A sail maker local to the design team offices was consulted and commissioned to produce the sails. The rigging was designed and installed by a company specialising in theatre set work. The resulting installation is dramatic, effective and was provided within the restraints of the budget (Fig. 6, Fig. 8).

Other sustainable design strategies employed include the flexible floor plate layouts for future adaptation to the needs of other tenants (Fig. 9).

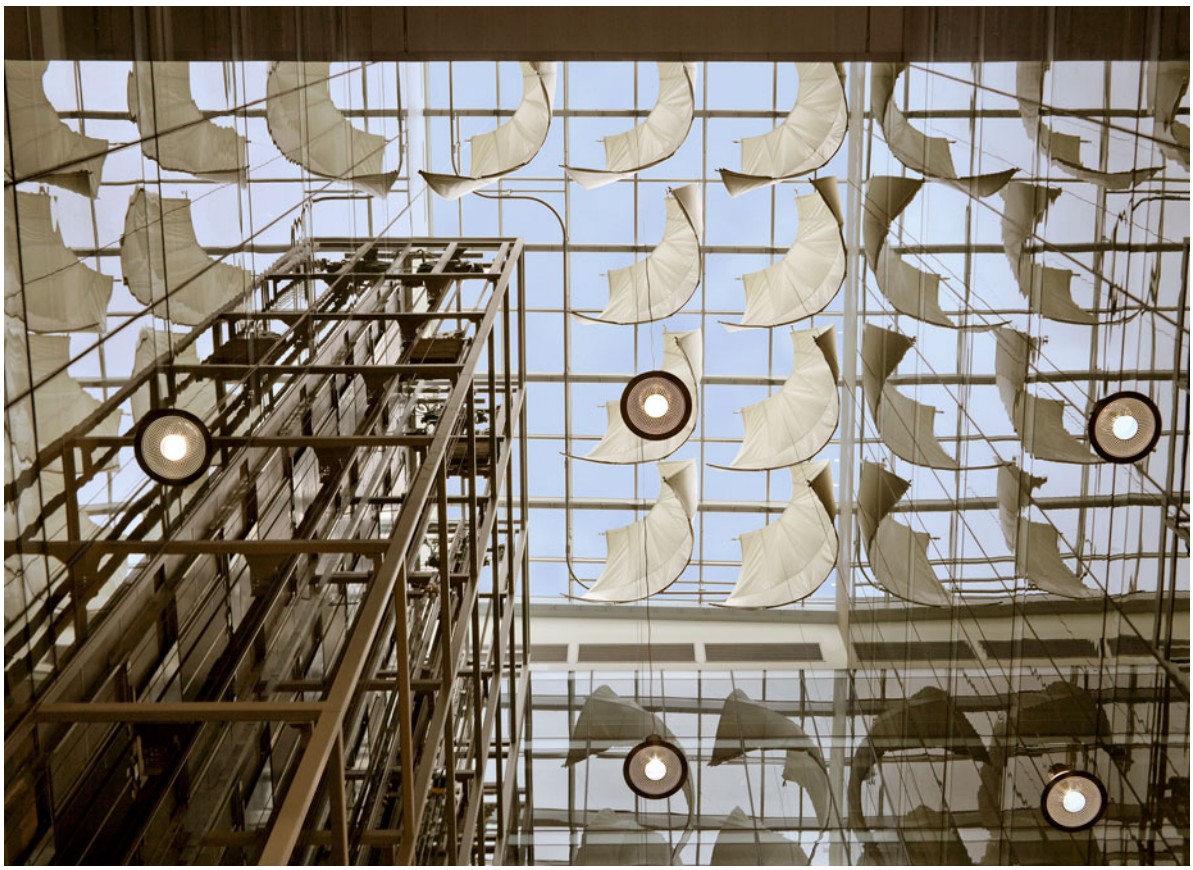
Concrete finishes are exposed reducing the need for further finishing materials, these masses also form part of the thermal strategy and facilitate the under-floor air distribution system.

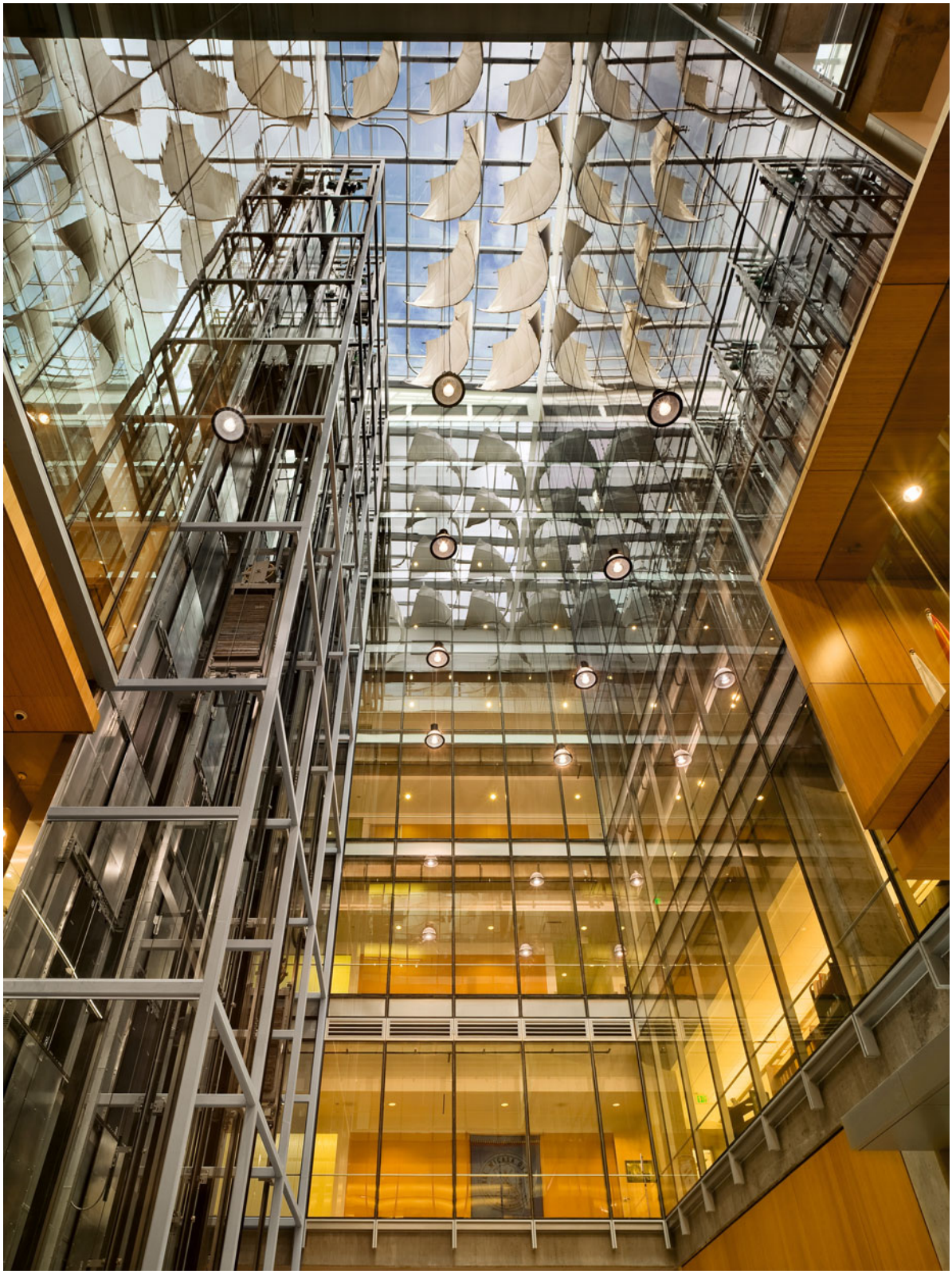
Roof mounted photovoltaic cells generate electricity for the facility (Fig. 5, Fig. 7).

Additionally, energy efficient, daylight responsive lighting is used throughout (Figs. 4, 8, 9, 10).

These combined strategies are designed to reduce energy consumption by 40% compared to that of a code baseline building of similar size.

Fig. 5 below





To achieve Leed Gold certification, the project's Construction Management policy and use of materials was closely scrutinised and implemented.

Construction waste was reduced through recycling. Fly-ash was used in the concrete sections of the building. Additionally, glass tiles, steelwork and carpets all included recycled material.

Renewable materials included cork floors, bamboo wall panels and doors made with rice hull cores. All wood-based materials were certified in accordance with the Forest Stewardship Council's principles and criteria. A regional sourcing policy on materials was also adopted in an attempt to reduce transportation as far as possible.

The development of the EPA's eco-roof (Fig. 11) was implemented by the designers, Zimmer Gunsal Frasca, in consultation with the EPA's own experts in this field.

In the Front Range climate zone precipitation is scarce. The team's goals were to demonstrate to local authorities that Denver's first eco-roof could remove pollutants from storm water and reduce the run-off rate of this precious resource.

It is thought that green roofs, where appropriate, adopted as a city policy can greatly reduce the 'heat island effect' produced by conventional, dark, untextured roofing in dense urban areas.

The EPA roof was installed over three terraced levels totalling 20,000 square feet. The vegetation is made up of native plant species and soil media.

The performance of the roof's components is being monitored by various groups including the EPA, the city, the Department of Horticulture at Colorado State University and the Denver Botanical Garden. This study hopes to inspire the future development of these technologies in the Denver region.

In a further effort to achieve a 44% water saving compared to standard buildings, high efficiency and waterless plumbing fixtures are employed throughout the building.

In order to fulfil the EPA's mission statement "To protect the public's health and safeguard the natural environment", post completion evaluations are conducted by the EPA and architects, Zimmer Gunsel Frasca demonstrating that the project's aims have been achieved, including the predicted significant energy and water usage savings.

California Academy of Sciences

San Francisco, USA

2008

Renzo Piano Building Workshop / Stantec Architecture (San Francisco)

www.rpbw.com

The Pacific Ocean's cool currents combined with the higher temperatures of the California mainland, produce the fog and mist which clings to San Francisco's famous hills in spring and summer. These landmark hills of Twin Peaks, Nob Hill, Pacific Heights and Russian Hill are now to be rivalled by the newly formed mounds presiding over the verdant roof of the California Academy of Sciences in Golden Gate Park.

The new Academy's mission statement is "To Explore, Explain and Protect the Natural World". A major component of this philosophy was to incorporate a sustainable design, construction and operational policy into the project. Many of the sustainable design principles used in the reconstruction of the facility were intended to be a working exhibit for the visiting public to view and understand.

The new Academy is located on the same site as the previous halls. This required the demolition of the existing buildings which were previously constructed over a 50 year period from 1916. To provide the best possible facility, the architects formed a design team to lead and collaborate with consultants in various specialist fields including Ove Arup and Partners (engineering and sustainability).

Organised around a central Piazza, the Planetarium Dome, Rainforest Biosphere (Fig. 2) and Steinhart Aquarium represent Space, Earth and Ocean. These three iconic exhibits create the new San Francisco "hills" in the undulating green roofscape (Fig. 3, Fig. 4, Fig. 5, Fig. 6).

This roof, set at the same height as the original, seeks to unify and consolidate the new Academy.

Population | 808,976

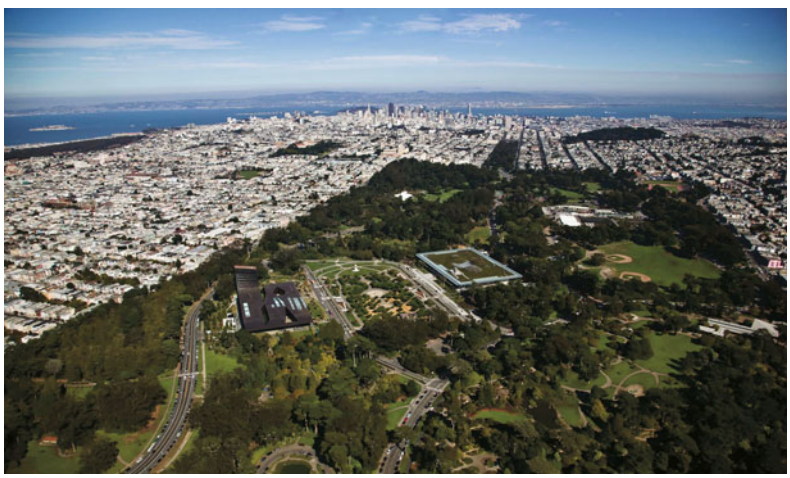
Coordinates | 37°46'45.48"N
122°25'9.12"W

Elevation | 16 m (52')

Precipitation | 566 mm (22.28")

Temperature | Average High:
18.4 C (65.1 F)
Average Low:
14.6 C (58.3 F)

Humidity | 73%



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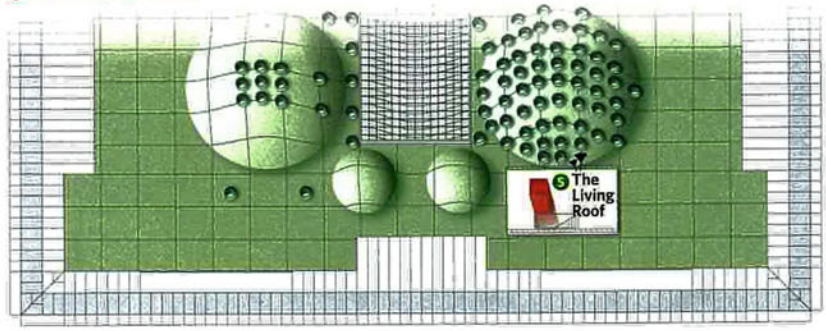
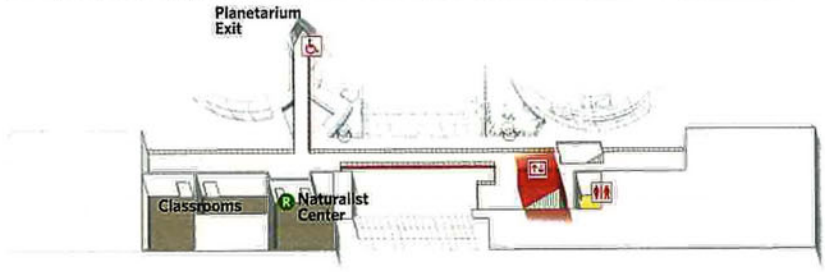
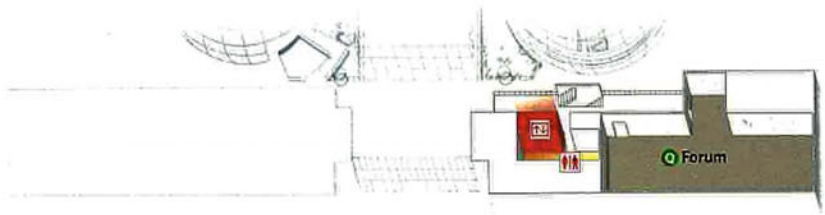
California Academy of Sciences



Roof



Level 3

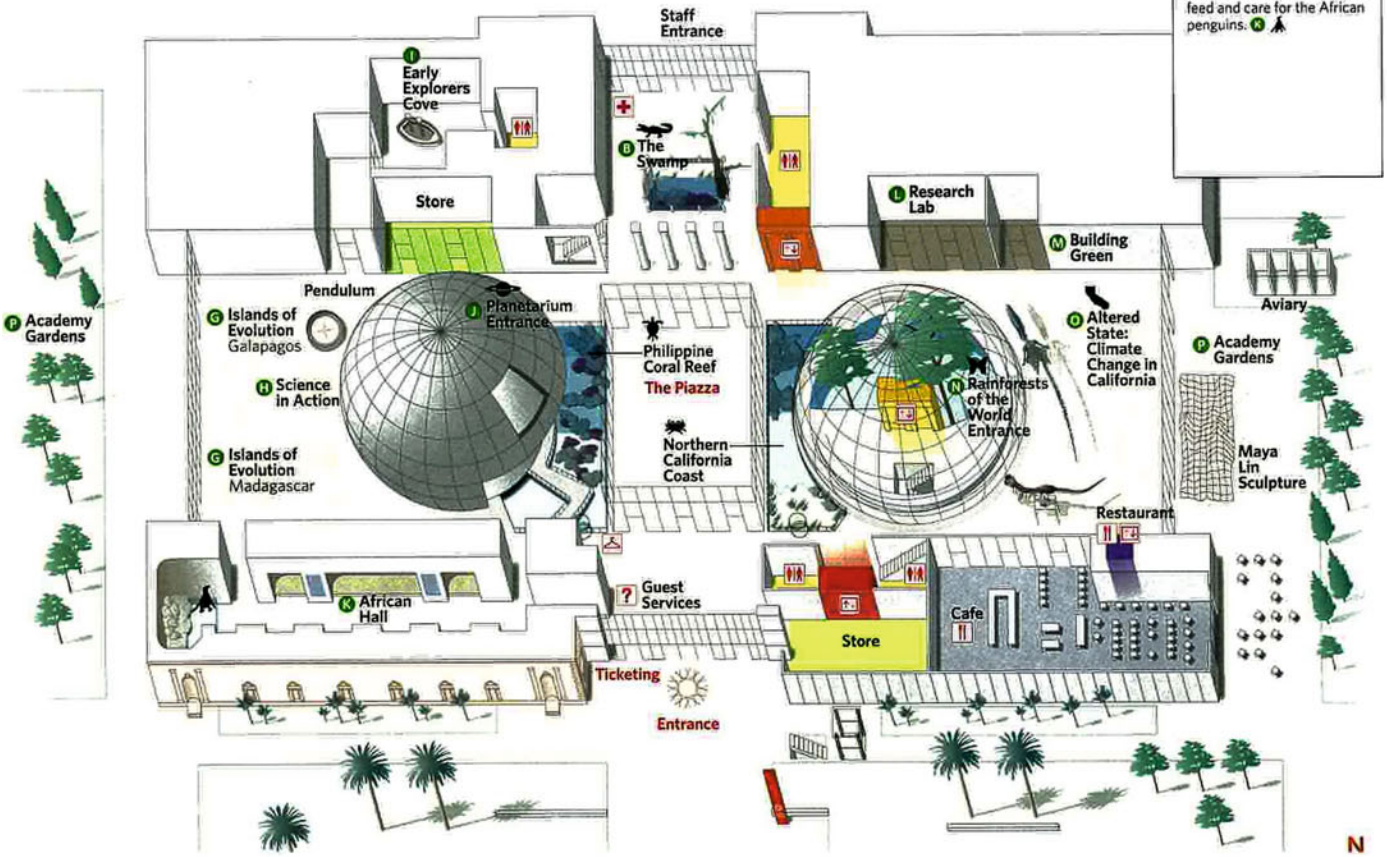


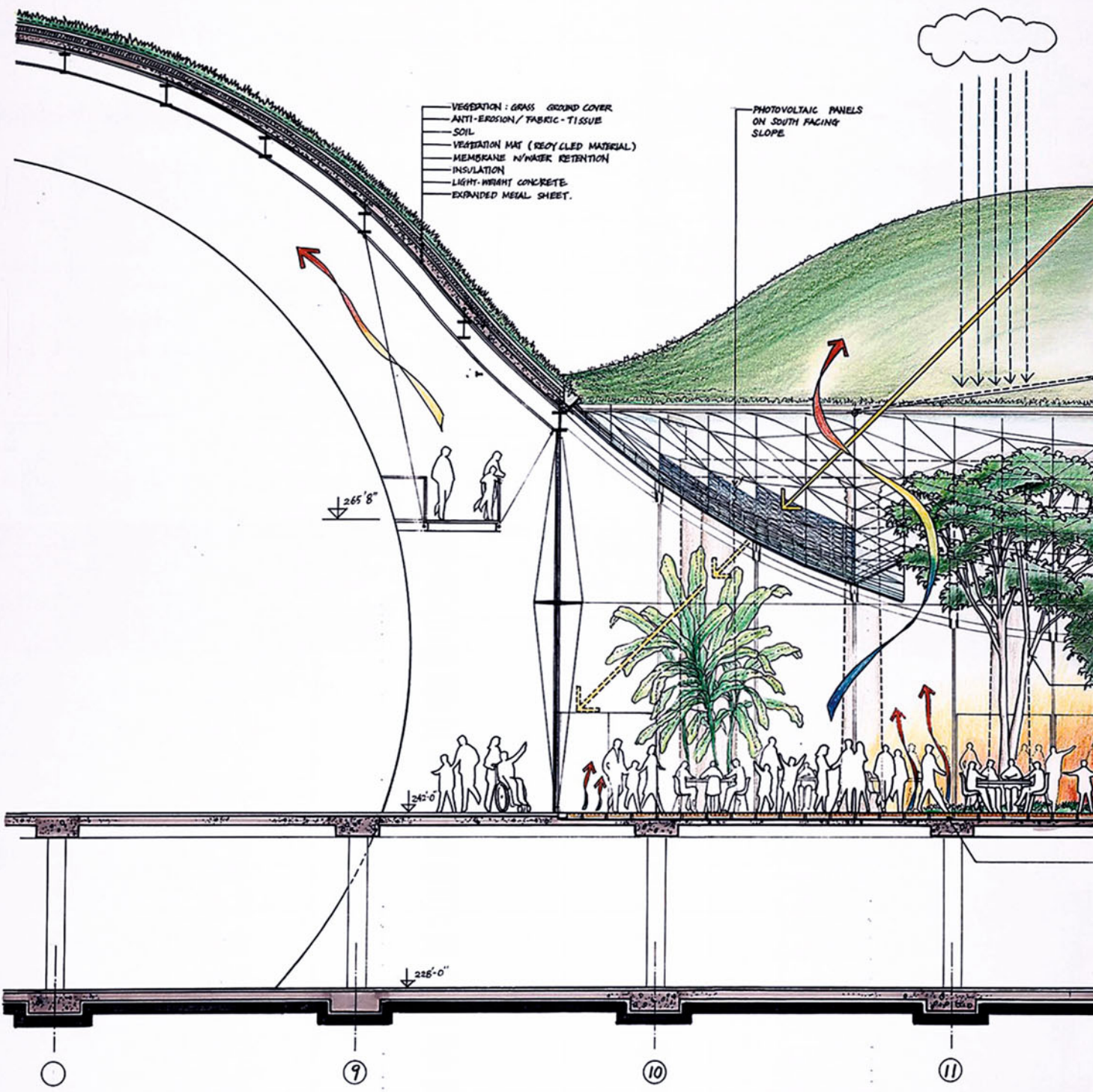
Level 2

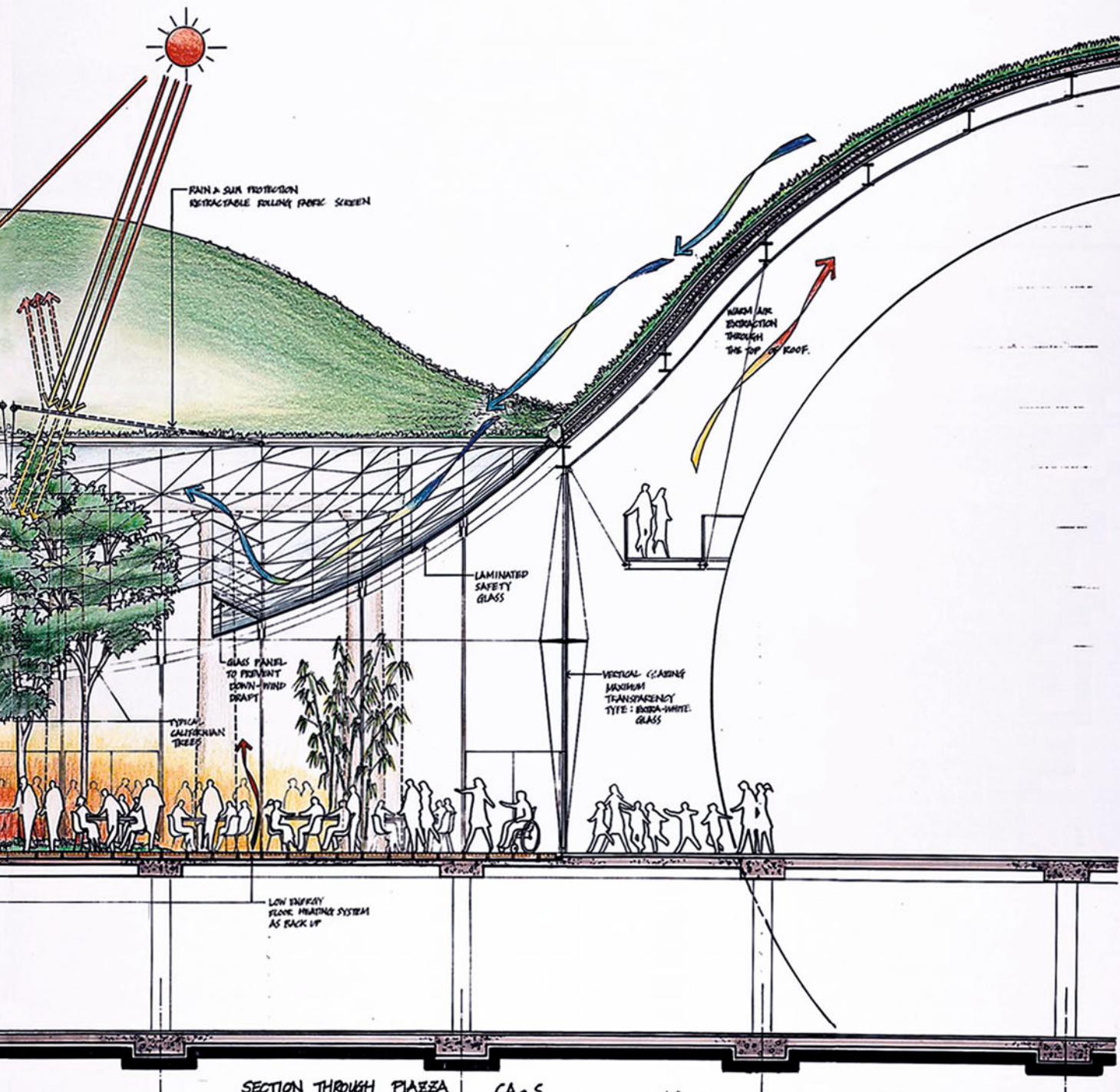
Daily Programming
Schedule varies. Visit the Guest Service desk for showtimes.

Planetarium
Fly through the Universe in the Academy's state-of-the-art planetarium. Visit the kiosk at the planetarium entrance to select your showtimes. J

Penguin Feedings
See how Academy biologists feed and care for the African penguins. K




VEGETATION : GRASS GROUND COVER
ANTI-EROSION/ FABRIC - TISSUE
SOIL
VEGETATION MAT (RECYCLED MATERIAL)
MEMBRANE W/WATER RETENTION
INSULATION
LIGHT-WEIGHT CONCRETE
EXPANDED METAL SHEET.
PHOTOVOLTAIC PANELS ON SOUTH FACING SLOPE
265'8"
242'-0"
225'-0"
9
10
11



SECTION THROUGH PLAZZA

CA.S

RPBW & G.H.C.P.

1/4" = 1'-0"

MAY. 15. 2002

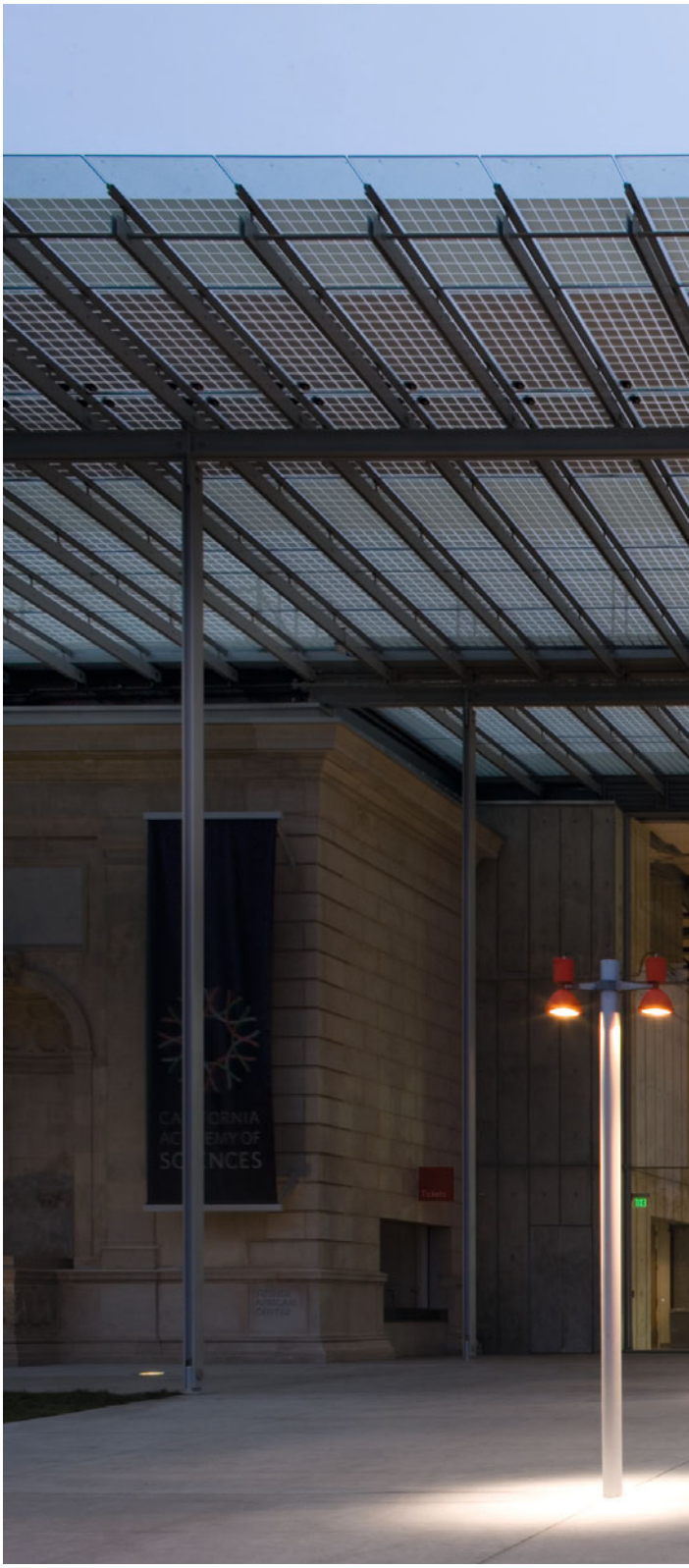
12 13

The green roof is constructed from steel and concrete, which is covered and sealed by a waterproof membrane. The greenery is provided by native plant species which (once established) are resistant to drought and require no irrigation. Skylights distributed throughout the green roof allow natural light into the exhibition space and are automatically controlled to provide ventilation to the spaces below (Fig. 3, Fig. 4, Fig. 5, Fig. 6). Beyond the perimeter walls the planted green roof becomes a glass canopy providing shade from the sun and shelter from the rain for visitors to the Academy. The canopy, extending and returning beyond the building's frontage, contains more than 55,000 photovoltaic cells harvesting solar energy (Fig. 7, Fig. 8).

The piazza, located centrally (Fig. 3) is covered partly by a glazed skylight within the green roof and is open to the elements in the centre. Retractable fabric sun and rain screens provide flexibility to this multi-purpose focal point. These ensure that both evening concerts and lunch-time diners are accommodated comfortably in all weather conditions. Supplementary screening improves the acoustic quality of the space when required (Fig. 7, Fig. 9).

Throughout the design and selection process the materials chosen for walls, facades and the general fabric of the building were kept frugal and utilitarian to emphasise the space. Light grey architectural concrete predominates with practical, rather than decorative qualities, to act as a backdrop for the exhibits. The concrete formwork tie holes are retained to be used as fixing anchors for the securing of exhibits.

Landscape considerations include re-location of the main entrance on Music Concourse Drive to centre the new facility to the site. Eliminating a further driveway and in-fill landscaping had the effect of further greening the external works and returning an acre of land to the Golden Gate Park.



Cesar Chavez Library

Phoenix, USA

2007

Line and Space, LLC

www.lineandspace.com

Phoenix, the capital city of Arizona, is home to a population currently counted as the sixth largest in America. The Cesar Chavez Library was constructed to serve the village of Laveen, a fast growing area of dense housing in the south of the city.

The 25,000 square feet library houses approximately 140,000 volumes, (Fig. 2) including books, periodicals, CD's and DVD's. 60 computers with internet connection are provided for public use, with an integrated computer training facility. Teenagers are accommodated in a dedicated area which includes audio and visual facilities to promote reading, relaxation and rejuvenation. Younger children are catered for with quiet areas for story reading and homework help. A 75 seat community meeting room completes the facility.

The roof design is one of the most important environmental features of the library (Fig. 5, Fig. 6). Projecting well beyond the building's facade, the overhanging roof reduces energy consumption by insulating, shading and, consequently, cooling. The outdoor shaded areas, fitted with furniture for resting and reading, provide a transitional space between the harsh glare of the outdoors and the library interior. These outdoor reading patios also benefit from supplementary conditioning. Diffusers exhaust spent air from the conditioned indoor space to create a more temperate micro-climate in these respite areas (Fig. 5).

Furthermore, earth berms were developed to provide a thermal mass for the building, to supplement the mechanical heating and cooling systems. The berms also provide a natural sound barrier to help reduce the noise transmitted from the adjacent traffic (Fig. 1, Fig. 3).

Population | 1,567,924

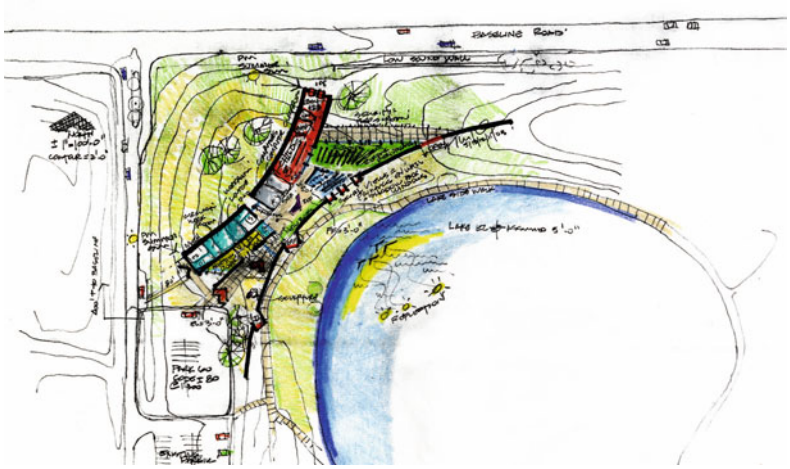
Coordinates | 33 26' 54" N
112 04' 26" W

Elevation | 340 m (1,117')

Precipitation | 211 mm (8.29")

Temperature | Average High:
30.4 C (86.8 F)
Average Low:
16.3 C (61.4 F)

Humidity | 36.5%



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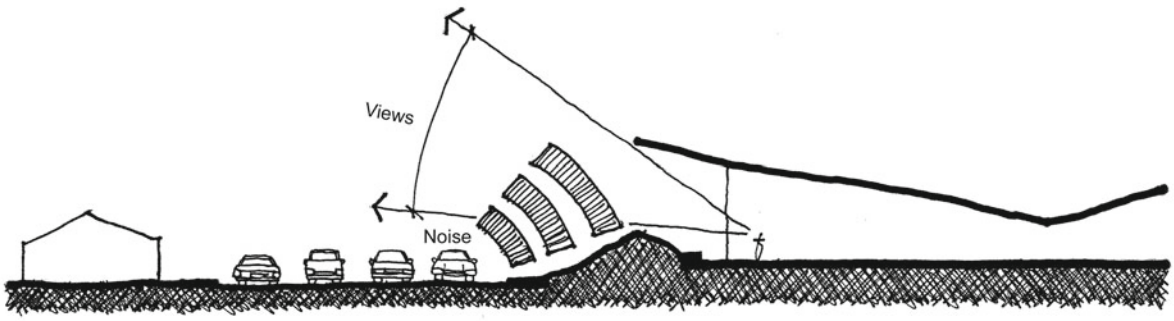


Site Section Diagram

Fig. 3. above | Fig. 4. below

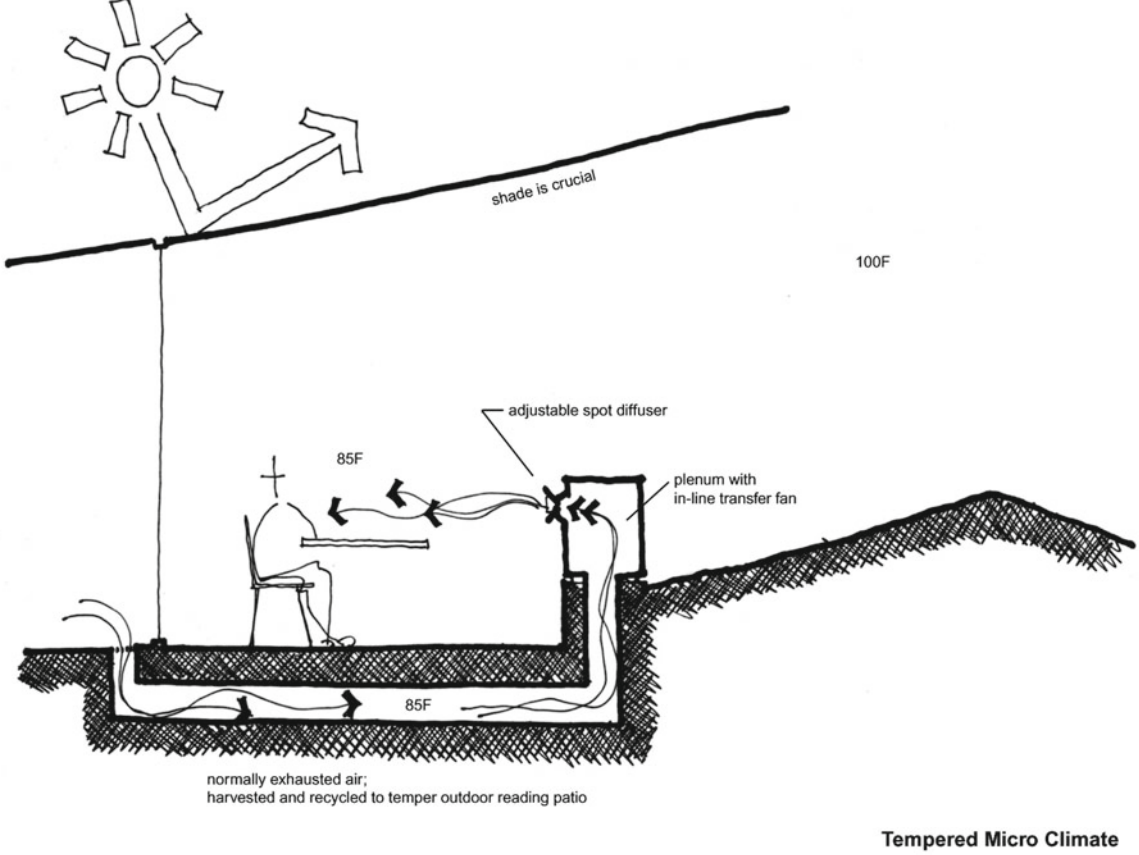


Fig. 5. above | Fig. 6. below

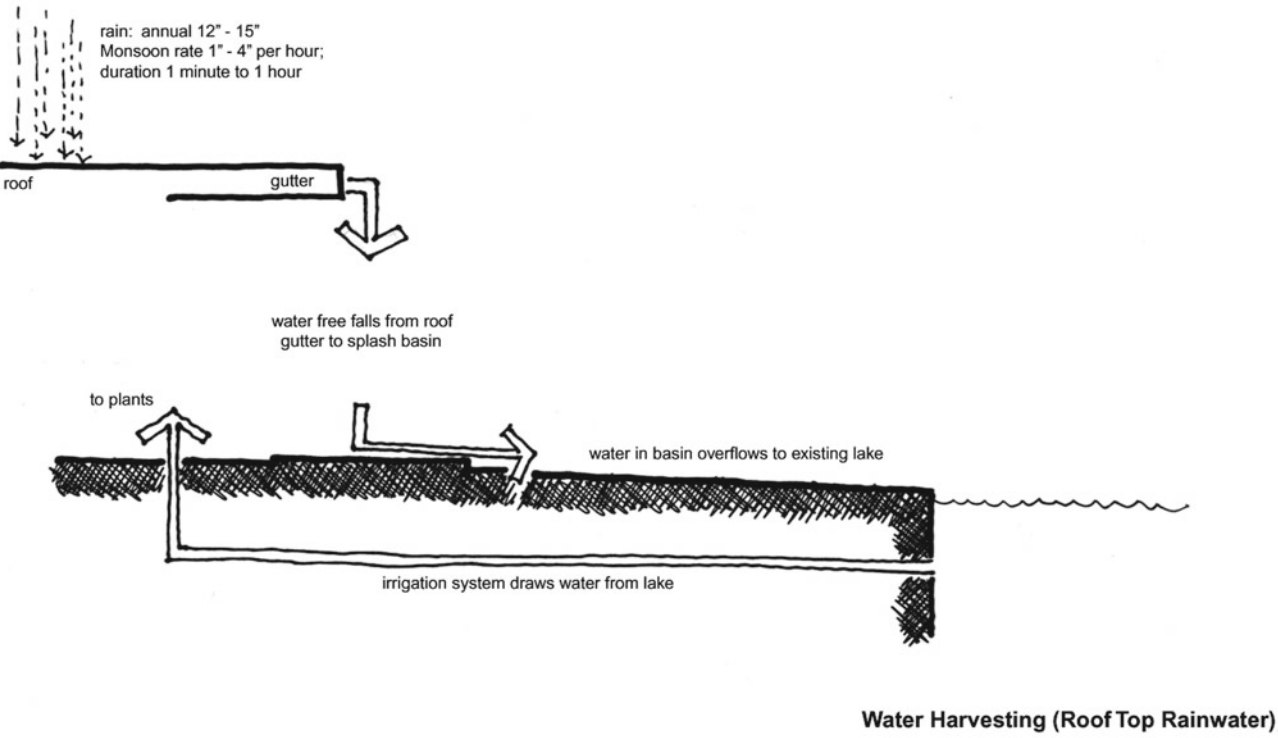
The principal design strategy for this public building is led by the topography of the chosen site. When the lake was constructed (approximately fifty years before the library) the excavated earth was utilised on site to form curved mounds for the park. The library design team avoided costly earth moving by cleverly integrating the library structure into the existing mounds.

Carefully planned orientation of the building and its fenestration allows natural daylight to penetrate deep into the library interior through glazed facades on the north and south elevations, see (Fig. 9) next page. This feature helps to reduce reliance on artificial lighting. The potential of detrimental solar gain from the prolonged effects of sunlight in the western desert sky is eliminated by constructing walling without windows on this vulnerable elevation. These careful radiation studies further reduced the load on the building's electrical and mechanical units.

Another major design consideration deals with the catchment and utilisation of the precious rainwater that falls only sporadically in the desert city. Again, the roof design is fundamental to the strategy. 37,000 square feet of roofing is sloped to a central channel (Fig. 8, Fig. 9). This channel is capable of coping with storm quantities without costly overflow, allowing all the rainwater to run off to a splash basin constructed at ground level. The splash basin efficiently drains the rainwater into the existing lake. Water is then drawn from the lake to irrigate the parkland planting. The condensation generated by the library's mechanical units is also collected in a manifold and directly routed to irrigate plants via perforated pipes (Fig. 10).

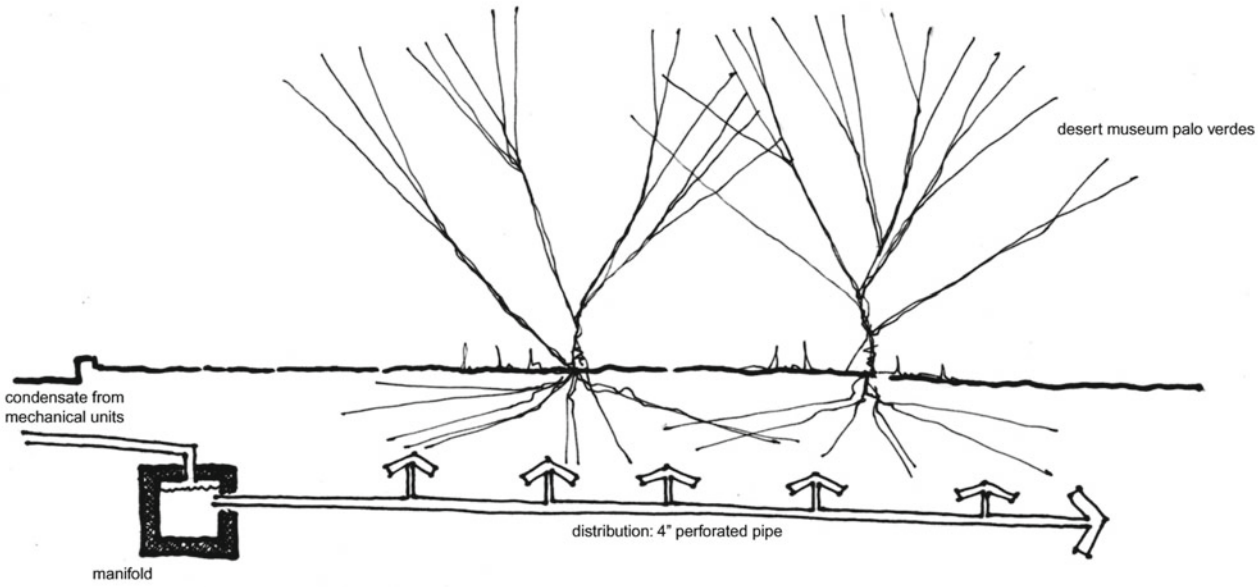
The public park and lake served as a recreational outdoor breathing space for the community, however, the new library facility is designed to enhance the outdoor space by providing a welcoming 'living room' that all family members can now enjoy.

The life lived by labour leader Cesar Chavez exemplified many aspirational principles. These same principles of community as family, cultural awareness, peaceful co-existence and the shelter and protection of the industrious peoples of the American South West are all embodied in the holistic library building delivered by the architects, Line and Space, and their collaborators in the design and construction of this exemplary project.



Water Harvesting (Roof Top Rainwater)

Fig. 8. above | Fig. 9. below



Water Harvesting (Direct Irrigation)

Fig. 10. above | Fig.11. below

Bay Educational Center

Providence, USA

2005

Croxton Collaborative Architects P C.

www.croxtonarc.com

The State of Rhode Island and Providence Plantations is the smallest state in the Union and yet has the longest name. This is not the only paradox, as Rhode Island is one of the most densely populated and heavily industrialised for its size. It is also remarkable that a state measuring only 37 miles wide and 48 miles long should have a shoreline of 400 miles. The "Ocean State's" Atlantic coast meanders north east from Connecticut, along Block Island Sound, via Narragansett Bay, before eventually reaching the state of Massachusetts in Rhode Island Sound. Presiding over these waters the monumentally opulent mansions of Newport have historically provided architectural interest. Most notably, The Breakers, built by the Vanderbilts in 1895, is regarded as one of American high societies most elegant, shorefront, private residences.

The focus has more recently shifted to the opposite (northern) end of Narragansett Bay, where a former Providence "city dump" was reclaimed as the site to house the Bay Educational Center. The environmental organisation, Save the Bay, commissioned Croxton Collaborative Architects to design a facility that would embody their mission to act as the new stewards of Narragansett Bay. The building has a linear, low profile following the coastline, and is embedded into the landscape (Figs. 1 to 6.). The west-facing slope of the sedum green roof is redolent of naturally formed dunes, affording protection from the Atlantic storms. The project received the Environmental Protection Agencies "Phoenix Award" 2006 for the best brownfield reclamation in Region One.

Population | 1,050,788

Coordinates | 41°49'25"N
71°25'20"W

Elevation | 23 m (75')

Precipitation | 1.180 mm (46.46")

Temperature | Average High:
15.6 C (60 F)
Average Low:
5.6 C (42 F)

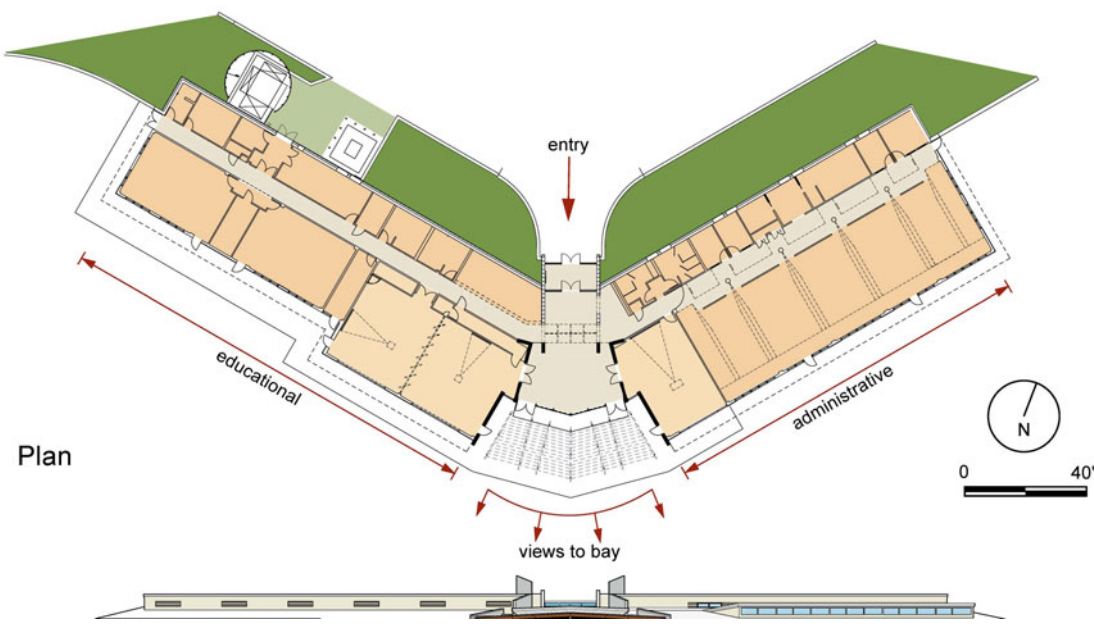
Humidity | 65 %

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_4, © Springer Science+Business Media B.V. 2011

Fig. 3 below

Building Section through Entry Lobby

North Elevation

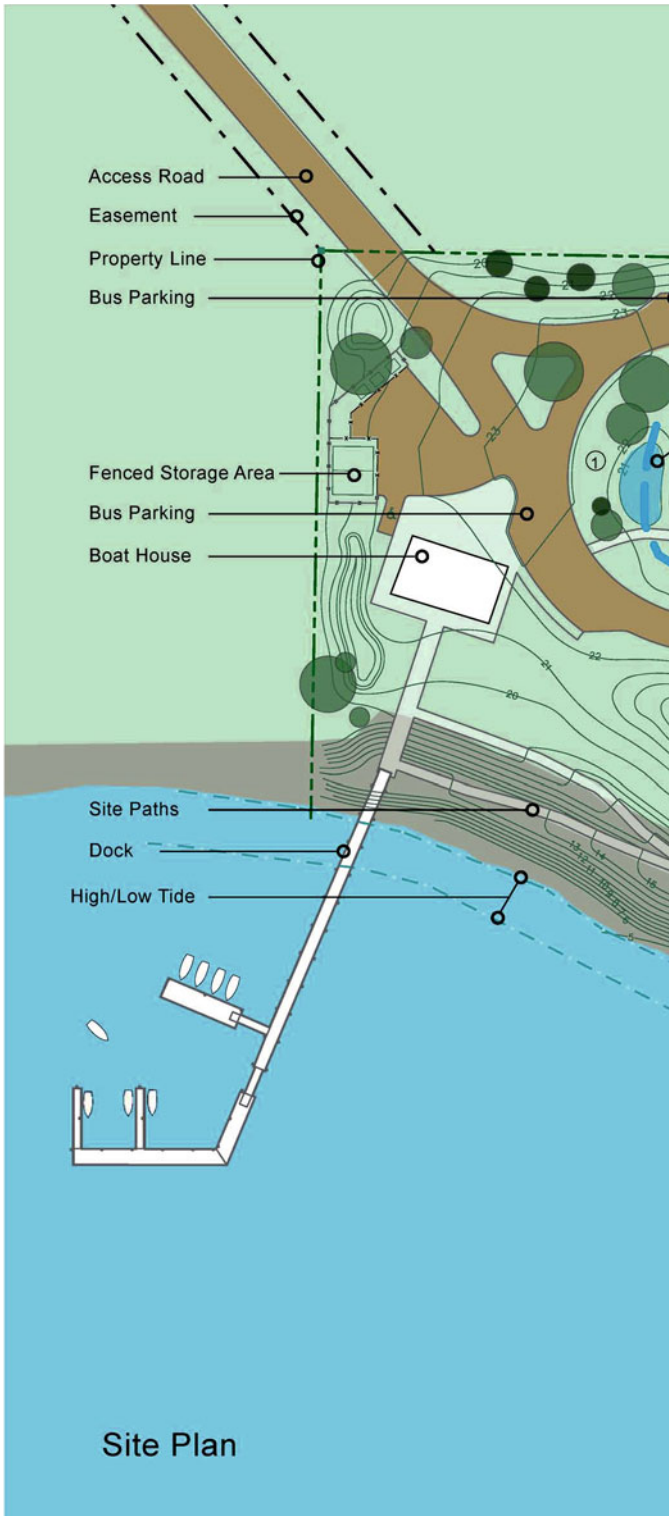


Plan

The north wing of the building contains the administration and support facilities.
The south eastern wing contains the public spaces, benefitting from the bay views and maxising the use of natural daylight. A 20 kW roof mounted, photovoltaic array, takes full advantage of this orientation (Fig.7). This end of the site also provides a boathouse, dock and pier. From this simple launch pad, multitudes of Rhode Island children from diverse economic backgrounds are provided with an introduction to the beautiful ocean, wildlife and eco-systems on their doorstep. A terraced, outdoor ampitheatre completes the educational wing.
All visitors to the Center enter through the dramatic south facing lobby. This space provides panoramic views of the bay from the most elevated point of the promentary. The breathtaking view, combined with an orientation chart covering the lobby floor completes the inspired, nautical, learning experience (Fig. 9). Direct sunlight, illuminating the space is mitigated by a timber slatted canopy to the external elevation (Fig. 8).
A combination of the design strategies (listed below) are employed in the building and resulted in a reduction of peak electricity load of 73% in comparison with similar code compliant buildings.

- High performance building envelope
- Integrated photovoltaics
- High efficiency lighting and controls
- Gas-fired heater / chiller mechanical system.

The consequent reductions in NOx and SOx are calculated to be 67%, with Co2 emmissions reduced by 51%. and ozone depletion by 100%.
Croxton Collaborative Architects have been historically instrumental in the development of best practice, environmentally sound, sustainable architecture.
This was recognised in 2005 when the U.S. Green Building Council presented the practice with the National Leadership Award. The award was made in the year when the Bay Education Center opened its ocean front doors to the public for the first time (Figs. 8 and 9).




Future
Overflow Parking
'Necklace' of Bio-remediation Swales
Overflow
Parking
Parking
⑤
⑥
③
②
④
Arrival
Loading
Dock
Amphitheatre
Sedum Green Roof
Marsh Restoration
Coastal Buffer Landscaping
Meteorological Station
20 kW Photovoltaic Array
N
0
100'


EXIT
EXIT

Green Dot E. 27th Street Charter High Schools

Los Angeles, USA

2008

John Friedman Alice Kimm Architects

www.jfak.net

The challenge of providing inner city youth with a college preparatory education has long been a major concern for parents in South Los Angeles. Population growth and a lack of new high school buildings has led to chronic overcrowding in the public school system.

The Los Angeles International Charter High Schools (LAICHS), provides parents with a viable alternative to the traditional public schools within the Los Angeles Unified School District. The Charter High Schools aim to provide a safe, supportive learning environment with a high teacher to student ratio. Within this framework students apply their classroom learning to the wider world through local business internships and community service programmes.

The Green Dot project adapted redundant clothing manufacturing warehouses for use as LAICHS school buildings, providing a much needed facility and a strong model for sustainable urban redevelopment. The scheme would provide a useful case study for students looking for examples of how the real world of work functions. East 27th Street fittingly forms a division line between a neighbourhood of single family residences and an industrial zone. The interconnected one storey buildings, with a new second floor in the taller section, now provide two separate school facilities with a combined floor space of 77,173 square feet. The schools share a gymnasium, a library and a food preparation area in the middle of the first floor. Detailed floor space allocation is illustrated on the architect's drawings (Fig. 4, Fig. 6).

Population | 3,833,995

Coordinates | 34°03'N 118°15'W

Elevation | 71 m (city hall) (233')

Precipitation | 384.6mm (15.14 ")

Temperature | Average High:
75.6 C (24.22 F)
Average Low:
56.6 C (13.67F)

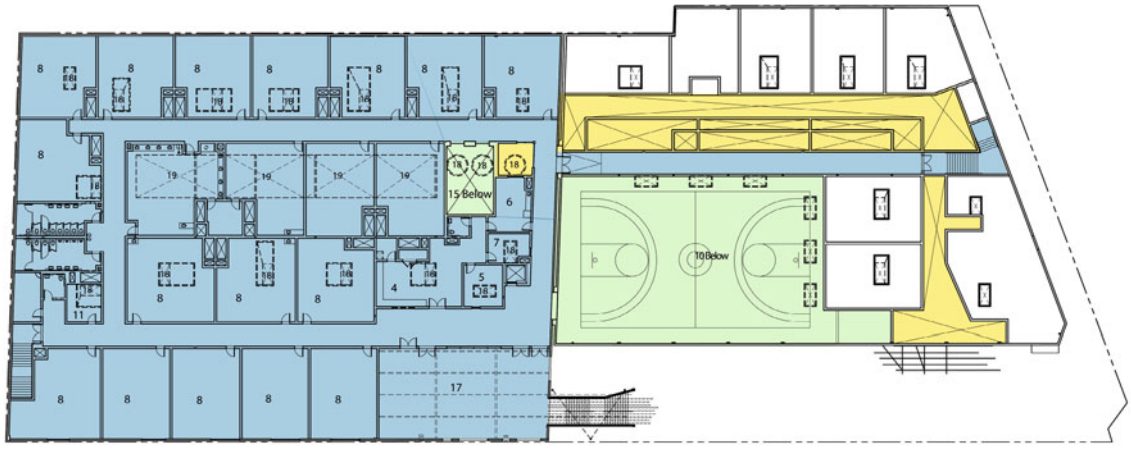
Humidity | 71.5%

42 Green Dot E. 27th Street Charter High Schools | Phoenix | USA | Fig. 1 above | Fig. 2 opposite

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_5, © Springer Science+Business Media B.V. 2011

Fig. 3 below


Legend:
Animo Justice
Shared Space
Animo Ralph Bunche
Adjacent Building
27TH STREET
LONG BEACH AVENUE
1 Entry Courtyard and Lunch Area
2 Main Stair up to School B
3 Entrance to School A
4 Administration / Faculty
5 Principal
6 Faculty Lounge
7 Assistant Principal
8 Classroom
9 Chemistry Lab
10 Gymnasium
11 Counselling
12 Food Preparation
13 Utilities / Maintenance
14 Special Education Classroom
15 Library
16 Computer Lab
17 Outdoor Terrace
18 Crosswalk to Schools
19 New Parking Lot
20 Service Yard
21 Main Entrance to Campus
22 Adjacent Commercial Building
23 Adjacent Single Family Residence
SITE + FIRST FLOOR PLAN



SECOND FLOOR PLAN

1 Entry Courtyard and Lunch Area
2 Main Stair up to School B
3 Entrance to School A
4 Administration / Faculty
5 Principal
6 Faculty Lounge
7 Assistant Principal
8 Classroom
9 Chemistry Lab
10 Gymnasium
11 Counselling
12 Food Preparation
13 Utilities / Maintenance
14 Special Education Classroom
15 Library
16 Computer Lab
17 Outdoor Terrace
18 Skylight above
19 Clerestory above

Legend:
School 1
Shared Space
School 2
Top of Ceiling Below

The requirement to create distinctive, formal identities for the two schools was achieved through emphasising the established differences between the two buildings, particularly the contrast between the masonry and concrete facades. Circulation paths were separated by placing the shared facilities in the middle of the first floor. Use of colour further identifies Animo Justice School from Animo Ralph Bunche, animating the whole campus.

A wide stairway, characterised by a canopy constructed from structural steel, creates a dramatic, elevated entrance to Animo Ralph Bunche (Fig. 7, Fig. 8). The stairway's balustrade provides edge protection by the use of a dot patterned mesh siding. The use of planting to yard areas and facades softens and enlivens the industrial nature retained in the architecture (Fig. 10). The steel framework of the canopy is designed to facilitate the future installation of photovoltaic panels .

A crucial element of the design was the need to bring natural daylight into every occupied room in the interior of the building. The strategy employed throughout was the installation of vertical and horizontal skylights. The positioning and shape of the skylights varies within the 46 classrooms, 4 science labs and other key facilities. The skylights are tinted to reduce harmful glare and mitigate solar gain (Figs. 11 to 16 inclusive). The effectiveness of the skylights was greatly enhanced by the considered angular profiling of the space between roof and ceiling to maximise light penetration to the deeper recesses of the rooms (Fig. 12). Light is also borrowed from room to room by the use of high level glazing to internal walls (Fig. 13).

The whole project from commencing design and permits in August 2007, through construction, to completion and occupation in September 2008 was achieved with a restricted budget of $13.1 million.

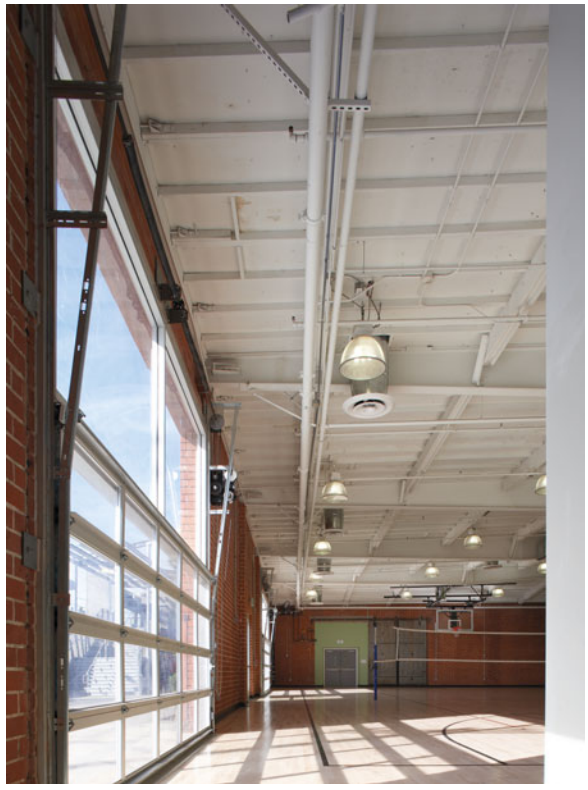
Green Dot East 27th Street is the first LEED-certified charter school facility in Los Angeles.


ANIMO JUSTICE


ANIMO

Fig. 11 below left | Fig. 12 below right

Fig. 15 below



Philadelphia Forensic Science Center

Philadelphia, USA

2003

Croxton Collaborative Architects P C.

www.croxtoncollaborative.com

The Philadelphia Police Department Forensic Science Center is located in a formerly derelict and abandoned school building (Fig. 1). The art deco style facade was constructed in 1929 from a concrete frame infilled with brickwork facades and industrial style fenestration (Figs. 5, 6, 7).

The challenges facing the design team were numerous. The City of Philadelphia and its project partners demanded that the Forensic Science Center should provide a model for sustainable design and construction within the city. The project was to be competitively tendered with limited financial resources, supplemented by grants.

Furthermore, the existing 2.16 acre site was completely hard paved contributing to frequent incidents of sewage outfalls into the Delaware River during storm surges. By utilising a Growing Greener grant from Pennsylvania DEP the site was re-landscaped to increase ground permeability and improve storm water absorption (Fig. 5). This would improve the water quality of the nearby river. Modelling and simulation programmes for power and lighting were implemented at the design stage (Figs. 2, 3) with the goal of reducing energy consumption in the high usage environment of the science laboratories. HVAC loads were minimised by providing high building insulation levels and a "building within a building" strategy for areas requiring the highest air qualities. Access to mechanical and electrical infrastructure was isolated outside the laboratory areas including a 15 kW photovoltaic array mounted on the roof.

The successful completion of the project has fulfilled the city's twin aspirations of restoring a neglected gem of a building, and providing a beacon for regeneration in Northern Philadelphia.

Population | 1,540,351

Coordinates | 39°57'12"N
75°10'12"W

Elevation | 12 m (39')

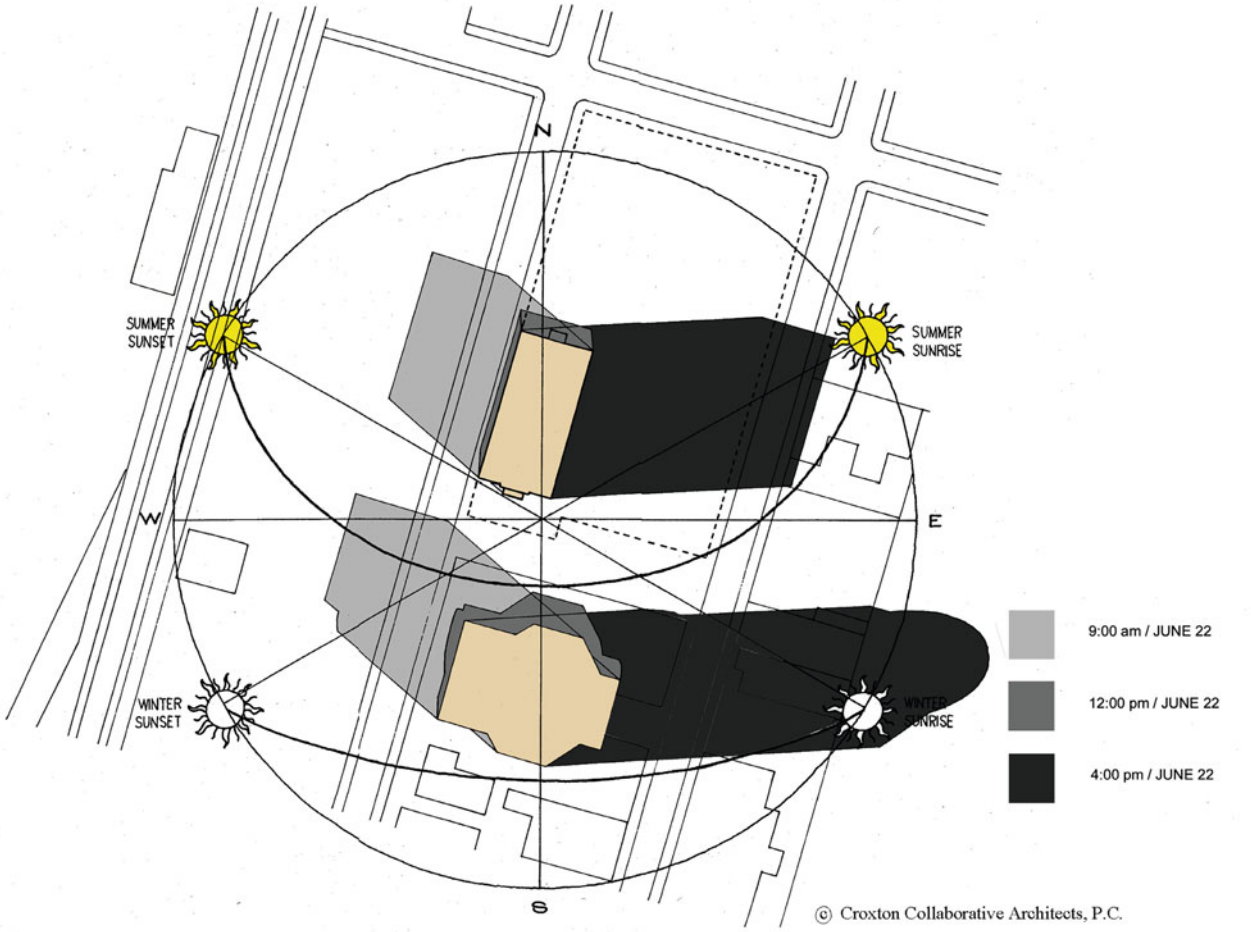
Precipitation | 1.068 mm (42.05")

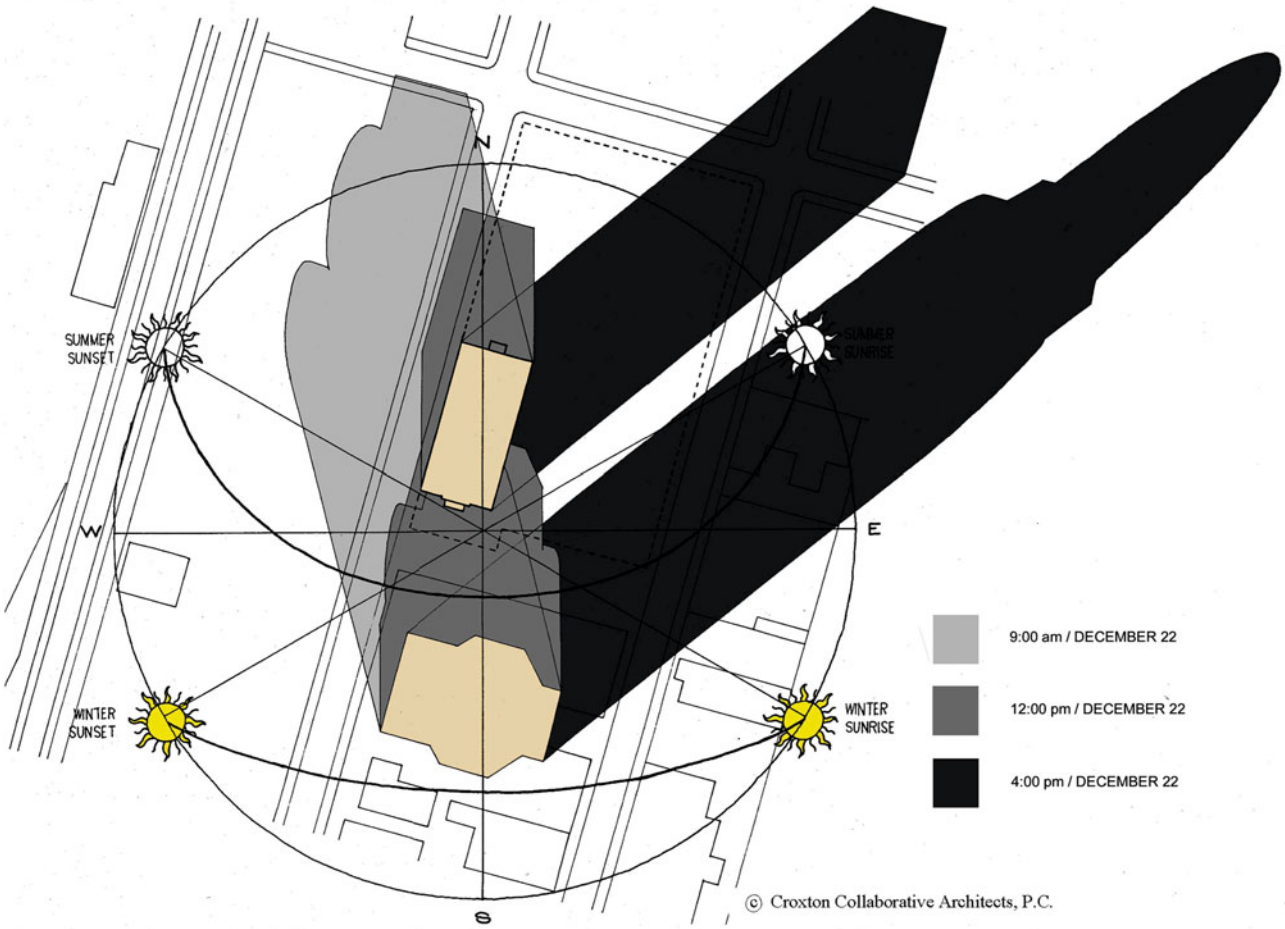
Temperature | Average High:
17.4 C (63.3 F)
Average Low:
8.7 C (47.6 F)

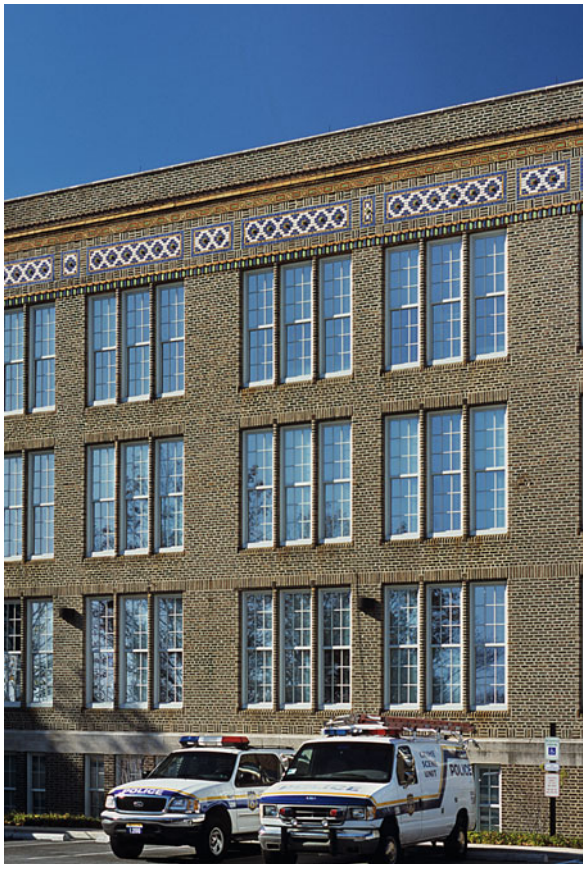
Humidity | **65.5%**

50 Philadelphia Forensic Science Center | Philadelphia | USA | Fig. 1 above | Fig. 2 opposite top | Fig. 3 opposite below

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_6, © Springer Science+Business Media B.V. 2011







The state of the art forensic laboratories are provided over four floors including a basement within the restored 44,000 square feet building. Facilities include:

- A firearms unit with a shooting range for ballistics analysis.
- A crime scene unit for 24 hours per day crime scene evidence gathering.
- Chemistry laboratories for drug analysis.
- Criminalistic and DNA laboratories for hair, fibre and blood analysis.

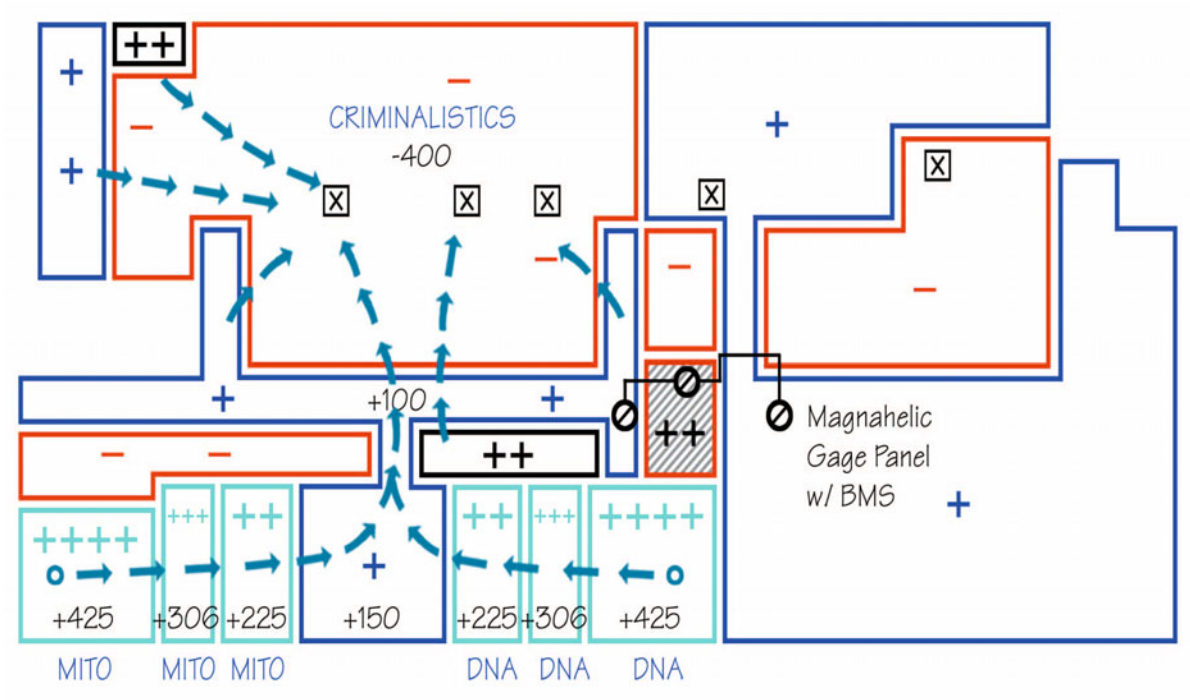
All crime scene evidence with the exception of homicide crimes are processed through the facility for the City of Philadelphia (Figs. 4, 6 to 8).

Careful selection of the materials used in the project eliminated the use of PVC pipework. Refrigeration and mechanical units are all free of chlorofluorocarbons (CFCs). Rapidly renewable or recycled materials were used in the wall finishes and flooring. The design team were also mindful of the health and well-being of the scientists working in the very demanding field of forensic science.

For example, extreme levels of brightness are required in the examination areas, consequently, high energy efficient fluorescent lighting was used throughout. The large air volume movements required by laboratory fume hoods also put demands on the energy required within the facility (Fig. 10). Despite these challenges the careful modelling and considered design was able to achieve measured improvements over codes in place at the time of construction, for example:

- 72% reduction in total annual source energy
- 69% reduction in 25 year CO2 emissions.
- 67% reduction in total annual utility bill
- 65% SO2 and NOx 25 year emmision reductions (Acid rain and Ozone smog).
- 61% reduction in annual peak electrical demand.
- Cumulative payback of strategies in 2.2 years.

The Forensic Science Center received the American Institute of Architects 'Cote Top Ten' Award for 2006 and a Philadelphia Sustainability Award for 2007.


CRIMINALISTICS
-400
+100
Magnahelic
Gage Panel
w/ BMS
+425
+306
+225
+150
+225
+306
+425
MITO
MITO
MITO
DNA
DNA
DNA

Gleneagles Community Centre

West Vancouver, Canada

2003

Patkau Architects Inc.

www.patkau.ca

West Vancouver is located on the north shore of the Burrard Inlet in British Columbia. The waterfront district is defined by its dramatically rugged coastline, with Howe Sound to the west and the Caitano river marking the eastern boundary. Development of the northern boundary will be limited to an elevation of 1,200 feet, with the ascending Coast Mountain wilderness above the Upper Levels Highway continuing to be preserved and forested. These south facing slopes facilitate essential watershed, open space and recreation.

An Environmental Strategy, adopted in 2005, outlines the Community Plan policies for the West Vancouver District. The guiding policy shaping principle is the continued absence of industrialisation. The local economy comprises mainly of service, retail and recreational activity. The District reported in 2005 that commercial property comprises only 4% of total property values, with the remaining 96% being residential.

The sloping site of the Gleneagles Community Centre is a microcosm of West Vancouver's topography. The cross-sectional slope is used to vertically stack the space on three levels, minimising the footprint of the building. A minimal cut and fill allowed both the lower and intermediate levels to be located on grade. The intermediate level (at street level) (Fig. 1), is designed as a living room for the community, encompassing a cafe, meeting room, administration and child care facilities (Figs. 5, 6).

On the opposite side of the building, the lower level contains a gymnasium which utilises the full height of the building. The gym, arts, and youth rooms all open onto a terrace covered by the overhanging roof (Figs. 2, 7, 10 and 11).

Population | 1,567,924

Coordinates | 49°22'0"N
123°10'0"W

Elevation | 178 m (584 ft)

Precipitation | 1529 mm (60.2")

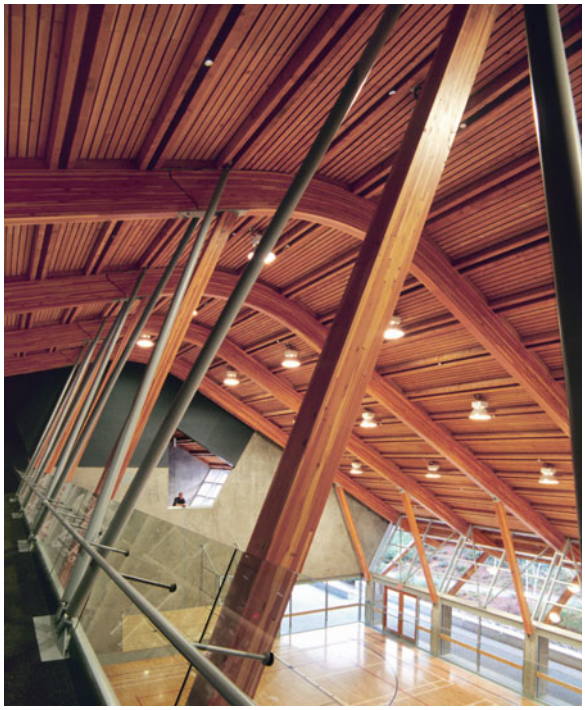
Temperature | Average High:
23 C (73 °F)
Average Low:
0 C (32 °F)

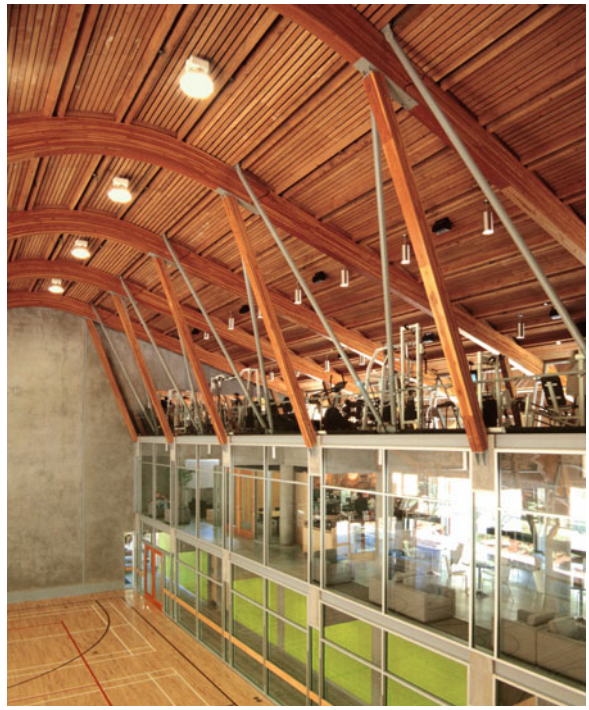
Humidity | 73.3%

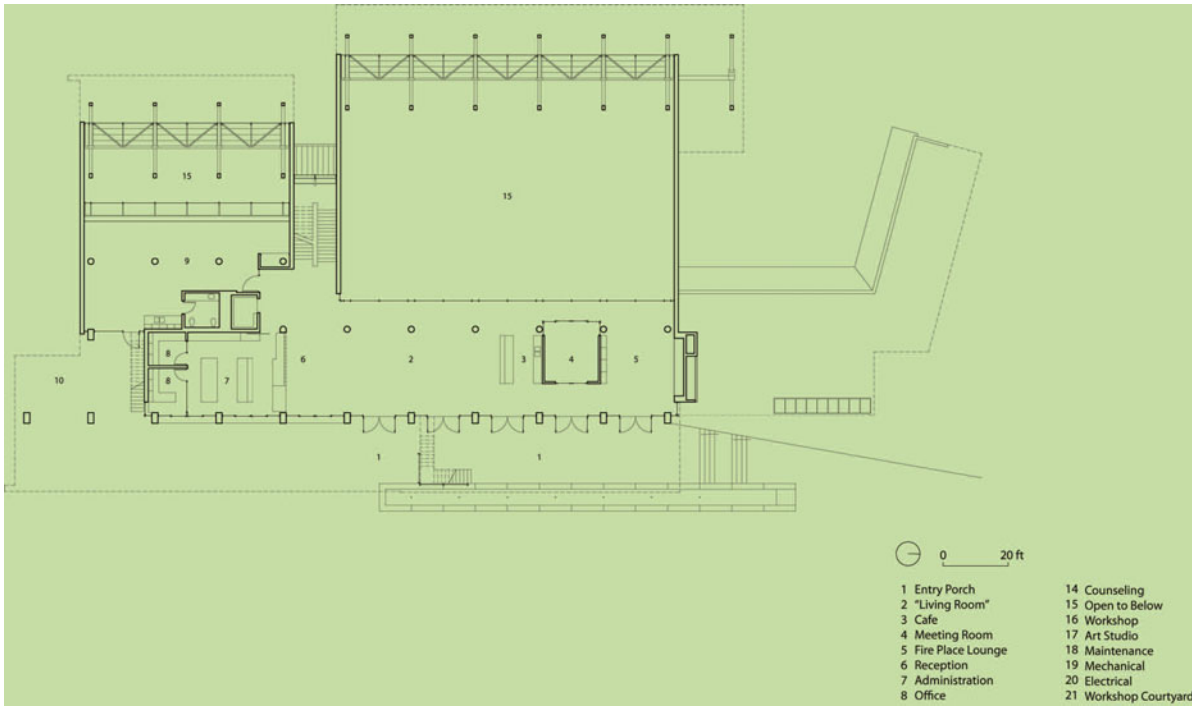
56 Gleneagles Community Centre | West Vancouver | Canada | Fig 1 above | Fig. 2 opposite

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_7, © Springer Science+Business Media B.V. 2011

Fig. 3 below left | Fig. 4 below right






0
20 ft
1 Entry Porch
2 "Living Room"
3 Cafe
4 Meeting Room
5 Fire Place Lounge
6 Reception
7 Administration
8 Office
14 Counseling
15 Open to Below
16 Workshop
17 Art Studio
18 Maintenance
19 Mechanical
20 Electrical
21 Workshop Courtyard

As befits a community centre, the sectional nature of the building is enlivened by the glimpses of varied human activity afforded by the glazed walls of the interior (Figs. 4 & 5).

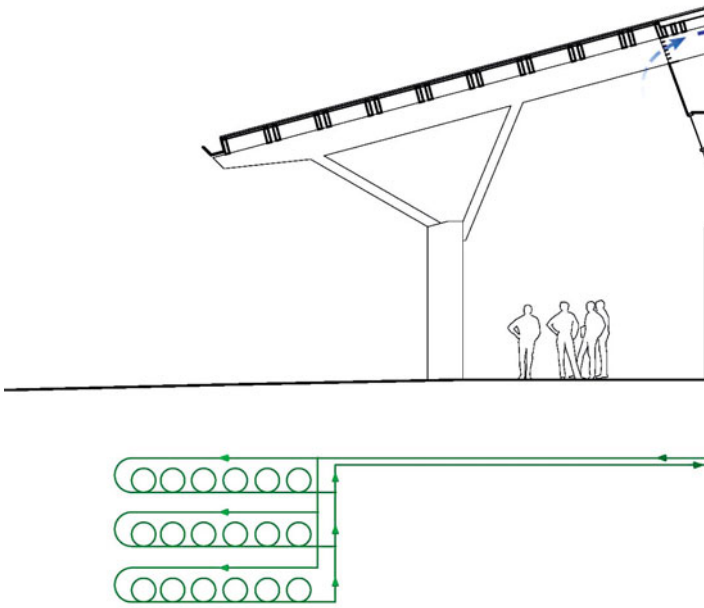
The building is formed primarily by a cast-in-situ concrete floor slab incorporating composite gable end walls and structural columns on grid. This monolithic structure embeds the building into the landscape. The profiled roof is supported by a heavy, braced timber truss and purlin roof structure (Figs. 10 and 11).

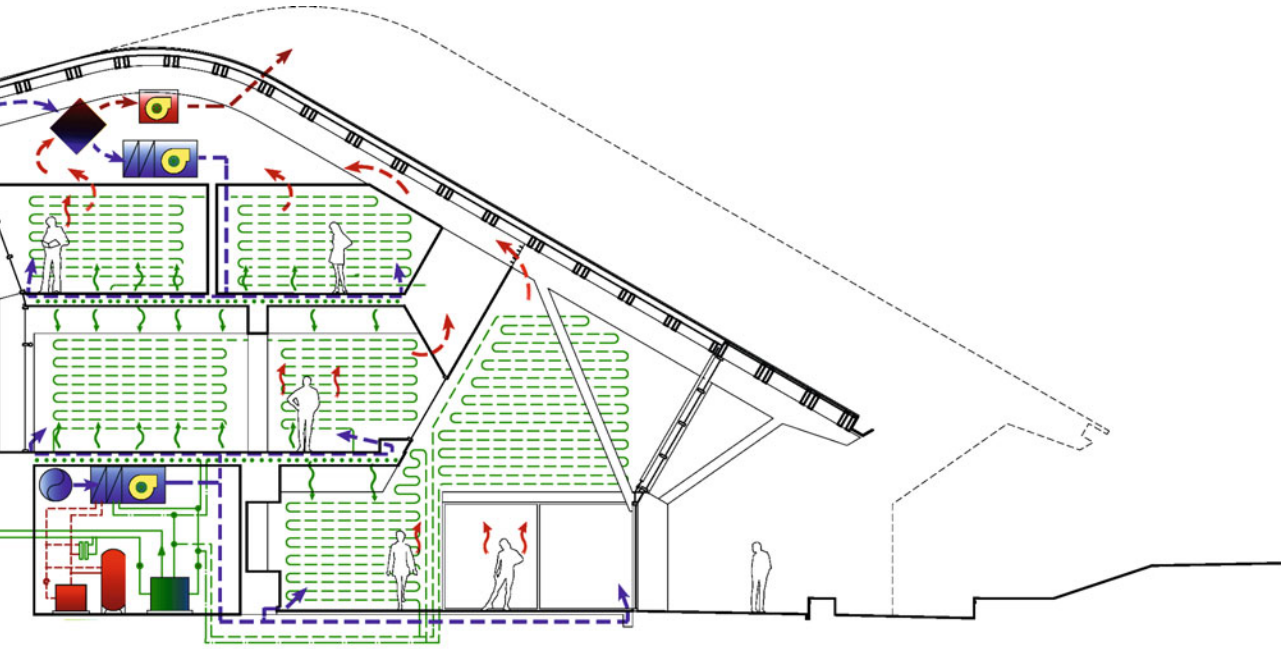
The concrete slab is vital to the strategy for controlling the building's interior climate by providing the mass required for thermal-storage. The thermal energy required for the system is provided by water-to-water heat pumps via a ground-source heat exchanger. This unit is embedded in the earth beneath the adjacent permeable car park surfacing (Fig. 8). The concrete floors and walls are capable of absorbing, storing and emitting the heat energy required to maintain the desired indoor temperatures, despite outdoor variations.

To ventilate the space, 100% fresh air is introduced, tempered and moved at low velocity from lower levels. The rising air takes contaminants with it to high level heat recovery and exhaust units (Fig. 8). By using air flow for ventilation only, the performance of the climate control system is unaffected by the random opening of windows and doors. The efficiency of the system reduces the mechanical system sizing by 40%.

Additionally, the generous roof overhangs contribute to the building's energy efficiency by mitigating excessive solar gain in the summer months. Rainwater is discharged from these overhangs into landscape swales permeating the water back into the natural watercourses. The building's facades and outdoor terrace areas remain dry under the protective shelter of the overhangs, thus preserving the fabric of the building.

Energy consumption for the period from February 2004 to January 2005 was 139 kWh / m2. A comparable commercial building operating in the same climatic region consumes on average 400 kWh / m2 per year by comparison.





40 Albert Road

Melbourne, Australia

2005

SJB Architects

www.sjb.com.au

The City of Melbourne, Victoria, evolved from the settlement of Bearbrass, which was established in 1835 on the Yarra river by Tasmanian settlers searching for pastoral land in the Port Philip area. In 1847, Queen Victoria began the process of altering the status of Melbourne to that of a city, by the installation of the Rt. Rev. Charles Perry as Bishop of Melbourne in the Cathedral Church of St. James.

Twenty first century Melbourne is derived from the original city grid laid out in 1836 by Assistant Surveyor, General Robert Hoddle.

The discovery of gold in Victoria and the subsequent influx of people in the early 1850's ensured the rapid growth of Melbourne as a city, with a population of 140,000 being recorded in 1861. The vibrant modern metropolis of Melbourne now has a population which in 2008 was estimated at 3.9 million people of diverse ethnic origins.

Climatic conditions in the area are dictated by the juxtaposition of Melbourne between the hot arid Australian interior and the cold Southern Ocean. The differential of temperatures can cause very changeable weather conditions, resulting in the celebrated Melbourne phenomena of "Four Seasons in One Day". Strong cold fronts can form, causing rapid drops in temperature, gales, thunderstorms and heavy rain.

As Port Philip is a large bay, warmer than the surrounding oceans, showers can be intensified on the leeward side of the bay.

However, Melbourne also enjoys extended periods of mild weather and clear skies in the Spring and days of extreme heat in the Summer.

Population | 3.9 million

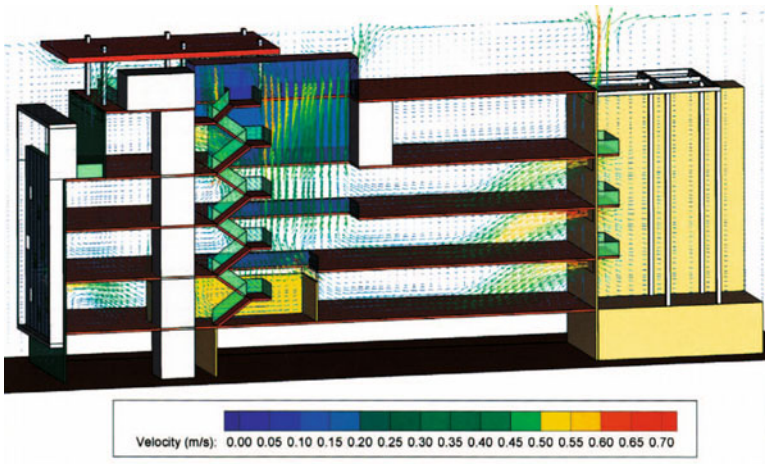
Coordinates | 37 48' 49" S
144 57' 47" E3

Elevation | 31 m (102')

Precipitation | 648 mm (25.1")

Temperature | Average High:
19.8 C (67.4 F)
Average Low:
10.2 C (50.3 F)

Humidity | 53%



J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_8, © Springer Science+Business Media B.V. 2011

40 Albert Road is owned by Szencorp, a company with business activities in property development, renewable energy generation and water usage strategies.
Szencorp's collaboration with SJB Architects, married design and technology to refurbish the five storey 1,200 m2 building to the highest levels of environmental sustainability, architectural excellence and user comfort. The SJB practice, which encompasses architecture, planning and interior design was well positioned to undertake the challenge. The finished building was also intended to be a demonstration tool and showcase for Szencorp's innovative technologies and their commercial viability.

The project had four key goals as follows:

- Significant measurable reductions in water and power usage.
- Consequent minimisation of the building's running costs.
- To produce an enhanced contemporary working environment.
- To create a measurable working commercial model of green engineering.

The refurbishment of 40 Albert Road retained 96% of the building's original structure and 88% of the facade. A sun screen erected to the front of this facade provides the elevation (Fig. 2 and Fig. 3) with a modern appearance and reduces glare inside the building.
The strategies for minimising reliance upon conventional electricity supplies include the use of in-situ ceramic fuel cells. This unit catalytically cracks natural gas rather than burning it. The system has low operating costs, and is energy efficient. Furthermore, emissions from this unit are minimal.
Another "first" is the commercial use of natural gas engine air conditioning units.
Similarly, the the effort to improve the comfort of the office space resulted in the first use of the Drykor dehumidification unit.
This system utilises a desiccant to absorb water vapour from the air and simultaneously removes 94% of all micro-organisms and 77% of airborne particles greater than 5 microns. These innovations contribute to the healthier working environment within the conditioned building (Fig. 1).

Fig. 3 above | Fig. 4 below


4
3
2
1
SZENCC
ECS
CARBON

Monitoring systems incorporated into the refurbishment are used to measure the performance of the building's mechanical and electrical systems. Szencorp have reported the following post - completion results:

- 70% reduction in energy use compared to conventional offices.
- 30% of the building's energy requirements can become self generated.
- 82% reduction in potable water usage.
- 72% reduction in the sewerage discharge compared to similar office units.

Furthermore, a managed lighting system splits the building into 21 zones (Fig. 4, Fig. 5, Fig. 6, Fig. 7) where the intensity of lighting can be separately controlled via a system of sensors linked to the Heating, Ventilating and Air Conditiong (HVAC) and security systems.

The investment in these systems and the resultant improvements in the interior comfort of the conditioned spaces has brought an increase in occupational health and, consequently, staff productivity.

An additional benefit of the project is an increase in financial returns on the rented element of the office space.

40 Albert Road is the first building refurbishment in Australia to attain 6 stars under the Green Building Council of Australia scheme. With a threshold of 75 points for 6 stars, Albert Road achieved a score of 83 points, leading to claims that this building is the greenest office space on the continent.

Szencorp's aspiration to use the finished building as a marketing demonstration to prospective clients has been realised, as tours of the building are now an established means of promoting the innovative technologies in use.

This project has received many industry awards including the IDEA Awards for interior design by SJB Interiors (Figs. 4, 5, Fig. 6, Fig. 7).

Fig. 5 above | Fig. 6 below


TOILET


EXIT
EXIT


EXIT
EXIT

40 Albert Road | Melbourne | Australia | Fig. 8 above 71

The New York Times Building

New York, USA

2007

Renzo Piano Building Workshop

http://rpbw.r.ui-pro.com

Founded in 1851 by Henry Jarvis Raymond and George Jones, The New York Daily Times was sold at one cent per copy. In 1857 the name was changed to The New York Times and, today, has the largest circulation of any local metropolitan newspaper in the United States. Only the The Wall Street Journal and USA Today exceed 'The Times' in overall sales.

Since its foundation "The Times" has been based in many locations in New York City, most notably from 1904 on Broadway in Long Acre Square, now Times Square. The Times Square headquarters is famous for the rolling headline news updates which are broadcasted to the street via a wraparound screen. The newspaper is part of The New York Times Company whose present chairman, Arthur Ochs Sulzberger Jr., is a descendant of Adolph Ochs who acquired the newspaper in 1896. It was under the guidance of Ochs that 'The Times' earned its international reputation using the motto "All The News That's Fit To Print" as his byword for quality journalism.

The new headquarters of The New York Times can be found at 620 Eighth Avenue between West 40th and 41st Streets in Manhattan (Figs. 1-4). The high rise element of the development is a steel framed, curtain wall, 52 storey skyscraper shrouded by a ceramic sunscreen. The key aim of architect, Renzo Piano, was to construct a transparent, animated building. The facade is glazed with ultra clear, low iron glass. To integrate and anchor the tower to the street level, a Lobby Garden connects the tower to a 378 seat auditorium - The Times Centre. The Lobby Garden is accessible to the public, visible from the streets and forms a living, verdant connection between 40th and 41st.

Population | 8,391,881

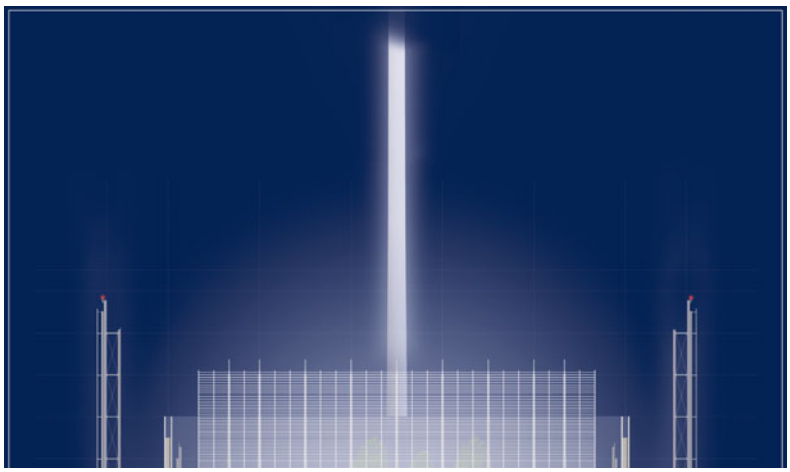
Coordinates | 40°43'N 74°0'W

Elevation | 39.93 m (131')

Precipitation | 1,260 mm (49.7")

Temperature | Average High: 17.22 C (63F)
Average Low: 8.33 C (47 F)

Humidity | 64%



72 The New York Times Building | New York | USA | Fig. 1 above | Fig. 2 opposite

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_9, © Springer Science+Business Media B.V. 2011


The New York Times
Sign
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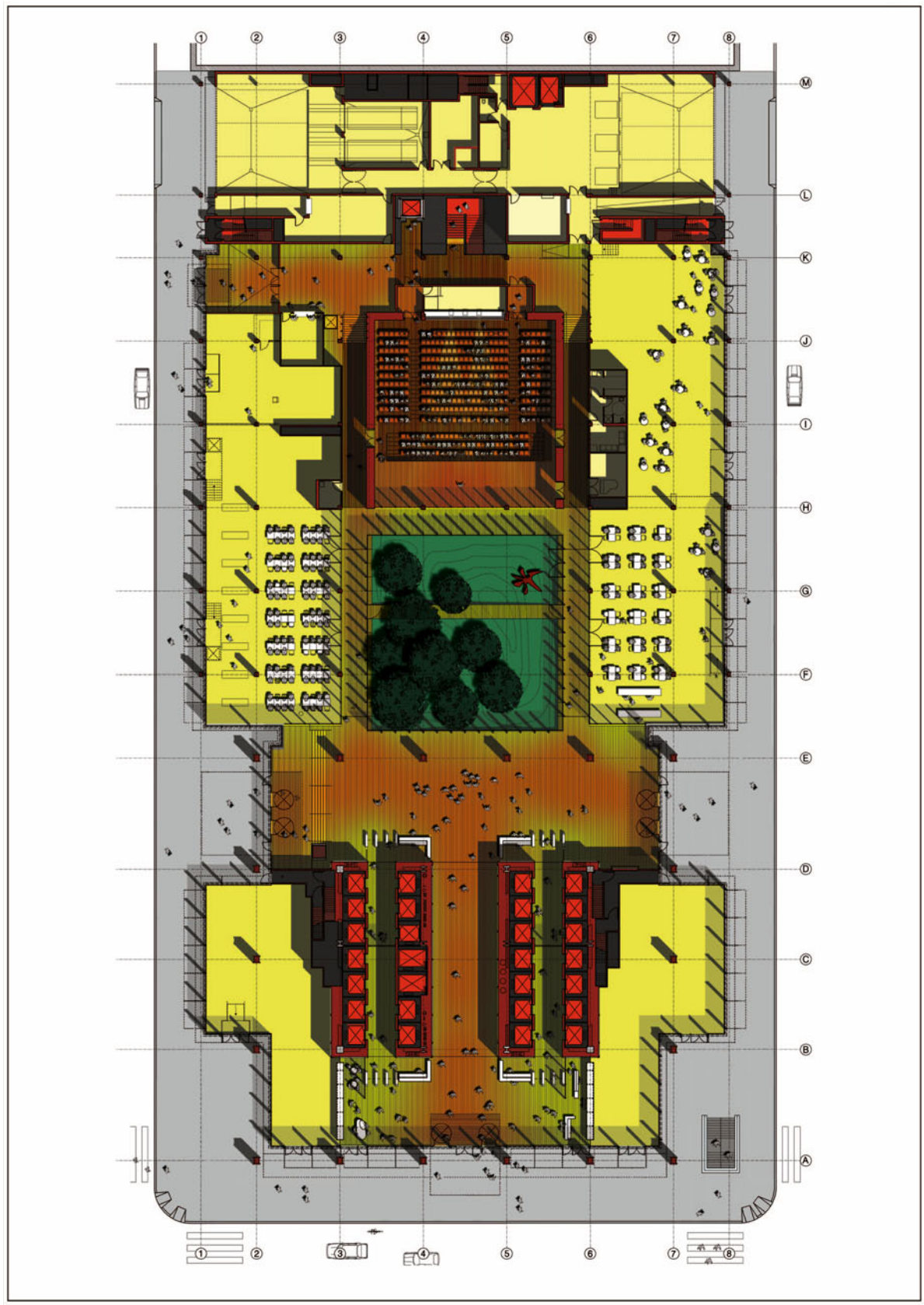
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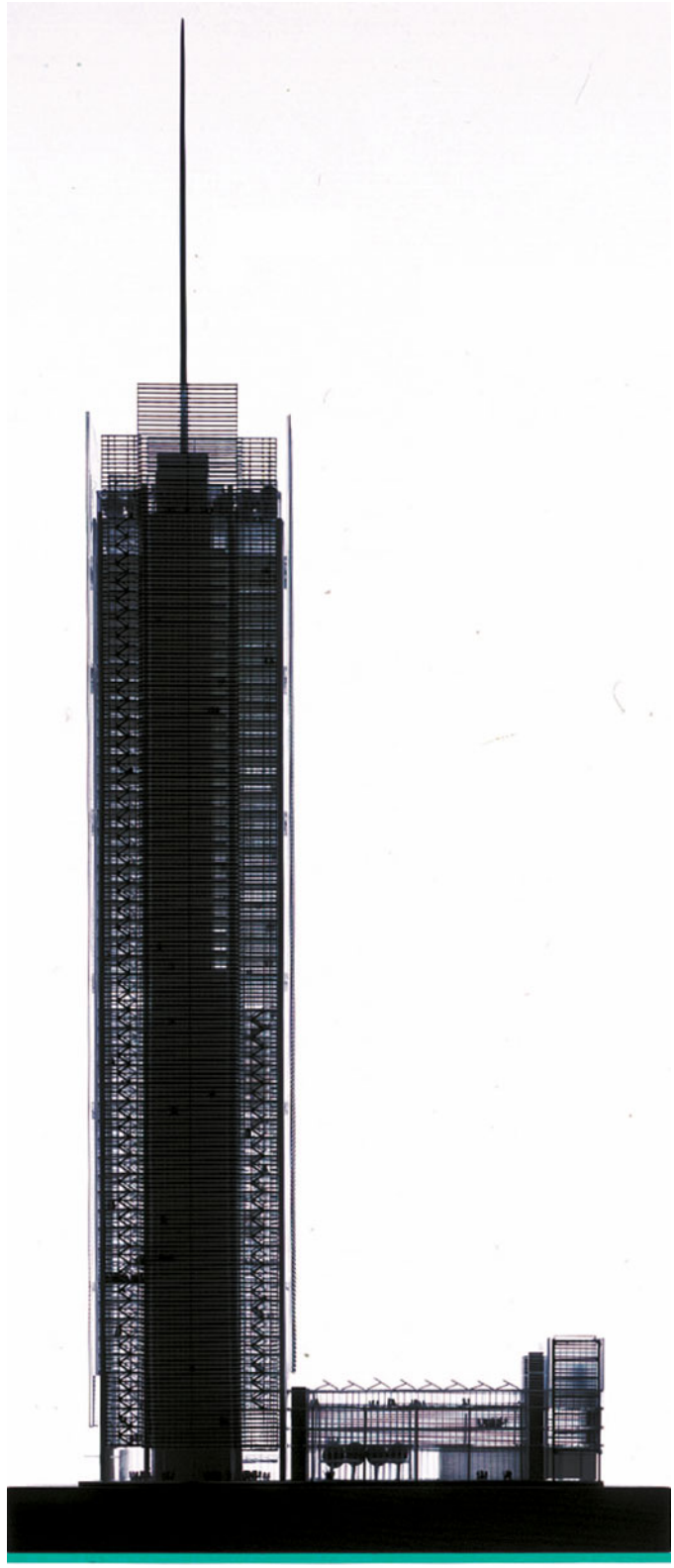


The development, which was undertaken jointly by The New York Times Company and Forest City Ratner Companies provides in excess of 730,000 square feet of Grade A office accommodation and retail space.

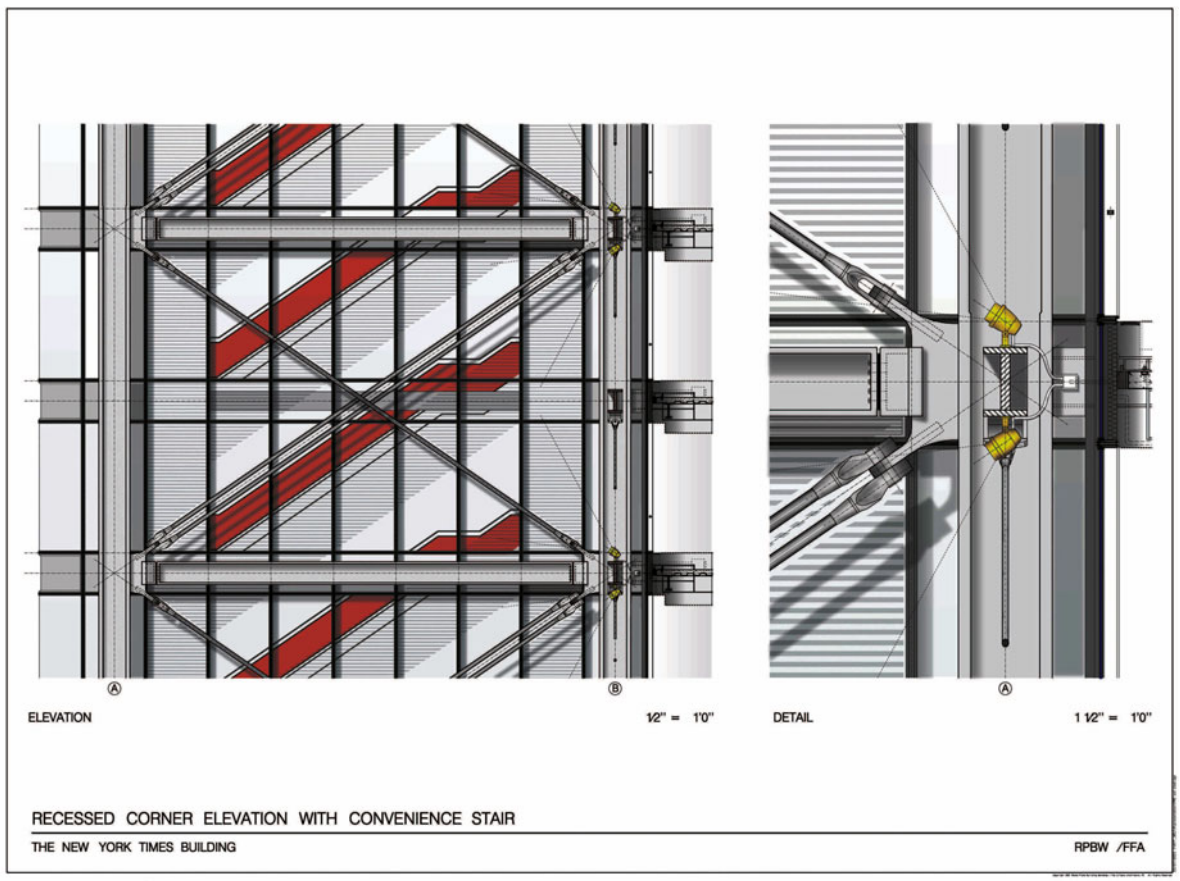
The design collaboration, between Renzo Piano Building Workshop of Genoa, Italy, and Manhattan architects FXFOWLE has delivered a building which combines advanced construction technologies with the human touch. Elevator passengers input their destinations in the lift lobby "pre-flight" which allocates efficient, logistical groupings of passengers to elevator cars.

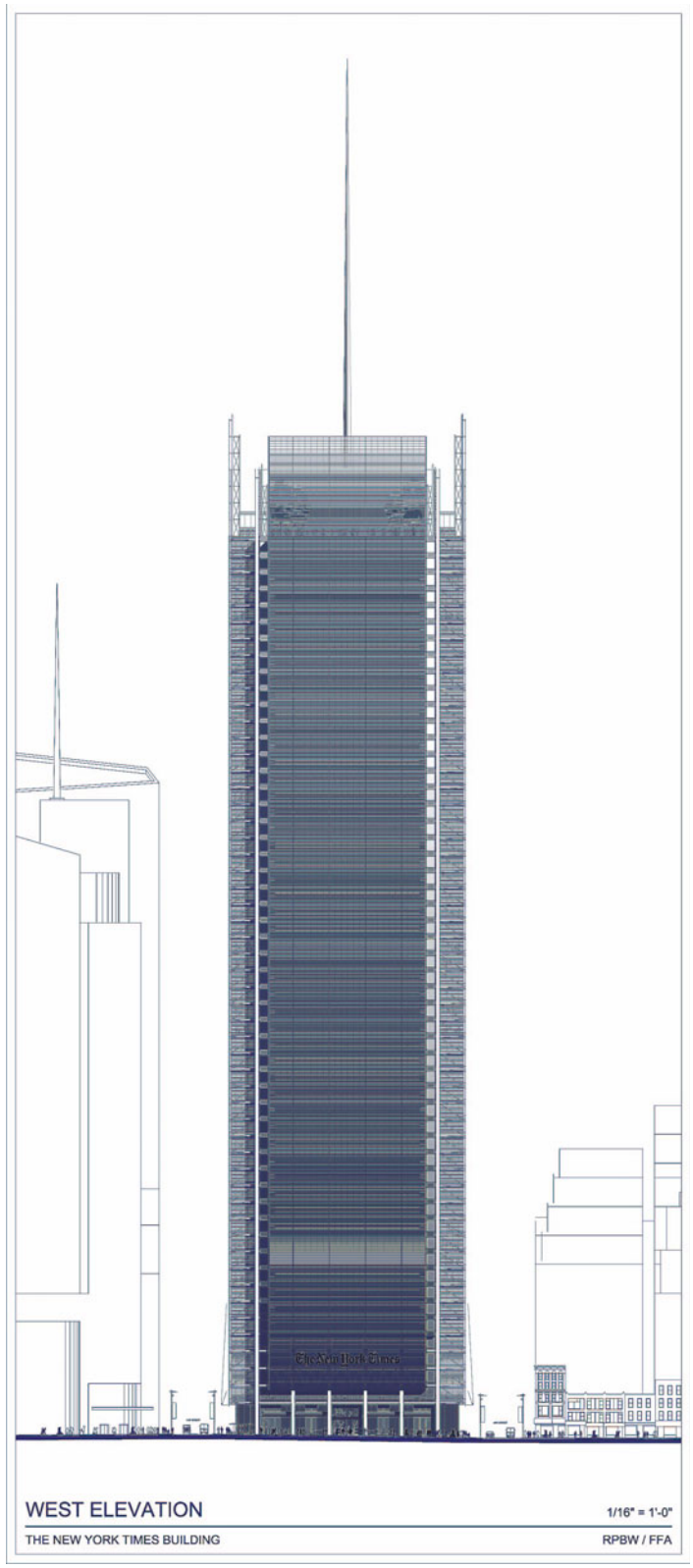
The innovative, ceramic rod, solar shading system effectively reduces solar gain which allows the inner skin high transparency glazing to run from floor to ceiling. This strategy greatly increases the amount of natural light available to the work place. When combined with variable lighting levels, and an automatic shading system, energy savings of 30% can be achieved on floors 2 to 27 (which are occupied by the Times Company).

Additionally, the transparent walls of the tower provide the occupants with dramatic, panoramic views of the famous New York City skyline. When viewing the building from the outside, people can be seen in the working environment and moving up and down the convenience staircases.

This dynamism is also evident in the moveable type art installation in the tower lobby. Here digital display screens provide a progressive stream of current and historic New York Times content, redolent of the nearby Times Square installation.

Renzo Piano's guiding principles of transparency and openness extends through to the structural steel frame (containing 70% recycled content). Columns, beams and ties are all visible to the building's occupants (Fig. 5) providing visual interest, and physical evidence of the skyscraper's integrity.




WEST ELEVATION
1/16" = 1'-0"
THE NEW YORK TIMES BUILDING
RPBW / FFA

The New York Times Building features multiple innovative, environmentally friendly features. In fact, The Times Company will generate more than 30% of its energy for its headquarters on site.

BUILDING MAST

The top of the building mast is 1,046 feet above street level.

LOCATION

620 Eighth Avenue
(between 40th and 41st Streets)
New York, New York 10018

HIGH-SPEED ADVANCED DISPATCH ELEVATORS

The gearless, high-speed "smart" elevators efficiently, smoothly and safely move passengers at speeds up to 1,600 feet per minute. Passengers input their destinations before entering the car, allowing the elevator dispatch system to group passengers and save time.

The building contains 23,500 tons of steel, nearly as much as the USS Intrepid; 70% is recycled content.

CURTAIN WALL

A second skin of ceramic rods acts as a sunshade and gently reflects the color of the sky. It is the first of its kind to be built in the United States. By blocking half of the sun's energy, we are able to have floor-to-ceiling glass that illuminates the floors with an unusual amount of natural light.

SHADING AND LIGHTING

In a first-of-its-kind installation, shades automatically drop to block glare and lights dynamically adjust to settings customized by employees. This sophisticated system maximizes the harvesting of daylight, optimizes work conditions and saves energy.

HEATING AND AIR CONDITIONING

In contrast to conventional systems, air is distributed under floor. This system offers building occupants higher levels of individual comfort and control, and saves energy. This is the first of its kind large-scale installation in a New York office building.

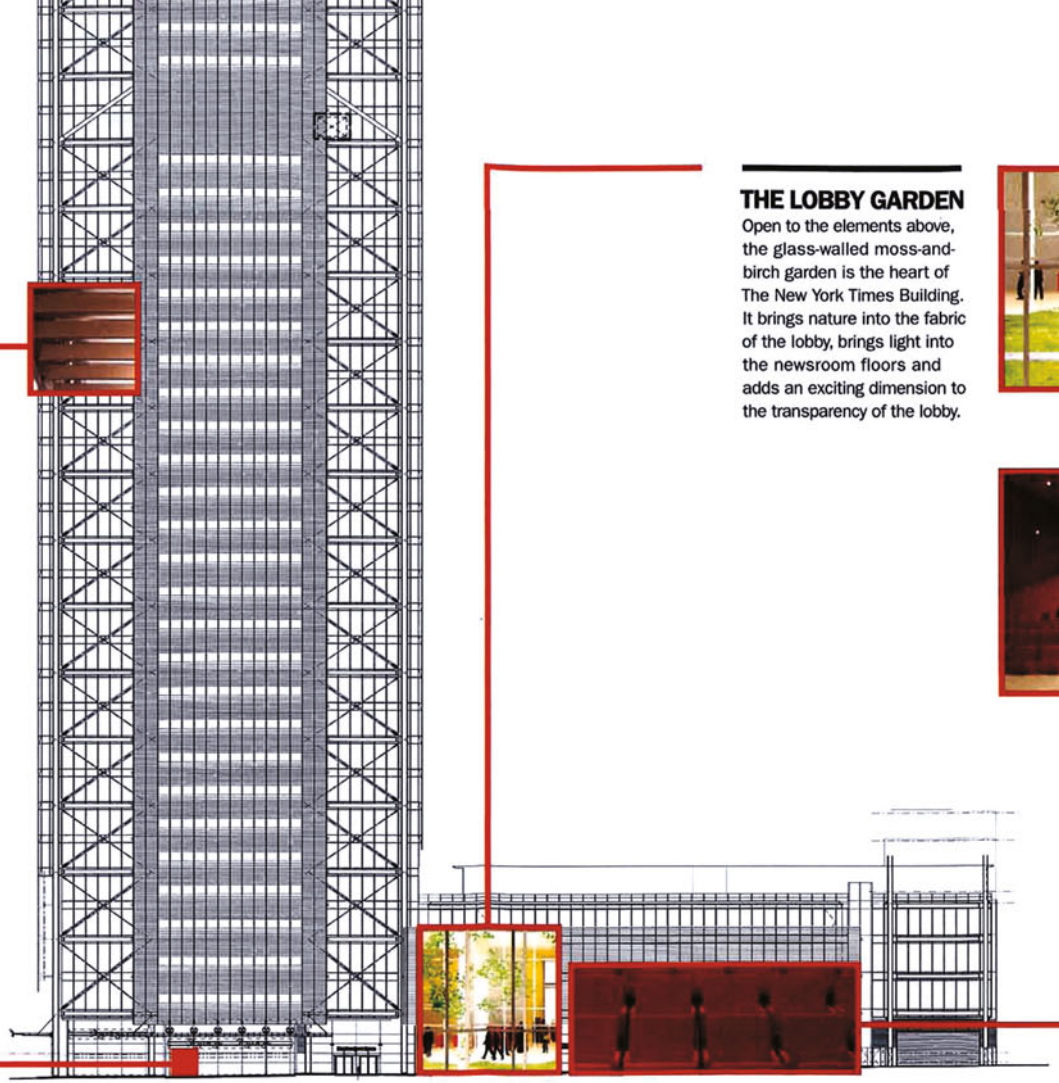
STAIRS

Two convenience stairs are located on each floor of the building, offering panoramic views up and down Eighth Avenue. The stairs encourage communication between departments and enliven the building exterior.

MOVEABLE TYPE

This media installation by New York artist Ben Rubin and U.C.L.A. associate professor Mark Hansen is a dynamic portrait of The Times. Sophisticated algorithms are used to parse the daily output of the paper (news, features, editorials) as well as the activity of hundreds of thousands of daily visitors to NYTimes.com (browsing, searching, commenting).

The resulting refracted view of The Times is displayed on 700 small L.E.D. screens on both sides of the main corridor of the ground floor lobby. The project is scheduled to open in fall 2007.



THE LOBBY GARDEN

Open to the elements above, the glass-walled moss-and-birch garden is the heart of The New York Times Building. It brings nature into the fabric of the lobby, brings light into the newsroom floors and adds an exciting dimension to the transparency of the lobby.

TheTimesCenter

Norddeutsche Landesbank

Hannover, Germany

2002

Behnisch Architekten

Transsolar

www.behnisch.com

Hannover, is the capital of the Federal State of Lower Saxony and is situated on the river Leine. As a major commercial, business and administrative centre in northern Germany, Hannover was chosen as the site for the World Fair, Expo 2000.

Due primarily to its size, 75,000 m2, the new headquarters building of Norddeutsche Landesbank is located in the city centre between the commercial centre to the north and the residential districts to the south.

The street level area of the development is accessible to the public and occupies an entire city block. The plan (Fig. 3) shows City Hall immediately to the west alongside Maschpark, (sports and recreation). Aegidientorplatz, to the northeast of the site and Friedrichswall are both subjected to heavy traffic.

Planning guidelines dictate that the perimeter of the building is aligned to the existing streets and restricted accordingly in height to 4 to 6 storeys. Stepped height variations up to 70 metres are then mitigated by the existing massing of the surrounding city. Viewed from the surrounding streets and park, the development appears to be a conventional city block (Fig. 1, Fig. 2).

However, at the centre of the plot is a large courtyard development. This provides numerous public amenities in a generously planted landscaped environment which includes large reflecting pools.

The cafes, galleries, restaurants and shops provide a haven in the city protected from the traffic emissions and noise experienced in the surrounding streets (Figs. 3, 4, 5, 6).

Population | 519,619

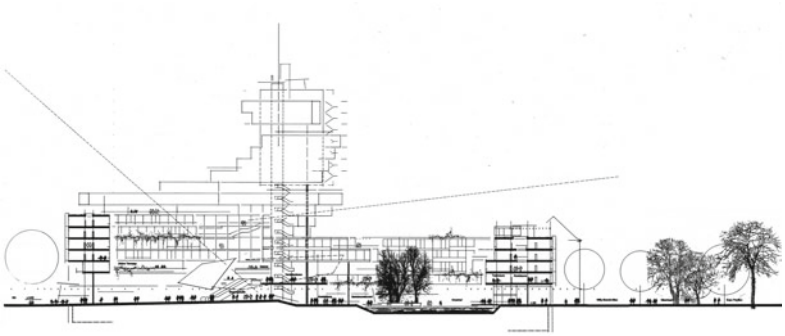
Coordinates | 52°22'N 9°43'E

Elevation | 55 m (180')

Precipitation | 660 mm (26.0")

Temperature | Average High:
12.9 C (55.3 F)
Average Low:
4.7 C (40.5 F)

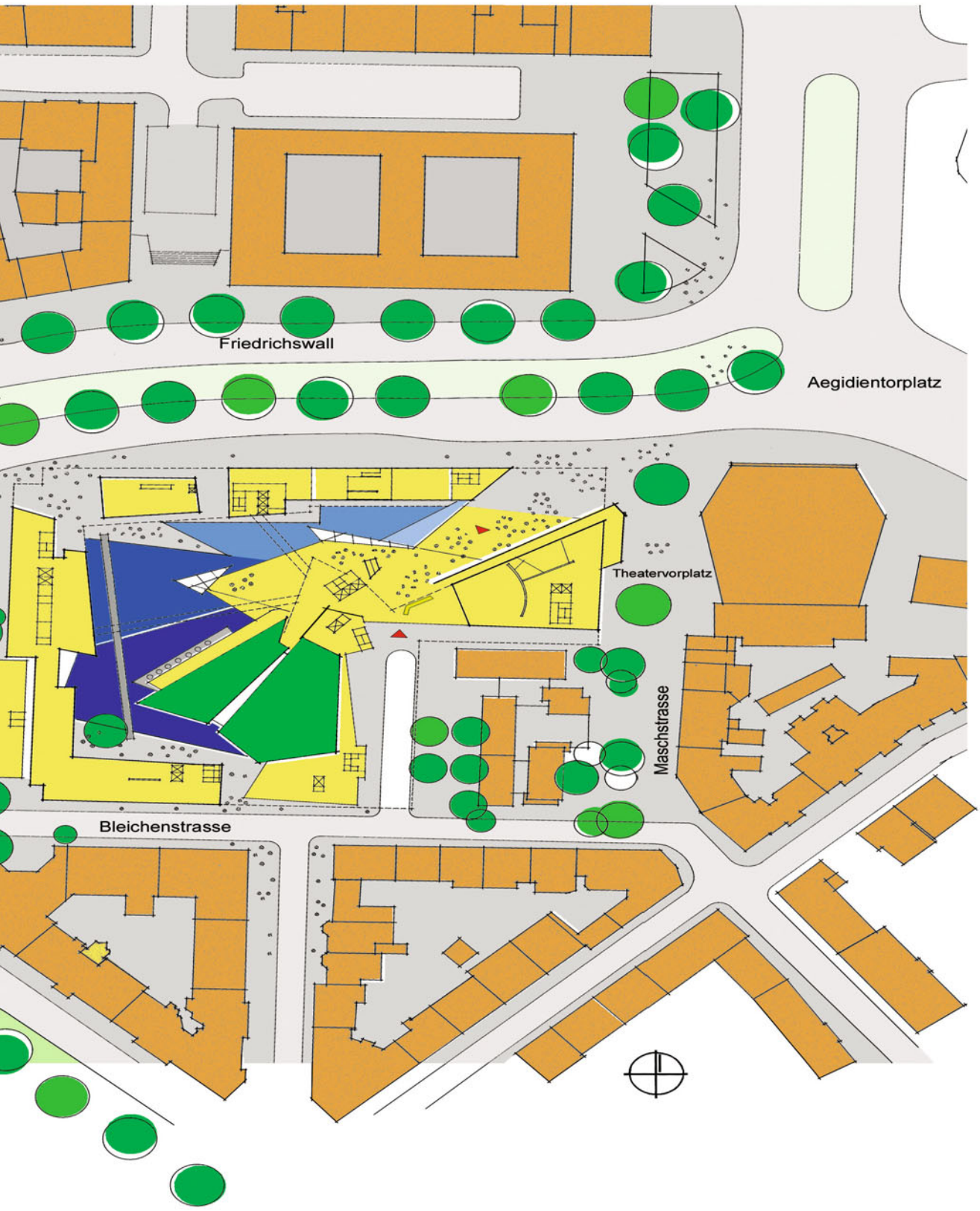
Humidity | 80.66% (Hamburg)



80 Norddeutsche Landesbank | Hannover | Germany | Fig. 1 above | Fig. 2 opposite | Fig. 3 next page

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_10, © Springer Science+Business Media B.V. 2011


Neues Rahthaus
Park
Willy-Brand-Allee
Maschsee


Friedrichswall
Aegidientorplatz
Theatervorplatz
Maschstrasse
Bleichenstrasse

Along with the recreational amenities, the central courtyard also provides access to the daily operations of the bank (Fig. 6, Fig. 7). From the base of the courtyard the seventy metre high headquarters building rises and rotates as a series of glazed, stacked cubes (Fig. 4, Fig. 5).
The architects, Behnisch, Behnisch and Partner in collaboration with Transolar Klima Engineering, devised an extensive environmental strategy for the Norddeutsche Landesbank. Taking into account the urban nature of the location and the building's function, the main considerations were the comfort and well being of the occupiers and the pursuit of low energy building systems. To eliminate conventional air conditioning units totally, the designers made full use of the naturally occurring elements and climatic conditions.
To optimise daylight and reduce reliance on artificial lighting, both blind and glazing systems were designed with the assistance of computerised shading studies of the site. The upper slats of the blinds were angled independently to upwardly direct daylight toward reflective ceiling surfaces. Glazed corridor walls further optimised day lighting (Fig. 7, Fig. 9).
A policy of natural ventilation was designed by utilising a double facade system. This has the additional benefit of reducing noise transmission from the streets. Clean air from the courtyard micro-climate is introduced into the void of the double facade, naturally ventilating the internal space through opening windows and corridor wall vents exploiting stack effect with heat recovery units mounted at roof level (Fig. 8, Fig. 10).
Outdoor air temperatures in the region exceed 22 degrees Centigrade during less than 5% of the year. When supplementary cooling is required, the building superstructure is actively cooled by flushing with water. The heat is exchanged into the ground to be used in the winter months with the aid of a heat pump. The circulation pump requires conventional power, however, the annual energy balance for heat introduced into the ground and extracted breaks even in the temperate climate.

Fig. 5. below

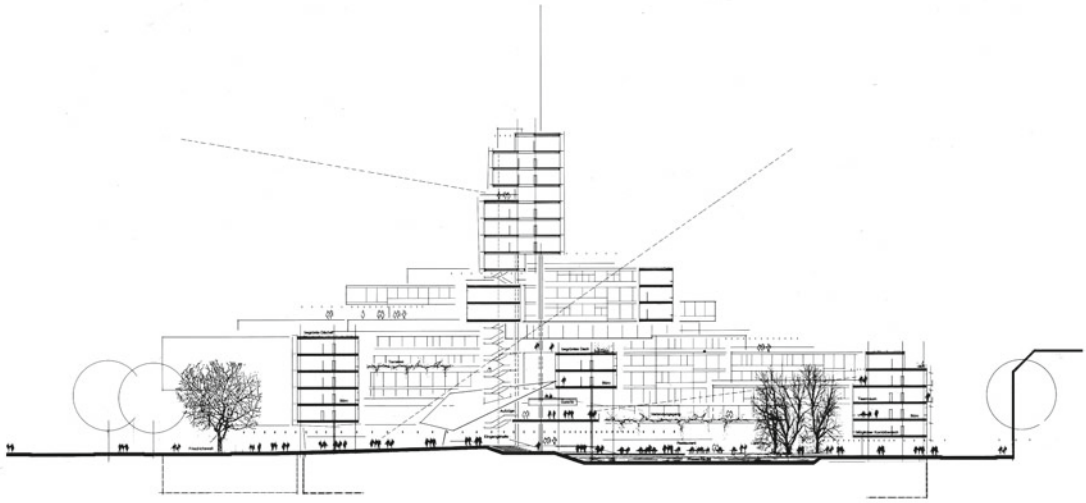


Fig 7 above | Fig 8 below

Fig 9 above | Fig 10 below

111 South Wacker

Chicago, USA

2005

Goettsch Partners

www.gpchicago.com

On the corner of Michigan Avenue and Wacker Drive, a bronze marker in the pavement locates the spot where the U.S. Government built Fort Dearborn in 1795.

The Fort's location, at the mouth of the Chicago river on the south western shore of Lake Michigan, made it ideally suited as a trading post during the nation's expansion from east to west.

This early hub was the forerunner of modern Chicago which still routes approximately 50% of the countries rail freight through the city.

Chicago's growth from an 18th century trading post to a 21st century city of skyscrapers has been punctuated by many challenges and innovations.

In 1871, the Great Fire burned most of Chicago's timber structures to the ground, however, the city was quickly and tenaciously re-built. During this process the U.S.A.'s first skyscraper, the ten storey steel framed Home Insurance Building was erected in 1885.

111 South Wacker's 53 storey structure (Fig. 1) is now a part of this pioneering tradition. Developers, The John Buck Company and the architects Goettsch and Partners (who had previously collaborated on the nearby UBS Tower) designed 111 with sustainability and LEED certification as their primary goals.

The resultant building totals 1,457,000 square feet distributed over 53 storeys of flexible, efficient office space with each floor plate being entirely free of interior columns. The building's central core (Fig. 1) provides the means to fully span 50 feet to east and west and 60 feet to north and south (Fig. 3).

Population | 2,853,114

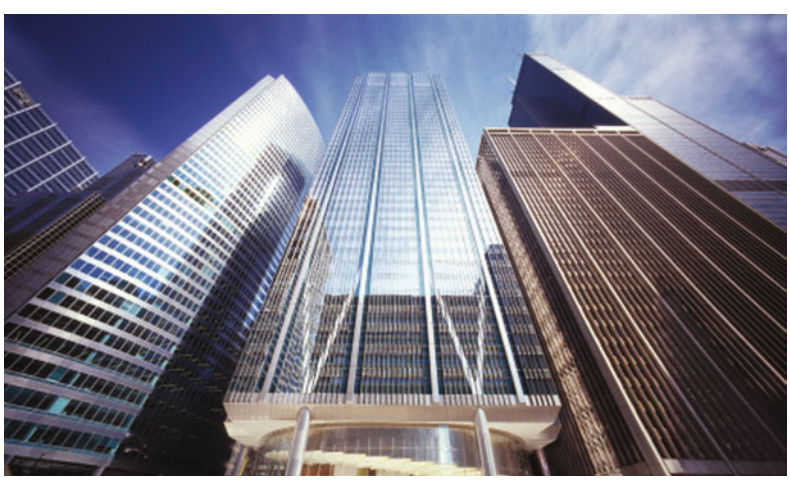
Coordinates | 41°50' 13" N
87°41' 4"W

Elevation | 182 m (597')

Precipitation | 974.1 mm (46")

Temperature | Average High:
15.27 C (59.5 F)
Average Low:
5.77 C (42.4 F)

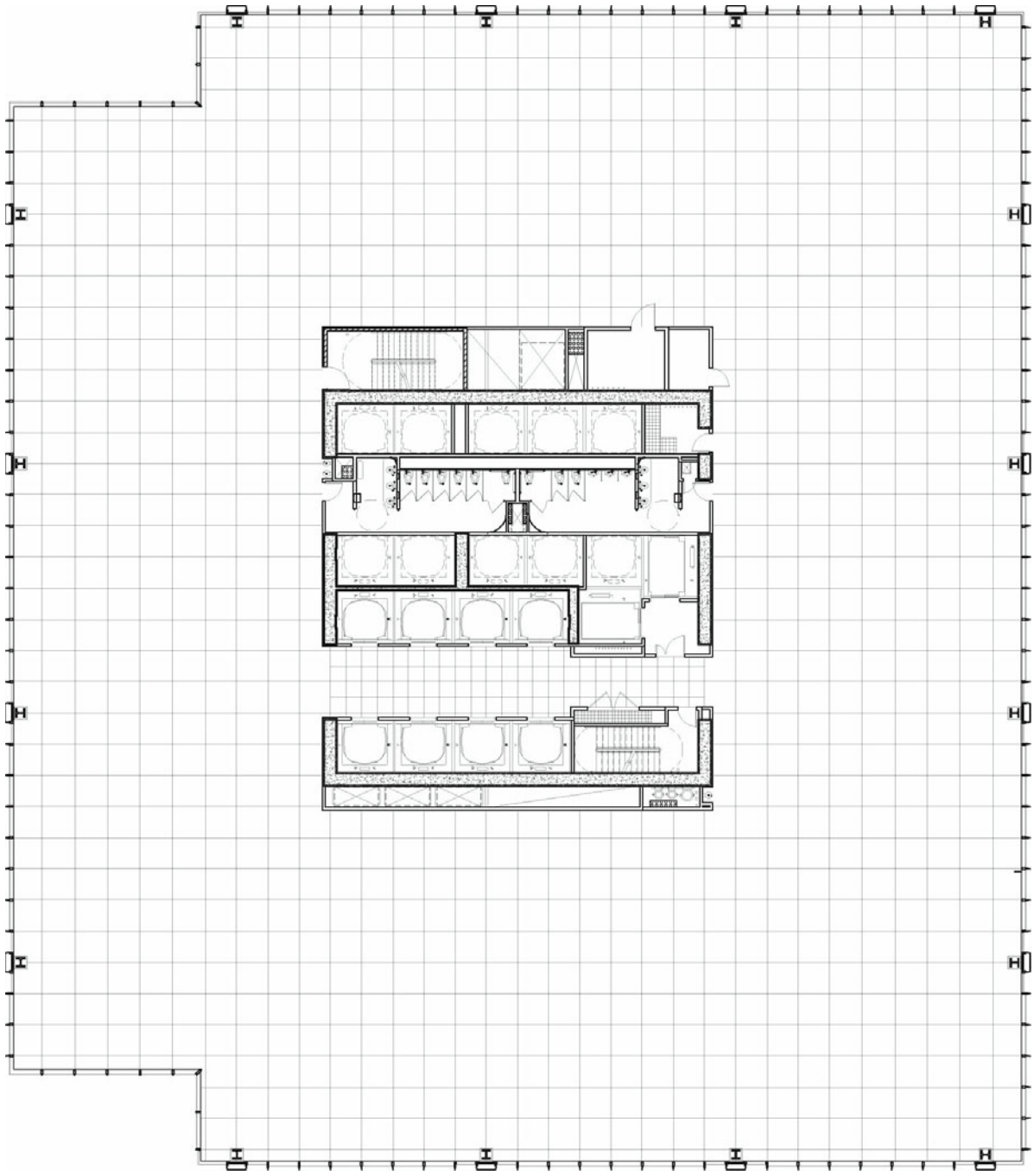
Humidity | 71 %



88 111 South Wacker | Chicago | USA | Fig. 1 above | Fig. 2 opposite

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_11, © Springer Science+Business Media B.V. 2011


VISITOR CHECK-IN



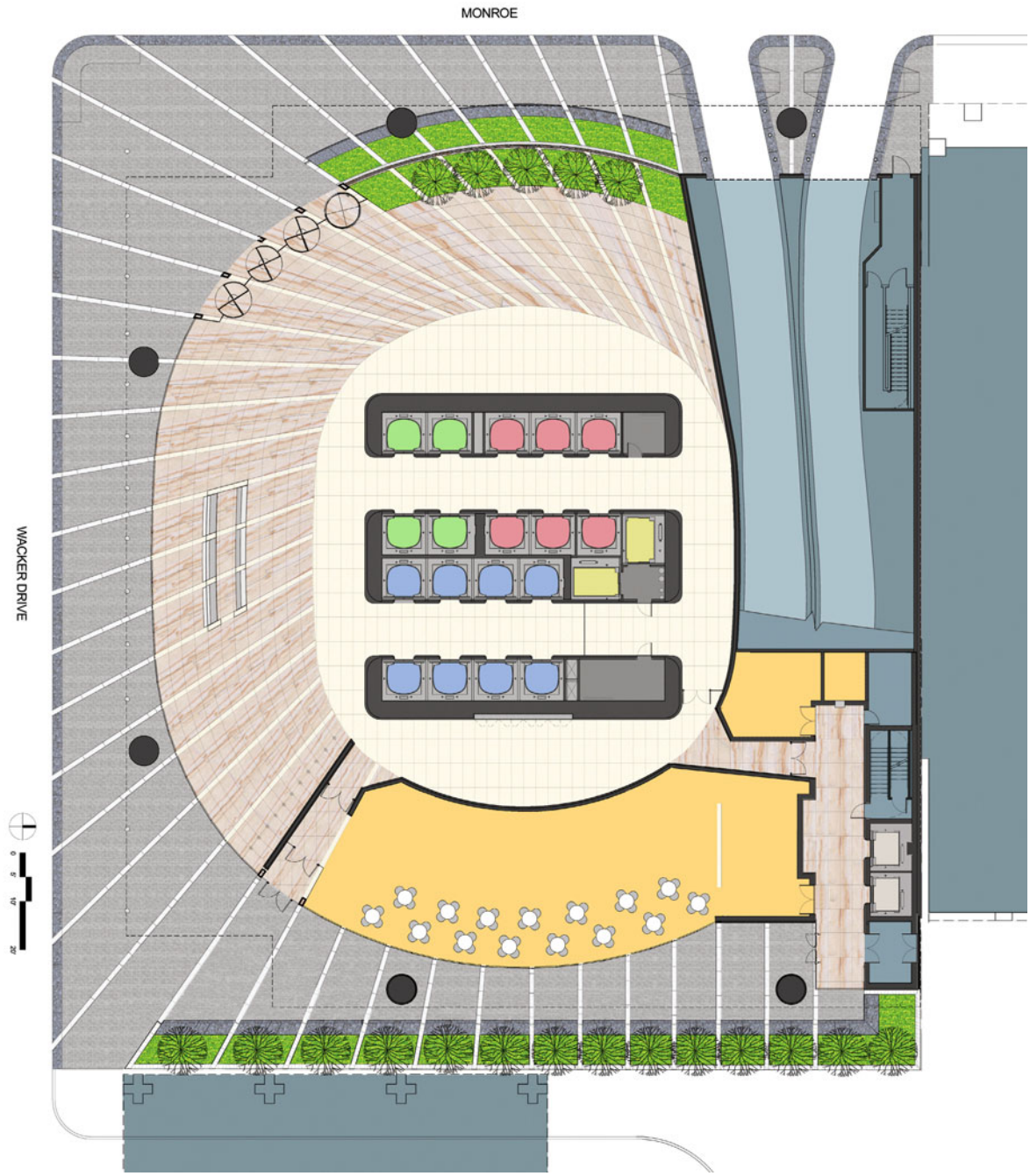
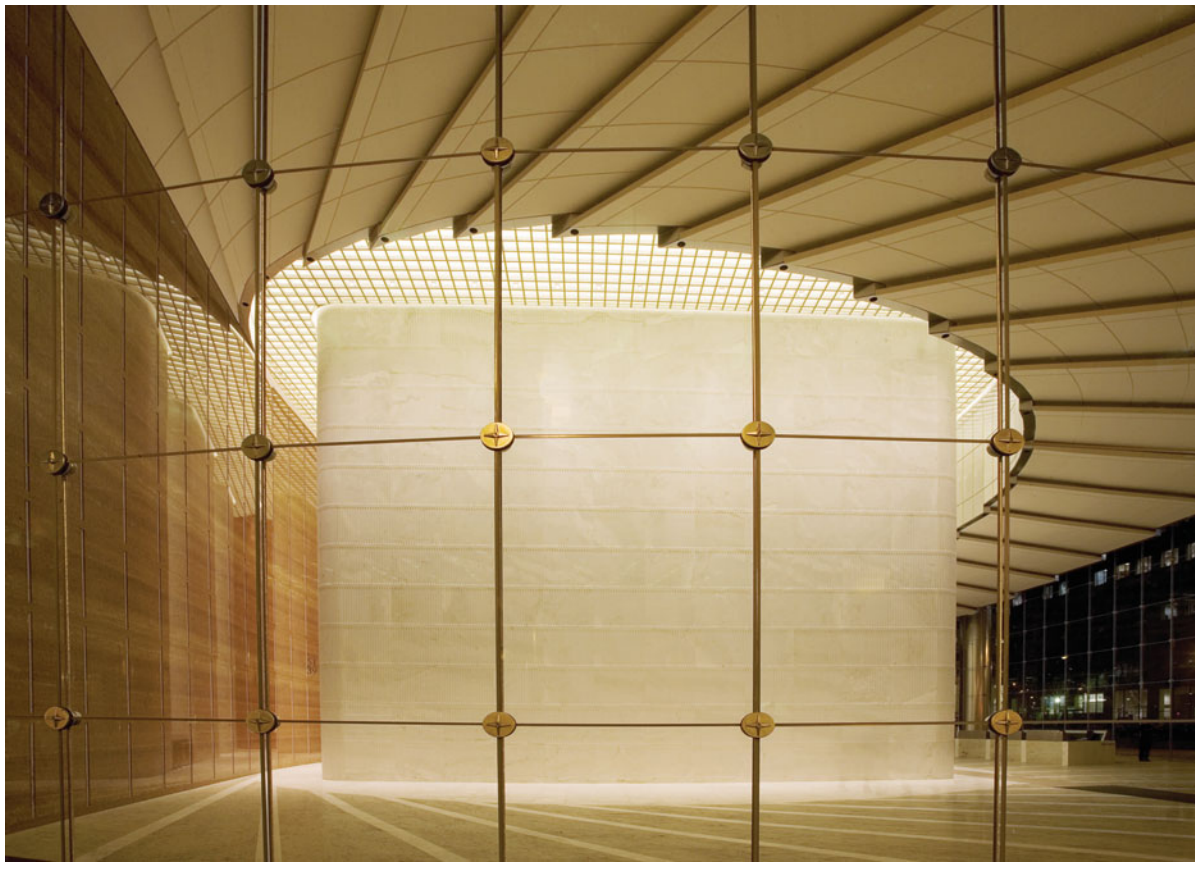

MONROE
WACKER DRIVE

Fig. 5 below



The street level base of the building presents a stunning, seamless transition from the external plaza to the internal lobby (Fig. 2). The lobby is enclosed by a non-reflective cylindrical glass wall retained by one inch diameter vertical cables.(Fig. 6, Fig. 9)

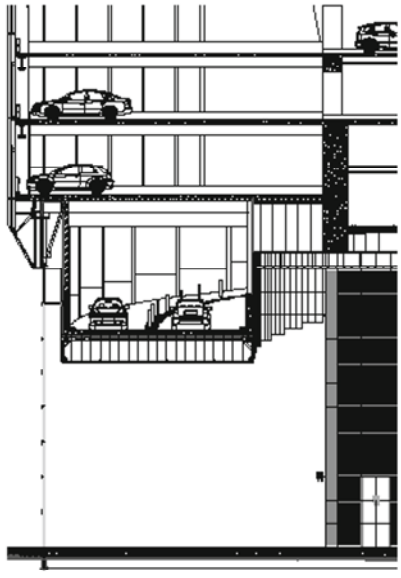
The public facade of the central core is textured and faced in marble. The core is encircled by a spiralling vehicle ramp which facilitates access to the upper garage levels. A stepped, illuminated ceiling covers the underside of the ramp, rising to the soffit level at 44 feet above the plaza. The radiating pattern of the ceiling is reflected below in the marble lobby flooring. It continues outside the glass wall in the granite sett external plaza, up to the edge of the road kerbs.

This design feature and the ultra-transparent glazed facade, blurs the boundary between interior and exterior, creating the illusion of an uninterrupted single continuous space.(Fig. 11).

The lobby also houses a restaurant and shop area (Fig. 4). Above the lobby, seven levels of parking provide space for 389 cars for both public and tenant use (Fig. 7).

Other facilities include a double height conference centre at the mid-elevation of the building and a fitness centre on the 10th floor. Wacker Drive provides access to the building's loading docks and additional levels of parking.

Multiple telecom risers, plant rooms and customised emergency power provision are all designed to attract discerning tenants to this state of the art building. 111 South Wacker also boasts direct elevator access for mid and high-rise occupiers (Fig. 4).



111 South Wacker was the first project to attain the LEED Gold certification for a building core and shell. To achieve this, the construction process was required to minimise both energy consumption and material usage.

The primary strategy was to enable the structure to re-use the existing caissons and foundation walls which had remained on the site.

Additionally, both high performance glazing and insulation were incorporated into the design of the building envelope (Fig. 9, Fig. 10). This was then capped by a high-tech. green roof.

Internally, the Heating, Ventilation and Air Conditioning (HVAC) plant employs low temperature air distribution incorporating automatic dehumidification when required. The system reduces duct and shaft sizes by 10%, increasing valuable net lettable areas. The HVAC and lighting systems are digitally controlled to increase comfort and minimise power consumption.

The selection of non-feature materials focused on products with a high recycled content. All of these initiative contributed to the high level LEED certification.

Silverspur

Palos Verdes, USA

2006

XTEN Architecture

www.xtenarchitecture.com

Palos Verdes Peninsula in the vicinity of Los Angeles is renowned for year round sunshine. This abundance can be both a blessing and a curse on the Southern California lifestyle.

When it comes to maintaining comfort in the workplace, new strategies and innovative technologies are required. One of the biggest challenges is the one faced by developers looking to upgrade under-performing building stock and improve investment returns. XTEN Architecture undertook the renovation of an existing 30,000 square feet office building by using high efficiency fixtures and technologies to transform both the interior and exterior of the building.

The new green roof of the building provides thermal mass and insulates the interior from solar gain whilst aiding the harvesting of rainwater (Fig. 3). Radiant heat added to the underside of the new concrete slabs reduces reliance on the costly forced air systems.

The most significant impact on the building was gained from the re-modelled building facade. A combined strategy of increasing daylight through full storey height glazing combined with high-tech shading was implemented to increase energy efficiency. The shading fabric used is perforated and micro-laminated which results in a reflection of 80% of the potential solar gain. However, considered positioning allows full transmission of natural light, greatly diminishing the reliance on artificial lighting. Occupiers of the re-modelled offices also benefit from uninterrupted views of their surroundings (Figs. 4, 5 , 6) .

Silverspur's pleasing external aesthetic is due in part to its changing appearance throughout the day and into the night (Figs. 1, 7, 9).

Population | 41,754 2006

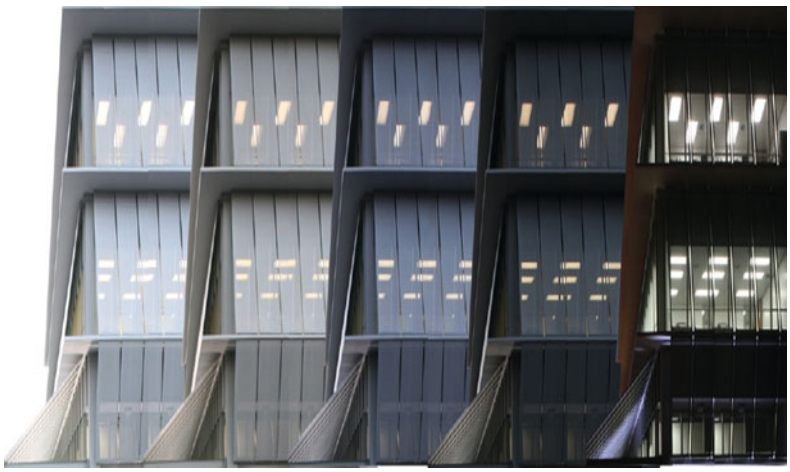
Coordinates | 33° 45' 31.13" N, 118° 20' 45.04" W

Elevation | 67 m (220')

Precipitation | 344.68 mm (13.5")

Temperature | Average High: 22.27 C (72.1 F) Average Low: 12 C (53.6 F)

Humidity | 72% Los Angeles



J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_12, © Springer Science+Business Media B.V. 2011


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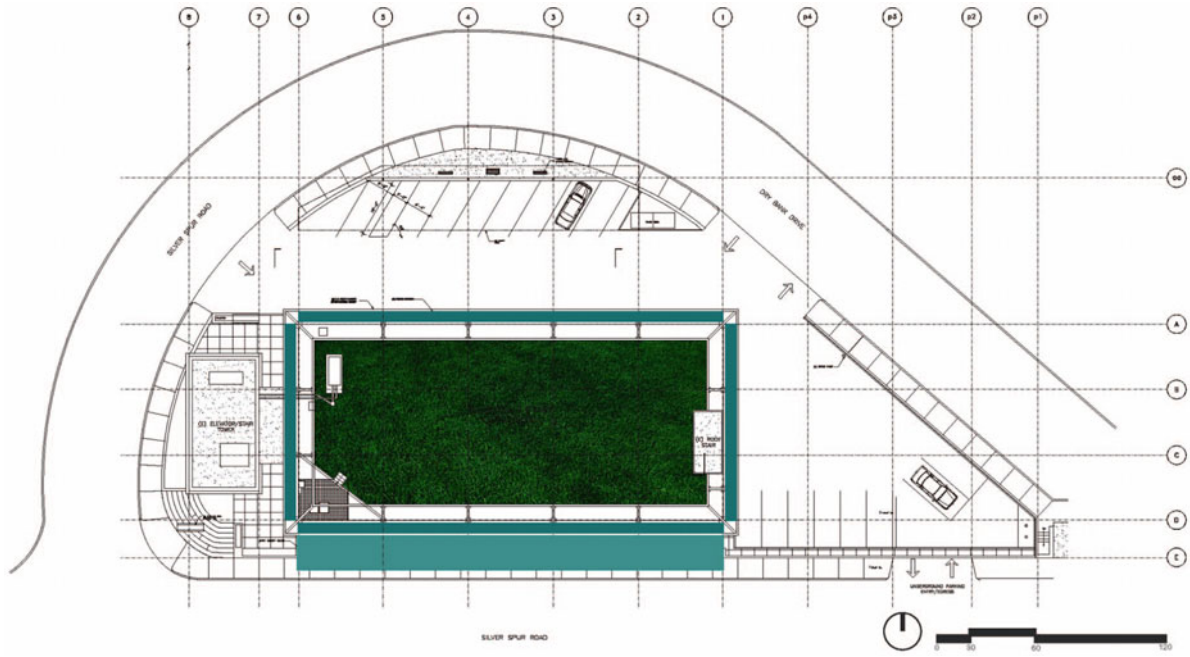
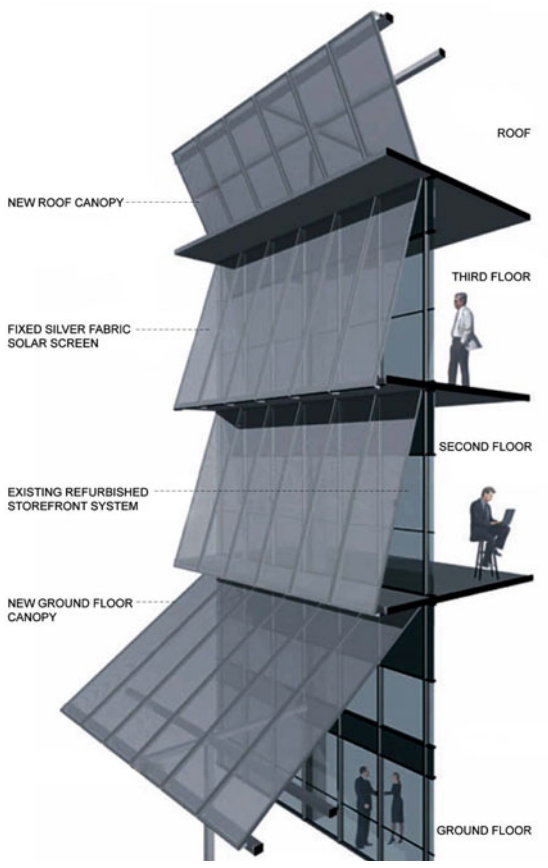
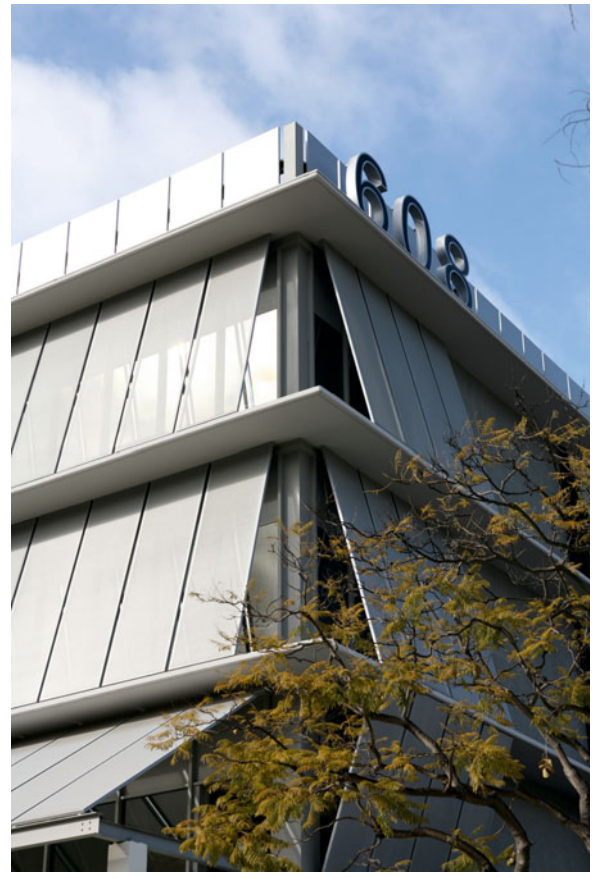
Fig. 3 below




ROOF
NEW ROOF CANOPY
THIRD FLOOR
FIXED SILVER FABRIC
SOLAR SCREEN
SECOND FLOOR
EXISTING REFURBISHED
STOREFRONT SYSTEM
NEW GROUND FLOOR
CANOPY
GROUND FLOOR

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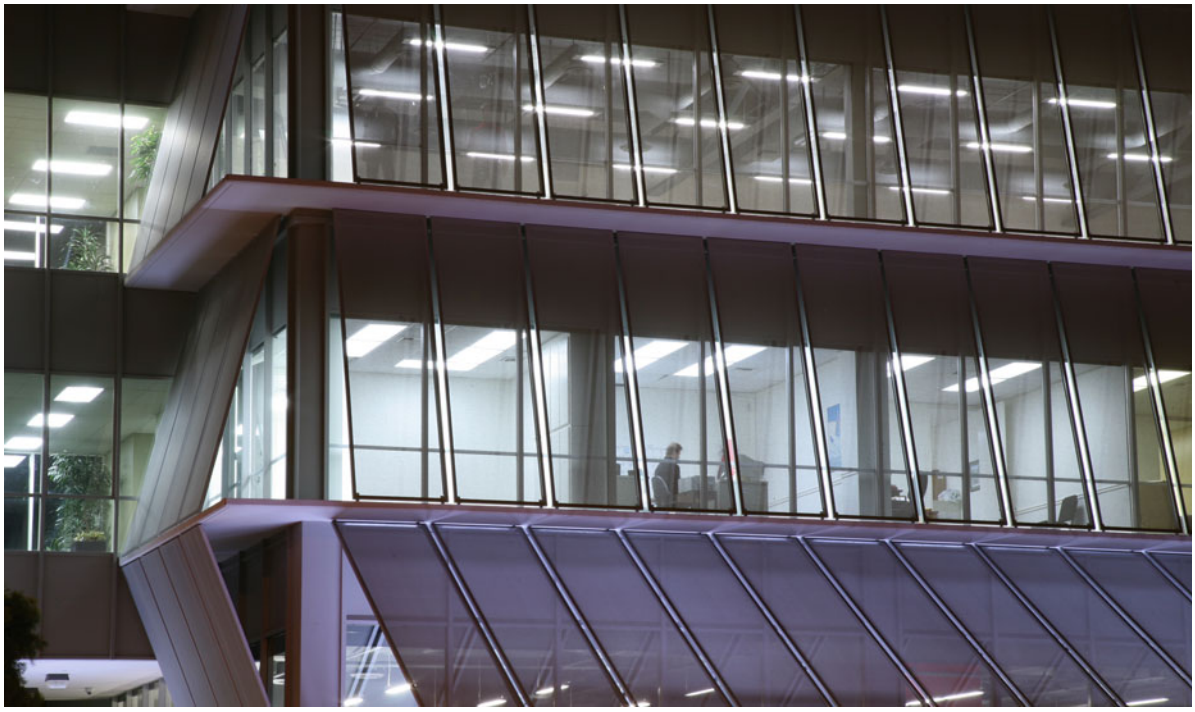
608
608 SILVER SPUR
BMA SECURITIES




608

Horizon Serono

Geneva, Switzerland

2004

Murphy / Jahn

www.murphyjahn.com

The Horizon Serono facility is home to the biotechnology company created in 2006 by merging Serono pharmaceuticals with the Ethicals division of Merck KGaA. The new entity, Merck Serono S.A. has its headquarters in the campus-like array of existing buildings and new structures which occupy an entire city block in Geneva, (Fig. 3, Fig. 5).

This aspirational project was designed by the architects Murphy / Jahn, a practice which was also forged by the merging of international talents when German born architect Helmut Jahn emigrated to Chicago and joined C. F. Murphy Associates in 1967. Murphy / Jahn came into existence in 1981 and, despite the death of Murphy in 1985, has maintained its Chicago base. Jahn has subsequently developed the practice globally with projects in its international portfolio such as the Suvarnabhumi Airport in Bangkok, Thailand.

After becoming the location for the Headquarters of The League of Nations in 1919, Geneva, Switzerland came to be regarded as an international city. Since 1946 it has also been the European Headquarters of the United Nations. Consequently, around 45% of Geneva's population are foreign nationals, originating from approximately 180 different countries.

The history of the Horizon Serono site can be traced back to 1892 and the development of electrical power in the city. At its previous zenith in the 1950's the dense urban nature of the site was characterised by the solidity and industrial quality of the buildings, which is still evident today in those refurbished as an integral part of the new scheme, (Fig. 1, Fig. 5).

Population | 187,697

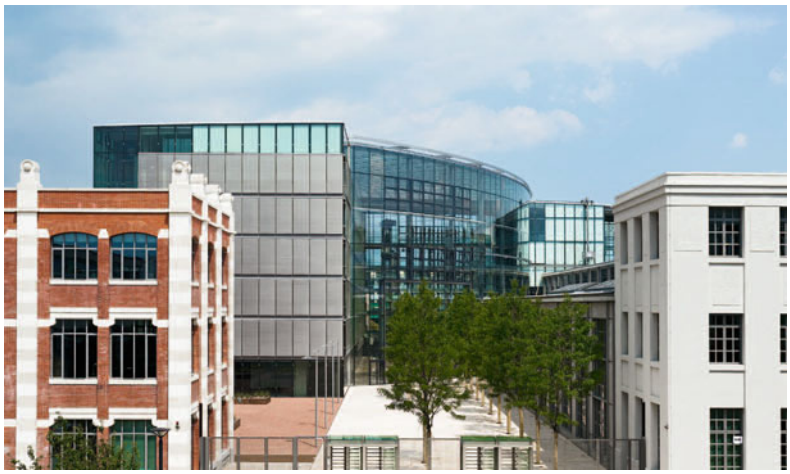
Coordinates | 46°12' N 6°09' E

Elevation | 375 m (1,230 ft)

Precipitation | 954 mm (37.56 ")

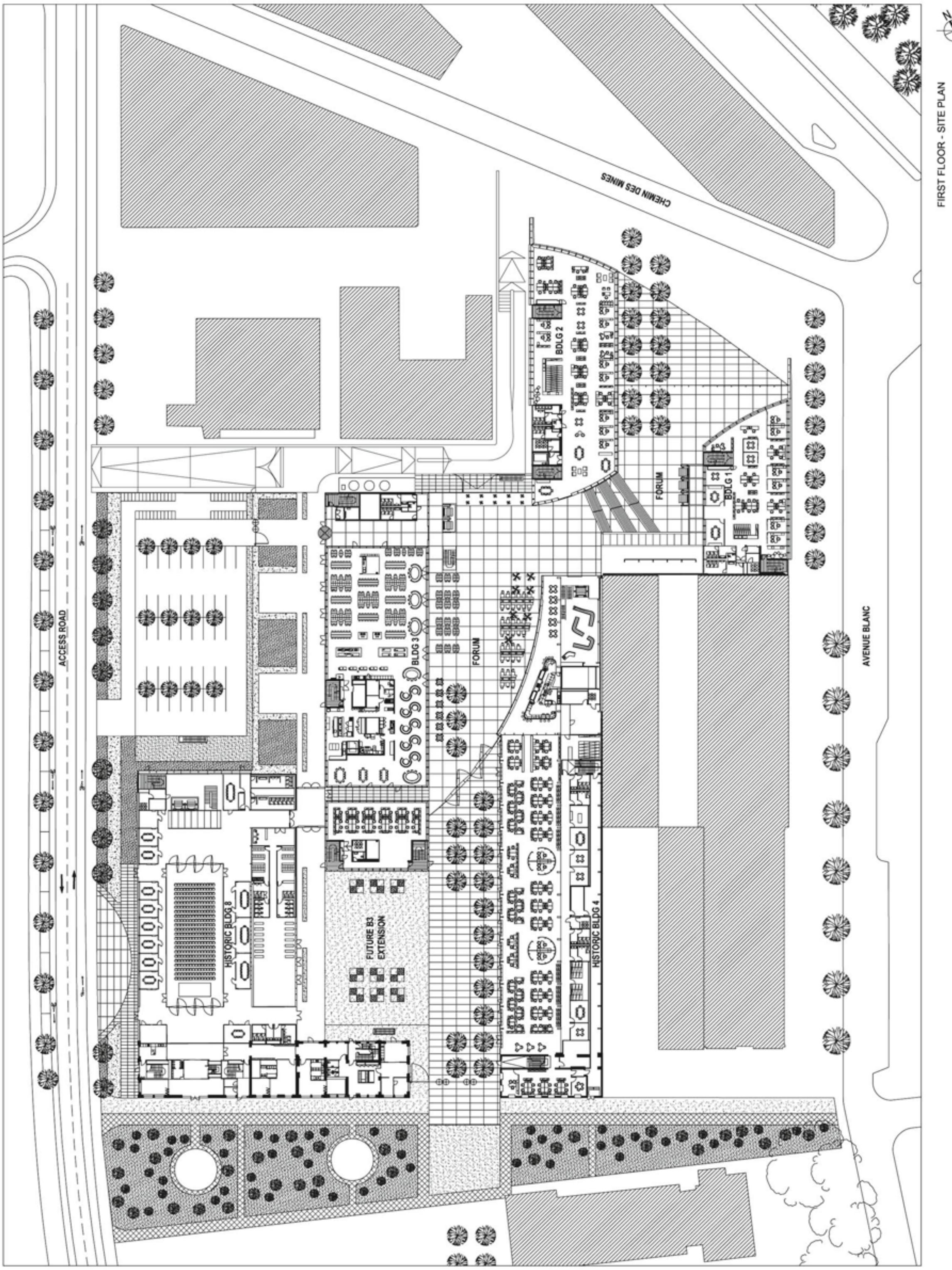
Temperature | Average High: 14.4 C (58 F)
Average Low: 5.5 C (42 F)

Humidity | 75.8 %



104 Horizon Serono | Geneva | Switzerland | Fig. 1 above | Fig. 2 opposite

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_13, © Springer Science+Business Media B.V. 2011


ACCESS ROAD
CHEMIN DES MINES
BDLG 2
BDLG 1
FORUM
BLDG 3
FORUM
HISTORIC BLDG 8
FUTURE B3 EXTENSION
HISTORIC BLDG 4
AVENUE BLANC
FIRST FLOOR - SITE PLAN
0
15
30 M

The task for Murphy / Jahn was clear; to retain the existing historic buildings on the site and simultaneously establish a new identity and continuity throughout the complex plot. (Fig. 1, Fig. 3, Fig. 5)

The strategically designed link between old and new structures is the 'Mainstreet'. This lively element is open to the weather along its length and sheltered at one end by an immense transparent curved screen windshield. This screen protects a wide plaza which is also covered by a cantilevered steel and glass canopy roof and bordered by new glazed building facades (Fig. 2, Fig. 9).

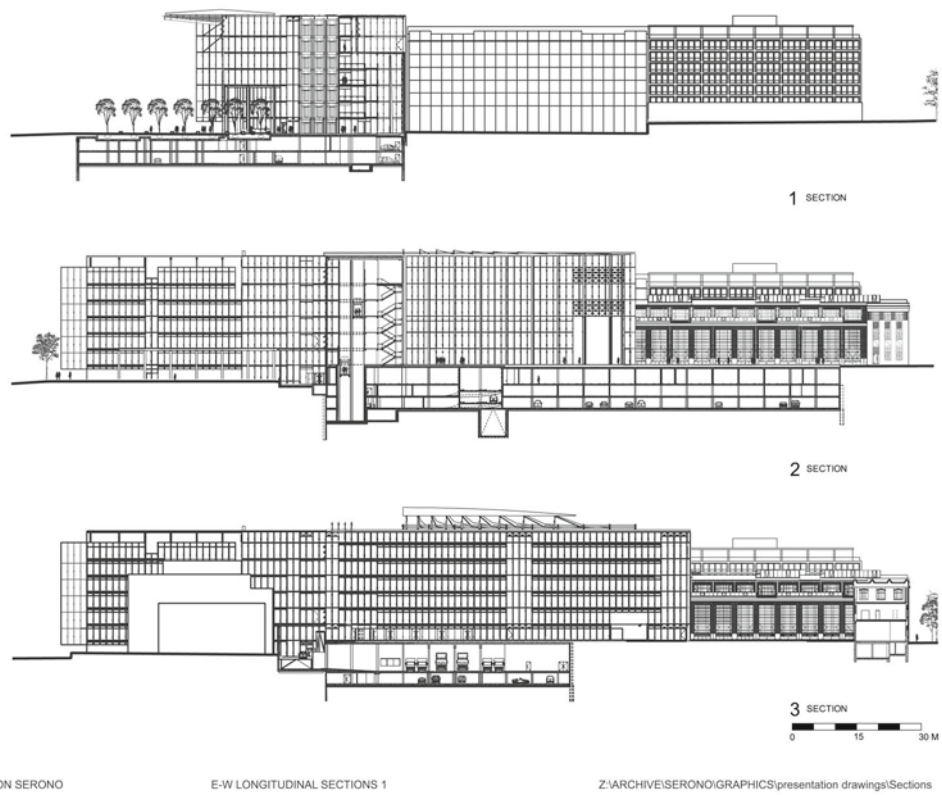
The plaza is sheltered, yet open and breathable, as the windshield is fitted with tall pivoting glass doors which are used to modulate the temperature inside. Similarly, the overhanging, counterbalanced glass canopy roof can be tilted open by hydraulic jacks (Fig. 11). Helmut Jahn compares this to the sun roof of a car.

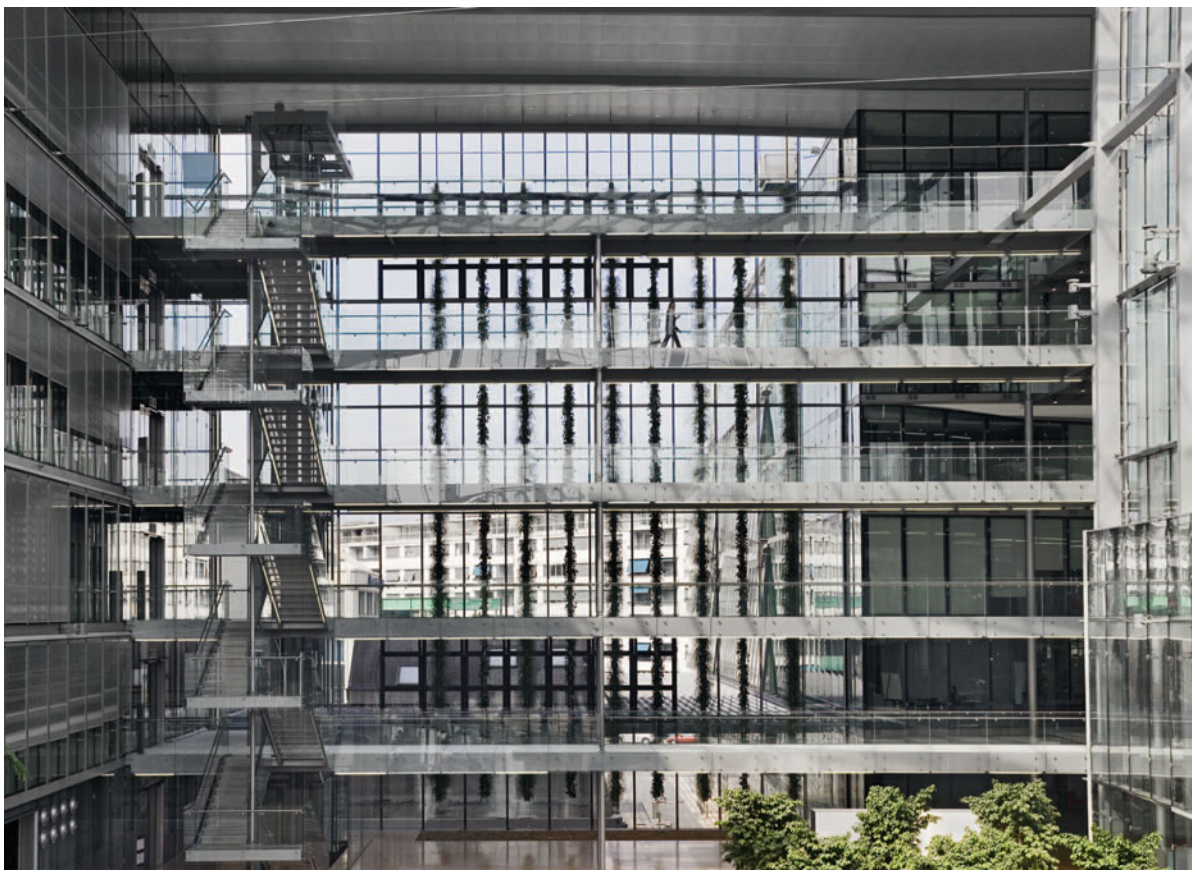
The combined ventilation system is indeed reminiscent of those employed in early saloon cars (i.e. balancing cooling air flow via pivoting quarter light windows and tilting / sliding sun roofs) prior to the introduction of high fuel consuming air conditioning units.

There is a constant movement of employees and visitors through the courtyards, bridges and hallways. The avenues and plazas are generously punctuated by trees redolent of the arboretums which border the adjacent Lac Leman.

This pleasant, communal environment was designed to help promote the interaction and collaboration between employees who were previously housed in separate sites.

The glazed building facades which form the sides of the avenues and plazas create an appropriate boundary between the internalised research and headquarters facilities and the more public open spaces. From within the building the working day is enhanced by the views afforded by the full height fenestration.





The construction, appearance and performance of the new buildings reflect Serono's scientific and technological ethos. Most evident is the use of daylight, natural ventilation and solar energy.

The strategy for heating and cooling includes utilising the nearby resource of Lac Leman. Lake water at a constant temperature is drawn and returned from a 30 metre depth and conditioned via heat exchangers or heat pumps to cool or warm the spaces within the buildings. Studies were undertaken at the Ecole Polytechnique of Lausanne to ensure that the returned water would not be detrimental to the lake's ecosystem.

These naturally occurring resources are combined with high technology control systems to enable the building's climate modulation. The result is a comfortable, pleasant place of work with low energy requirements and low emissions.

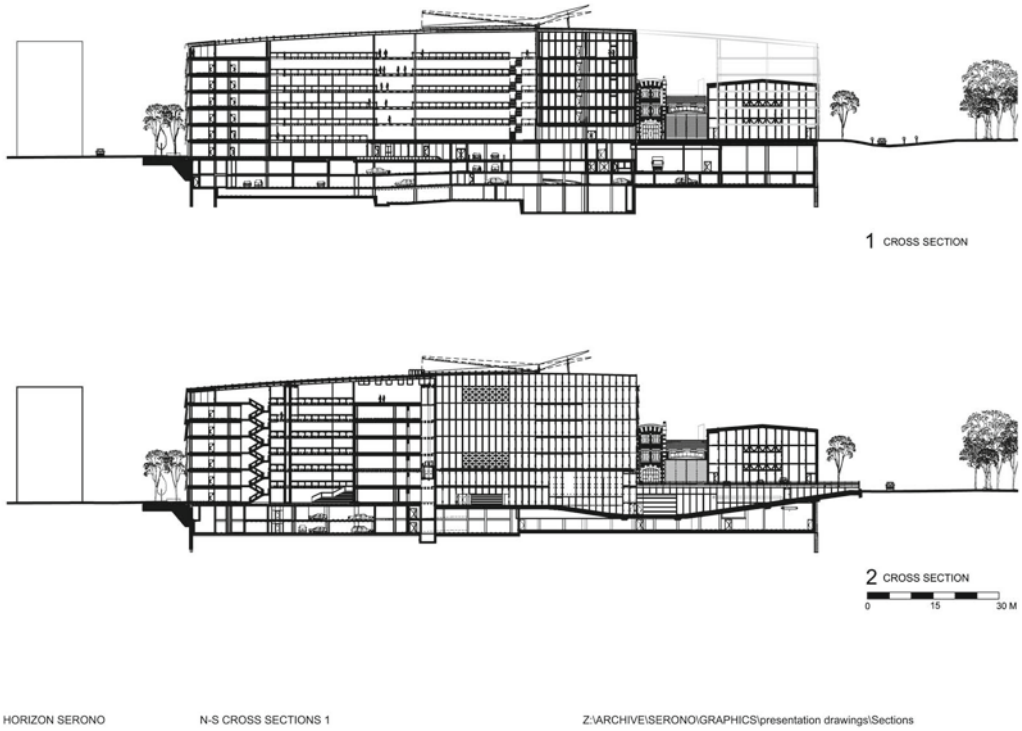
Murphy / Jahn's "archigreen" mission statement commits the practice to environmental responsibility through the "elimination of the inessential". The pared down approach to the design of Horizon Serono has compound benefits, including the aesthetic continuity of the site's protected industrial heritage.

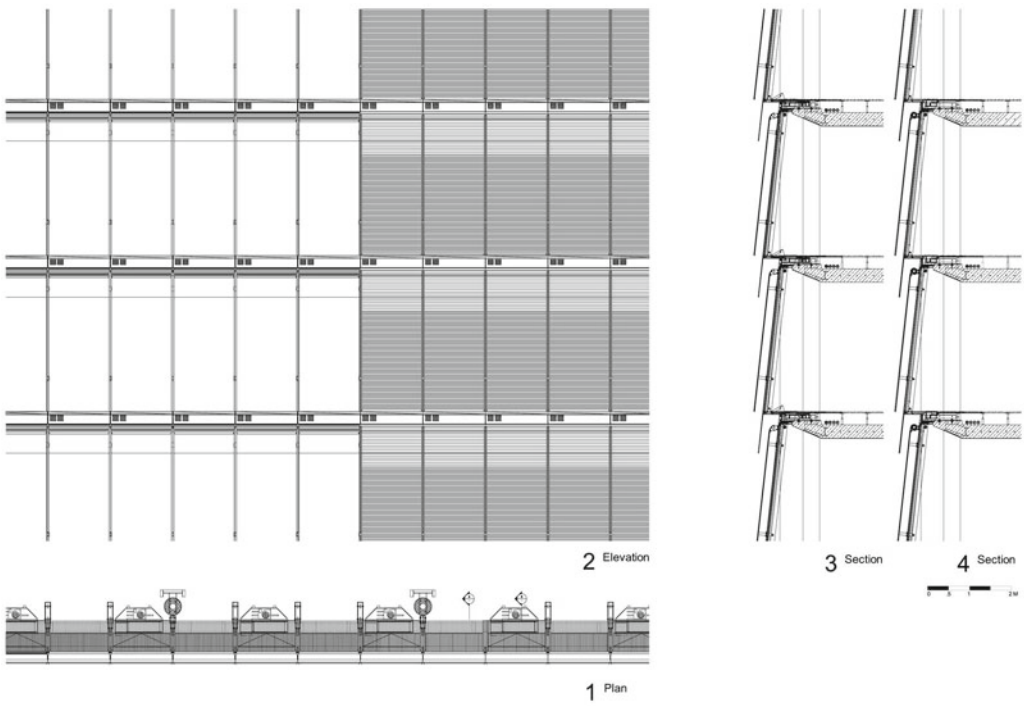
The interiors of the new facility were carefully tempered and made livable through considered interior design strategies led by McKay and Partners of London.

The combination of engineering and architectural design is also evident in the facade systems employed at Horizon Serono (Fig. 13, 14, 15).

The facade's glass panels are canted and overlapped like shingles. The overlap shields rain from the floor level ventilation flaps which are connected to the raised floor voids above the active structural floor slabs. The slabs are exposed to the underside.

Additionally, the overlapping glass covers a mechanism for operating the stainless steel external shades. The components for heating, cooling and shading are fully integrated into the building management system which allows some degree of local control by the building's occupants.




2 Elevation
3 Section
4 Section
1 Plan
HORIZON SERONO
Facade System 1.0
ARCHIVE/SERONO/GRAPHICS/presentation drawings/details

Near North Apartments

Chicago, USA

2007

Murphy / Jahn

www.murphyjahn.com

"The Windy City" may refer to Chicago politician's ability to boast about their city's merits. However, it is also true that Chicago's winters are cold, and very windy. Harnessing that wind power through roof-mounted turbines is only one of the innovative technologies being employed at Near North Apartments.

The development, by Mercy Housing Lakefront, represents the changing face of the city's supportive housing, following policy initiatives by Mayor Richard Daley. The project was designed to achieve a LEED Silver rating. Architects, Murphy / Jahn, combined pioneering energy and water saving technologies with functional architecture to enable the goal to be reached.

In aspiring to improve the quality of affordable housing in the area, it was hoped that the lives of the residents would be improved. As a consequence, a previously blighted area of the city would be uplifted.

The four storey building was aligned to Clybourn Avenue with the triangular remainder of the plot being utilised for parking and landscaped outdoor space for tenants (Fig. 1, Fig. 5, Fig. 6).

These external works aimed to maximise permeable surface area and minimise sub-surface drainage systems. Rainwater is collected and stored for site maintenance and irrigation. Chicago's historical use of the freshwater resource of Lake Michigan is no longer taken for granted.

The glass wall end facade (Fig. 2) provides natural daylight to the stairwell, promoting a feeling of security, and a connection to the outdoors. At night this elevation has a luminous appearance.

Population | 2,853,114

Coordinates | 41°50' 13" N
87°41' 4"W

Elevation | 182 m (597')

Precipitation | 974.1 mm (38.23")

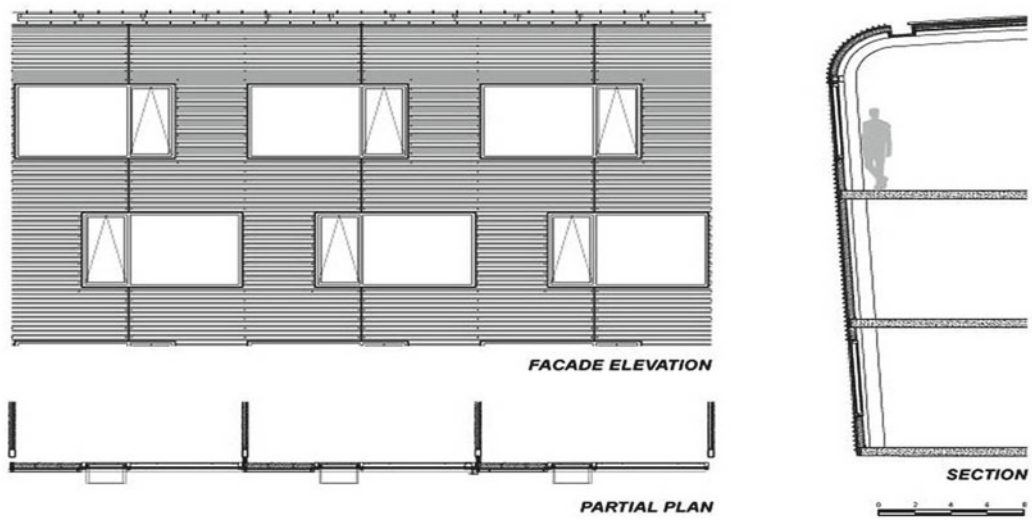
Temperature | Average High:
15.27 C (59.5 F)
Average Low:
5.77 C (42.4 F)

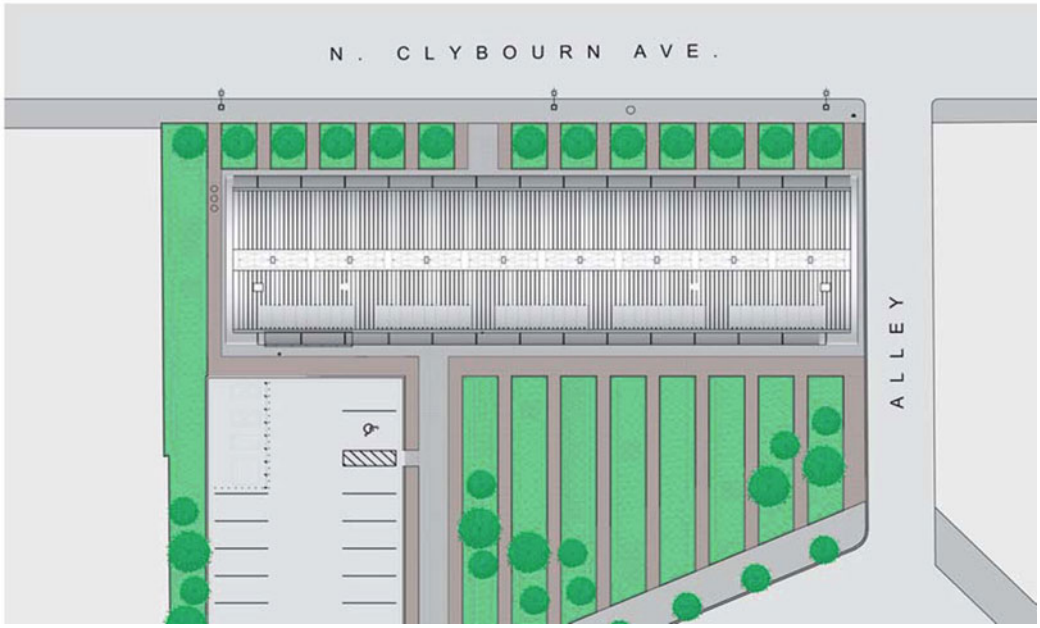
Humidity | 71 %

116 Near North Apartments | Chicago | USA | Fig. 1 above | Fig. 2 opposite

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_14,

Fig. 3 below




N. CLYBOURN AVE.
ALLEY

The apartment building provides 96 self contained living units, varying in size from 270 to 300 square feet. Every unit has its own kitchen and bathroom. The total floor area is 47,000 square feet, with the ground floor providing most of the utilities for the residents including a community room, bicycle store, laundry and pantry (Fig. 10).

Murphy/Jahn's philosophy of greening through minimalism is evident in the architecture. For example, the concrete structure remains visible, eliminating the need for further finishing materials (Fig. 8, Fig. 9).

This, combined with the stainless steel facade, provides a sustainable, fit for purpose contemporary building (Fig. 3, Fig. 4).

The interior surfaces, which require secondary finishes, employ materials with low or zero content of volatile organic compounds (VOCs) (Fig. 8, Fig. 9, Fig. 13, Fig. 14).

The Near North apartments are also pioneering grey water technologies. Water used for showering and washing is captured, filtered and recycled for the flushing of toilets.

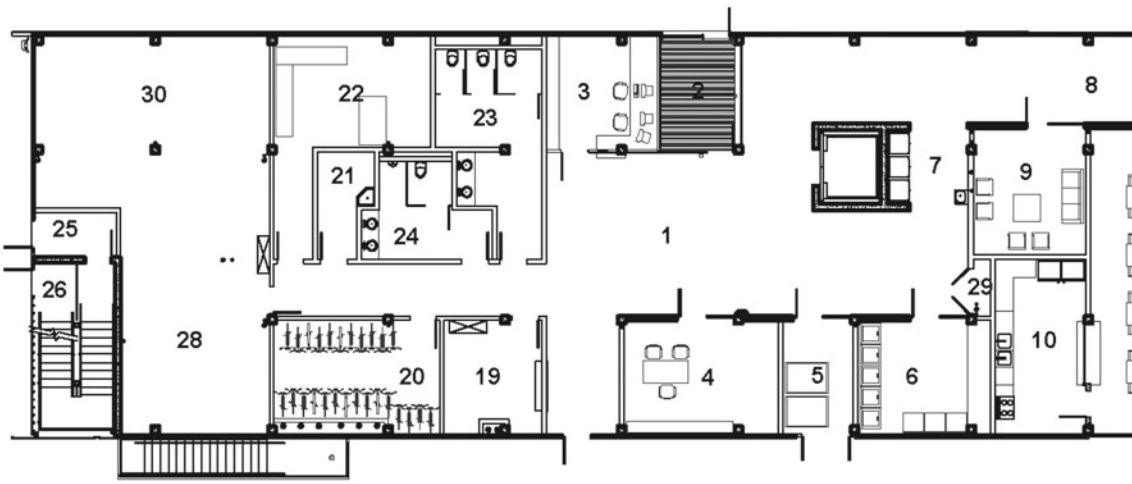
Mechanical and electrical systems provide individual heating and cooling for the residential units and the common areas.

The roof-mounted solar energy units and wind turbines are designed to supplement these conventional energy requirements. The building's orientation and its curved roof profile are an integral part of the strategy to enhance the efficiency of the wind turbine units (Fig. 7).

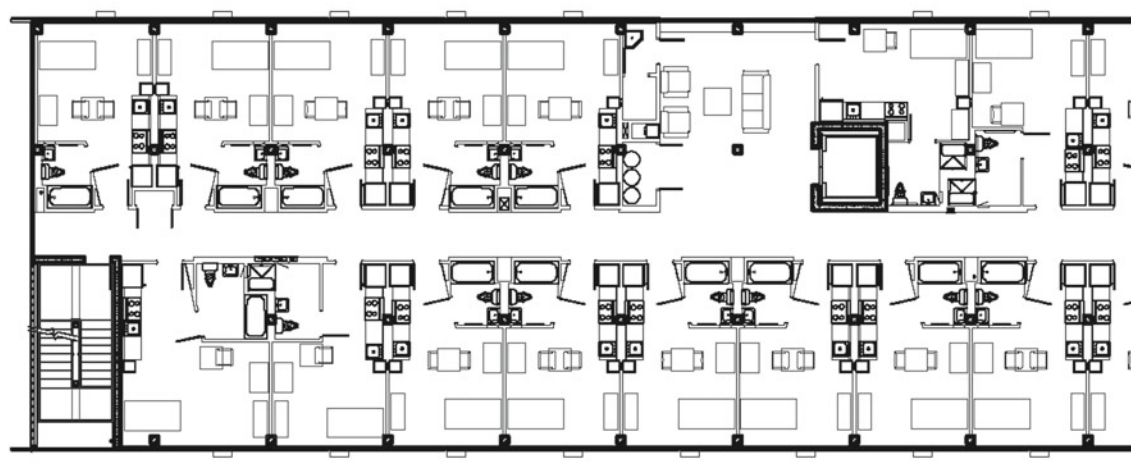
The combined technologies are being evaluated and monitored by the building's owners and managers.

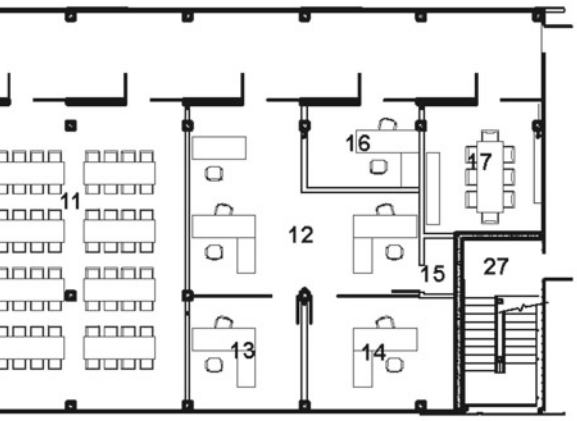
Rental incomes for the supported housing schemes are necessarily low. Therefore, the city, its developers and their residents all have a vested interest in energy efficiencies lowering running costs for the building.

New residents are inducted into the building and well informed of its positive attributes.



KEY					
1	LOBBY	11	COMMUNITY ROOM	22	MAINTENANCE OFF
2	VESTIBULE	12	CASE MANAGEMENT OFFICE	23	PUBLIC TIOLET - W
3	RECEPTION - DESK CLERK	13	OFFICE	24	PUBLIC TIOLET - M
4	PROPERTY MANAGEMENT OFFICE	14	OFFICE	25	VESTIBULE
5	TRASH AND RECYCLING ROOM	15	STORAGE	26	WEST STAIRWELL
6	LAUNDRY ROOM	16	OFFICE	27	EAST STAIRWELL
7	VENDING MACHINES	17	CONFERENCE ROOM	28	STORAGE
8	CORRIDOR	18	CORRIDOR	29	ELECTRICAL CLOS
9	SMOKING LOUNGE	19	MAIL ROOM	30	MECHANICAL ROO
10	PANTRY	20	BICYCLE ROOM		
		21	JANITOR CLOSET		



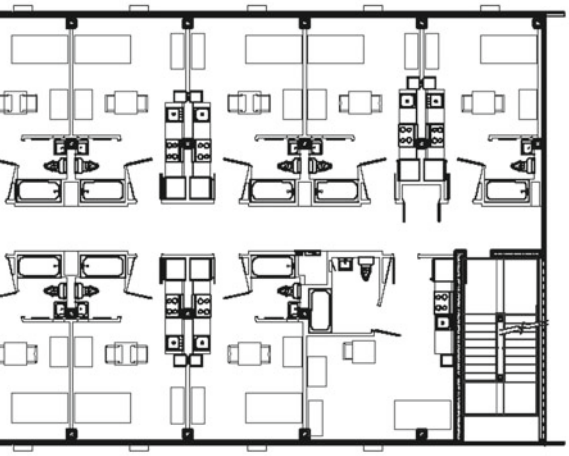


ICE - SHOP
OMEN
EN

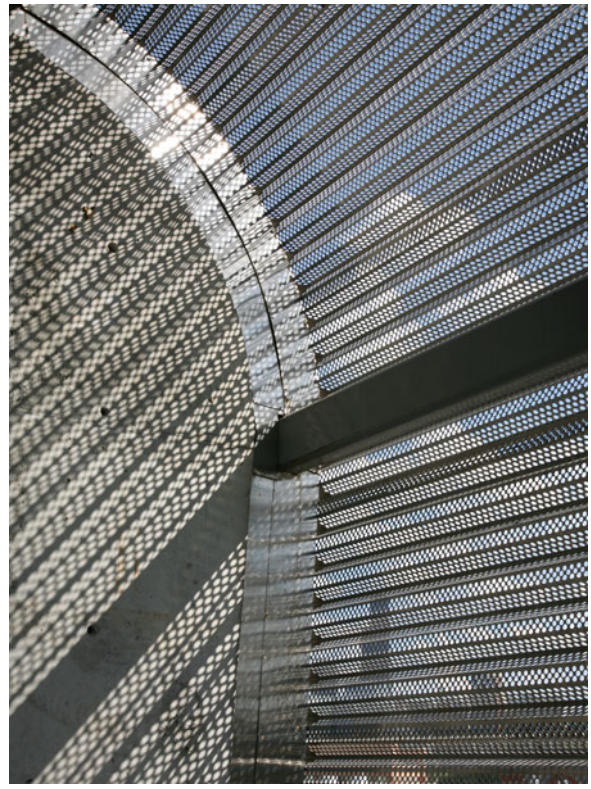
GROUND FLOOR PLAN

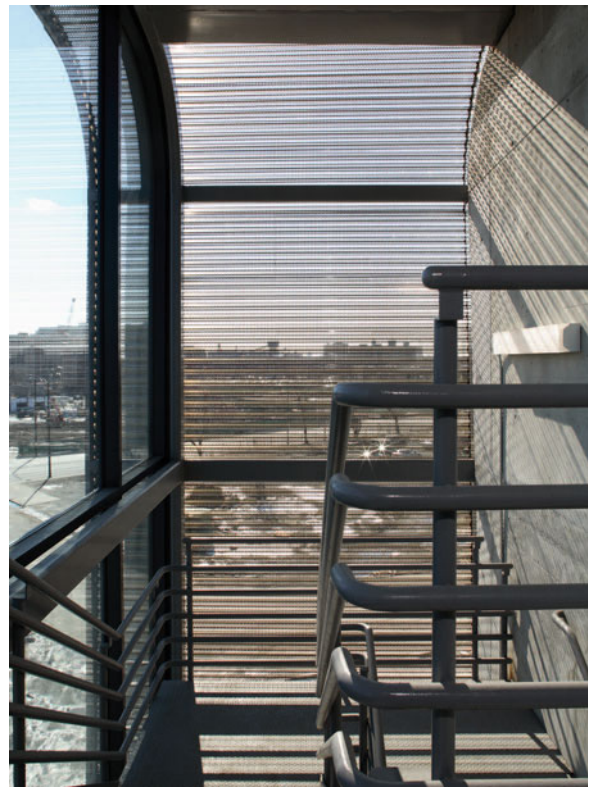
0 5 10 15 20

ET
M



TYPICAL FLOOR PLAN





Lavarack Barracks

Townsville, Australia

2005

BVN Architecture

www.bvn.com.au

The City of Townsville, in the state of Queensland, is located on Australia's north-eastern coast. The city is considered as the unofficial capital of North Queensland and is home to government and civic administration offices for the northern part of the state. Magnetic Island and the central section of the Great Barrier Reef lie offshore in the Coral Sea.

The climate is classified as tropical savannah. In winter, south east trade winds combined with Townsville's east/west coastline produce less rain than in other tropical cities such as Cairns where the coastline runs north/south producing a lift effect and high rainfall figures.

Townsville's development relies on the Ross River Dam at Five Head Creek as the major water storage facility for the urban areas.

Urban development is continuing outside of the Central Business District to the north and west of Townsville including the North Shore Estate housing development. To the south, a satellite city called Rocky Springs will eventually house 55,000 people.

Five kilometres to the south of Townsville, another satellite development is being constructed in three stages to house the Australian Army's 3rd Brigade, the Defence Force's ready deployment unit.

The original Lavarack Barracks development was established here in 1965-1966, surrounded by the ruggedly beautiful landscape of the foothills of Mount Stuart.

Stage 2 of the redevelopment includes 1,112 new Living-in Accommodation units.

Population | 175,542 (2008)

Coordinates: | 19°15'23"S
146°49'6"E

Elevation: | 4 m (9.84')

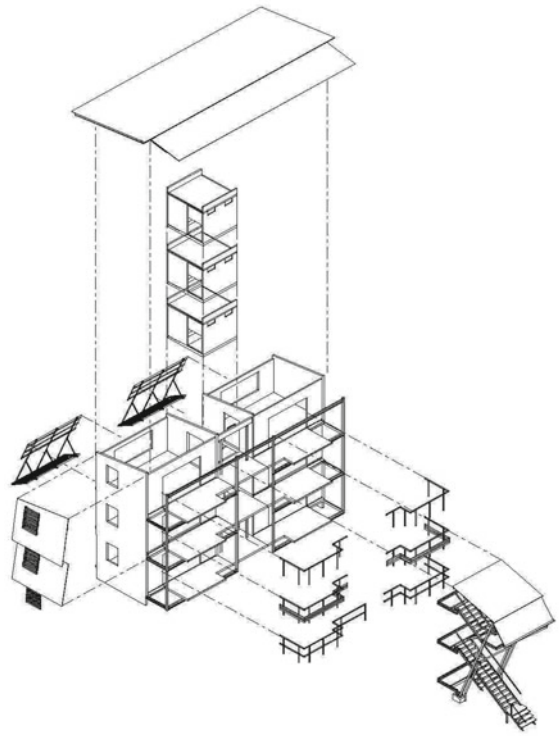
Precipitation: |1137.3 mm (44.7")

Temperature: | Average High:
28.9 C 84 F
Average Low:
19.8 C 68 F

Humidity: | 66%

126 Lavarack Barracks | Townsville | Australia | Fig. 1 above | Fig. 2 opposite

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_15, © Springer Science+Business Media B.V. 2011



LAVARACK BARRACKS STAGE 2
LIVE-IN ACCOMMODATION & MESSES

High Voller Nield

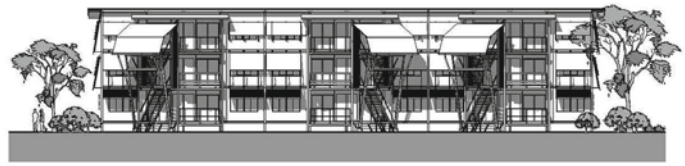
Fig. 3 above | Fig. 4 below

LAVARACK BARRACKS STAGE 2
LIVE-IN ACCOMMODATION & MESSES

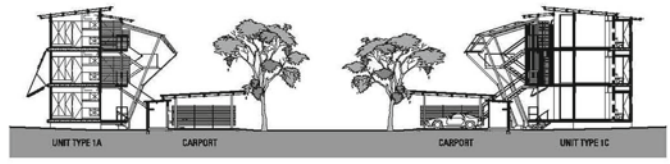
High Voller Nield

WEST PRECINCT

UNIT TYPE 1A - 18no.UNIT BLOCK
FRONT ELEVATION WITH CARPORTS



UNIT TYPE 1C - 18no.UNIT BLOCK
FRONT ELEVATION



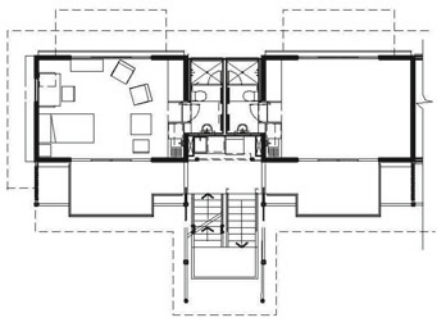
TYPICAL CLUSTER SECTION

LAWARACK BARRACKS STAGE 2
LIVE-IN ACCOMMODATION & MESSES

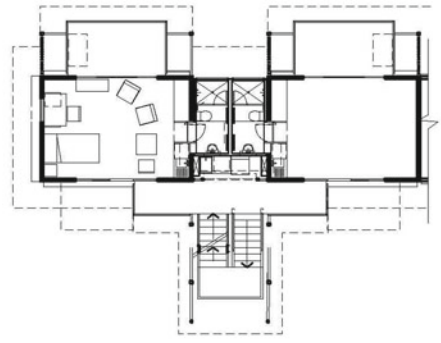
High Voller Nield

LIVE-IN ACCOMMODATION
TYPICAL 'OTHER RANKS' ELEVATIONS AND CLUSTER SECTION

Fig. 5 above | Fig. 6 below



UNIT TYPE 1A



UNIT TYPE 1B

UNIT TYPE 1C

LAWARACK BARRACKS STAGE 2
LIVE-IN ACCOMMODATION & MESSES

High Voller Nield

TYPICAL FLOOR PLANS - 'OTHER RANK' UNITS

The overall development was designed as three distinct residential precincts. Clustered groups of units provide a strong neighbourhood feel and engender community spirit. Open spaces connecting the clusters include formal parkland, private open space and natural landscape. Pathways and streets connect the residential, recreational and social meeting areas (Fig. 8).

The placement and orientation of the housing appears to be random in the surrounding landscape, however, they are in fact placed to respond to the topography of the site and its planned axis. The residents enjoy spectacular views of creeks, lagoons, mature trees and distant mountains (Fig. 7).

The large scale of the development, combined with the compressed programme, provided an opportunity to prefabricate the various components off site. Factory built wall units, bathroom modules and joinery facilitate quick assembly on site using craneage. This approach had many advantages including increased quality control and minimising the impact of the reduced construction process on the site's natural environment (Fig. 7).

Minimising the disturbance to the ground contours, protecting native fauna, wildlife habitat and corridors was achieved by mainly keeping the ground floors free from housing units (Fig. 8, Fig. 9, Fig. 10). This policy helped to maintain uninterrupted natural overland flows. Storm water runoff follows the existing ground contours into natural riparian systems.

The floor plans of the modular units were kept narrow to maximise natural ventilation along with minimal east-west sun exposure. Siding materials were selected for low maintenance and cost efficiency. Nett useable floor area has been maximised by utilising external, exposed pre-fabricated staircases with landings shaded by overhanging canopies (Fig. 8, Fig. 9).

These suspended aerial staircases further enhance the communal, walkable, neighbourhood element of the transitional areas. The overhanging roofing provides protective rain shelter and sun shading for the outdoor private balconies (Fig. 9, Fig. 10).

Lavarack Barracks units are fitted throughout with low energy electrical systems and water saving plumbing fittings.

The BVN project, in association with Troppo Architects, has received many awards including the Queensland RAIA Harry Marks Award for Sustainable Architecture.

Fig. 7 above | Fig. 8 below

Fig. 10 above | Fig. 11 below

Urban Canyon

Seattle, USA

2009

b9 architects inc.

www.b9architects.com

Urban Canyon is a speculative housing development of seven homes designed with community living in mind. Although purely residential, the massing and shape of the buildings, along with the linked pedestrian walkways and shared outdoor spaces, generates the ambience of village life.

The buildings are carefully oriented to provide natural light and cross ventilation from a minimum of three sides per unit, whilst considering the privacy of the individual homeowners. To maximise the planned allowable density of the site, the largest mass is located at the corner, diminishing along the lengths of the streetscape toward the adjacent, existing single-family dwellings.

When the previous homes on the site were dismantled the bricks were salvaged, cleaned and used to lay the footpaths which meander door to door throughout the canyon, (Fig. 2, and Item 6. on Fig. 5). Similarly, concrete broken out from the 19th Avenue sidewalk was re-used to construct the permeable "hard" landscaped areas detailed on the architect's plan. The 19th Avenue sidewalk was reconstructed with a planting strip to accommodate three new trees (Fig. 4, Fig. 5).

The recycling theme continues with locally sourced Douglas fir siding, further enhancing the warm rustic feel of the architecture.

Parking is restricted to the periphery of the plot, maximising and protecting the pedestrianised and soft landscaped areas within the urban village. By segregating motor transport and pedestrians, the inhabitants inevitably meet along the pathways to their homes. The provision within the development of a shared food garden (Fig. 5 Pea Patch) completes the community design philosophy.

Population | 617,334

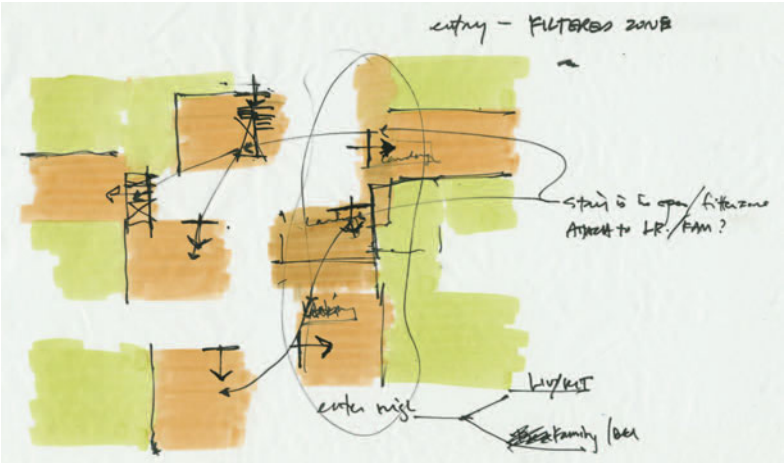
Coordinates | 47°36'35"N
122°19'59"W

Elevation | 0–158 m (0–520')

Precipitation | 919 mm (36.2")

Temperature | Average High:
24 C (75 F)
Average Low:
2 C (36 F)

Humidity | 70 %



J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_16, © Springer Science+Business Media B.V. 2011

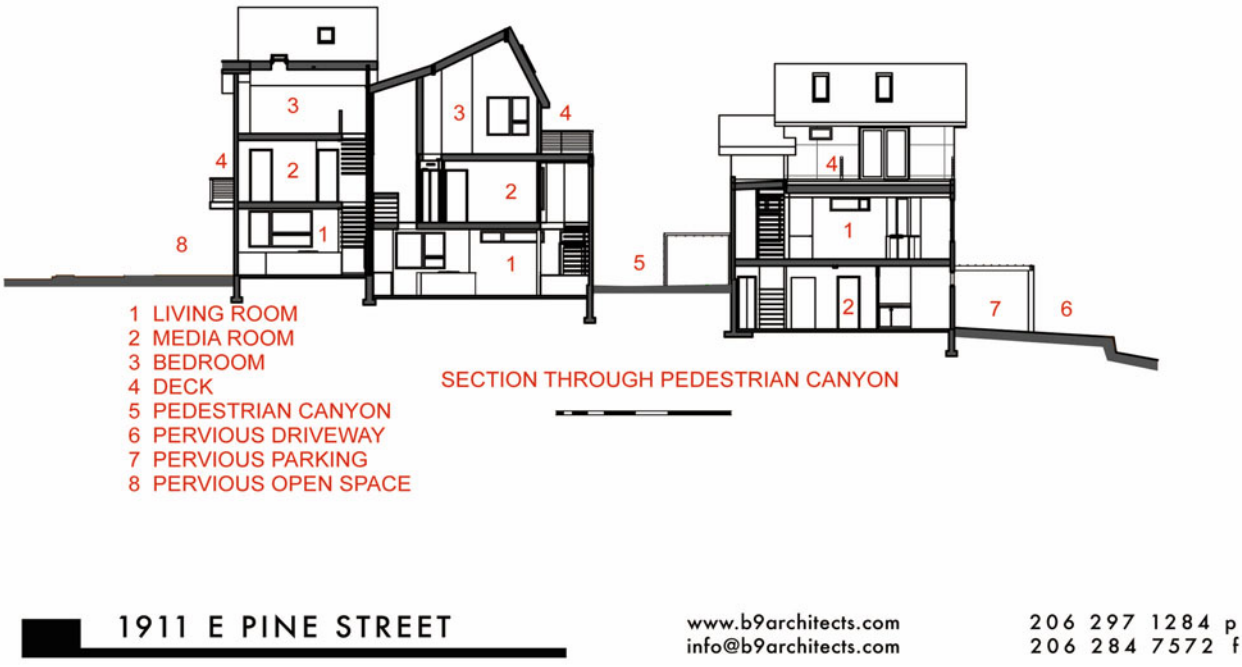
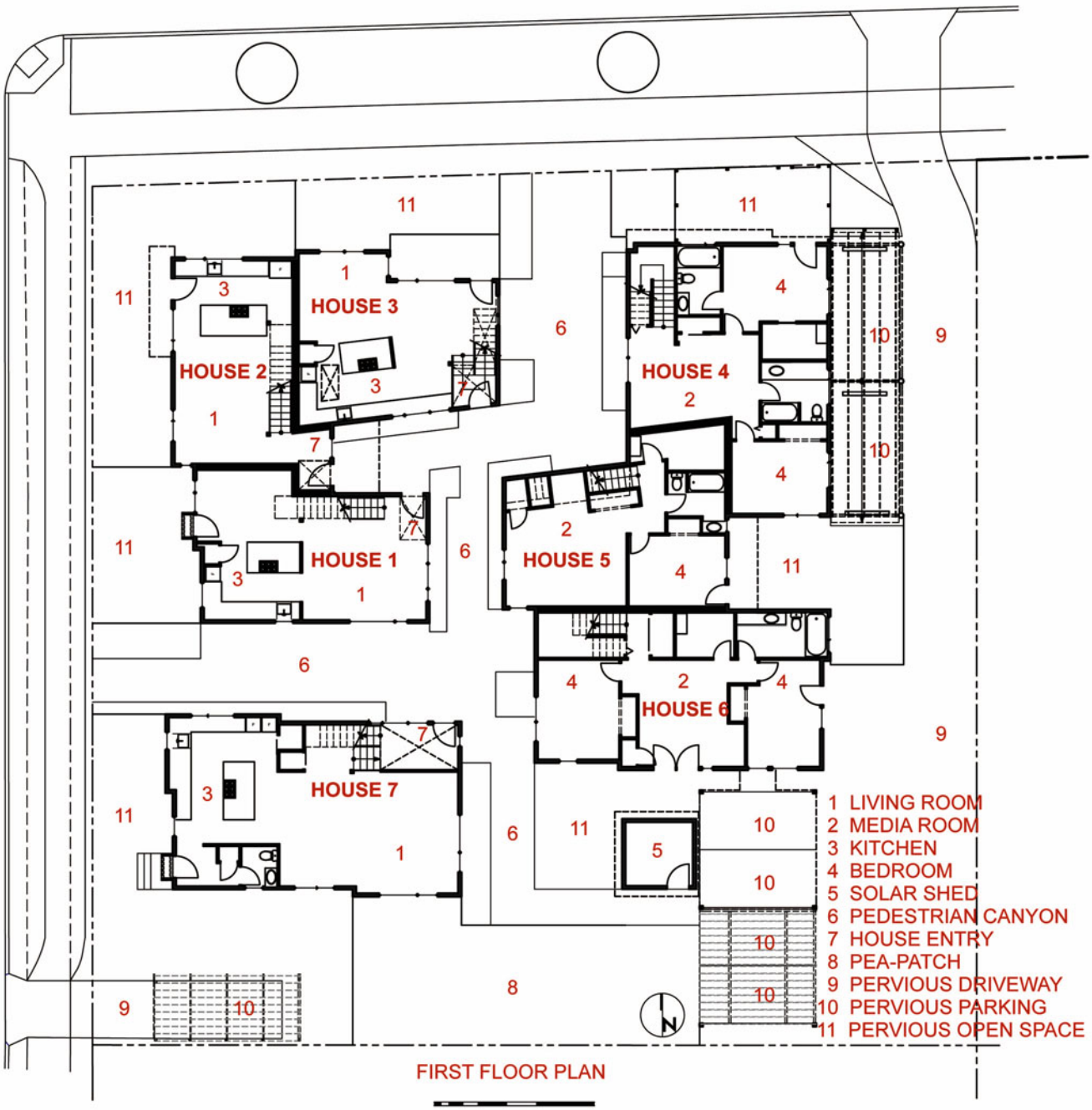


Fig. 3 above | Fig. 4 below | Fig. 5 Architect's Plan opposite



FIRST FLOOR PLAN

1911 E PINE STREET

www.b9architects.com
info@b9architects.com

206 297 1284 p
206 284 7572 f

The balance between exterior glazed walls and solid party walls was used as a strategy to reduce energy consumption. Additional insulation to the walls and vaulted ceilings further increased the ability to retain heat energy.

Pre-heating of domestic water and hydronic heating is supplemented by solar energised systems. This provides a minimum of 15% of the energy requirement for this task.

Photovoltaic units ranging in size from 1.4 kW to 2.9 kW, strategically placed around the site are designed to provide up to 17% of the energy requirement per unit. The photovoltaic unit installed on the bike shed provides power to the low level external footpath lighting system (Fig. 2) and generates income for site maintenance through sales to the local utility company.

The Urban Canyon housing units are modelled to be between 30% to 45% more energy efficient than comparable units designed to 2004 IECC compliance.

The multi-family project received a City of Seattle five star rating for sustainable design and construction. Further innovations include:

- 463 square feet of green roof area installed throughout five homes and carports (Fig. 7, Fig. 10).
- 1200 square feet of turf was removed from planting strips and replaced with low shrubbery, mulch, trees and pervious paving (Figs. 7, 8, 9.).
- 448 square feet of paperstone (re-cycled paper and resin composite) used throughout the development as countertops (Fig. 12).
- 485 square feet of Medite (100% recycled wood fibre) used in the manufacture of cabinetry, shelving and wall panels (Fig. 12).
- 5100 square feet of reclaimed/re-milled fir flooring used throughout the development. (Fig. 11).

The simple materials palette is informed by local supply, recyclable and recycled sources.

Urban Canyon as a housing scheme is more than the sum of its parts, largely due to the genetic intelligence of its homespun roots.

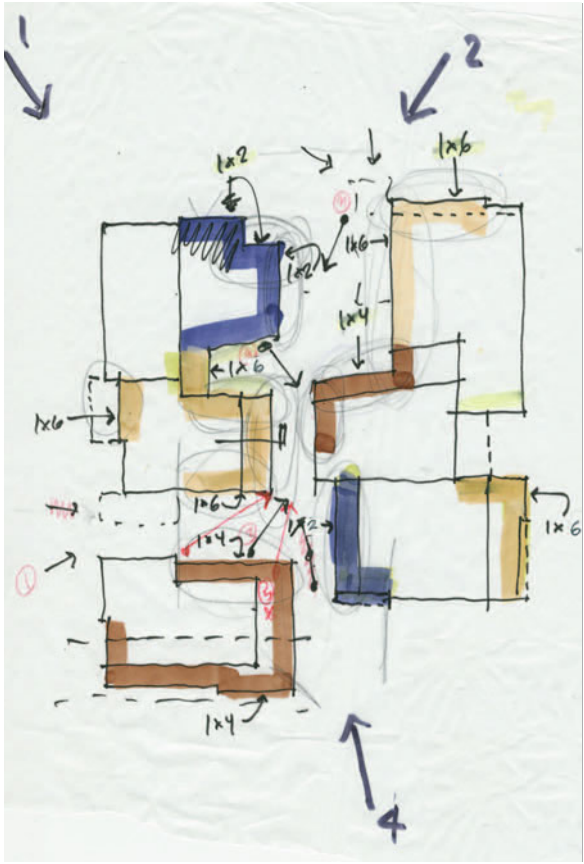
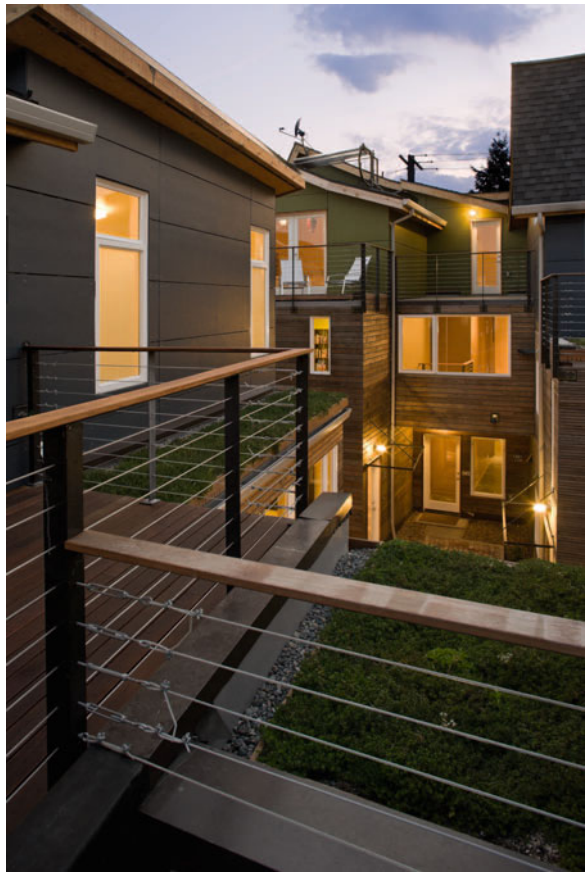


Fig. 8 below



Thin Flats

Philadelphia, USA

2009

Plumbob LLC

www.onionflats.com

Thin Flats, formerly a traditional Philadelphia housing row, is the site of a remarkably challenging experiment in ecological residential design.

The urban duplex form is normally a space devoid of natural light at its core and lacking connection with the elements at the peripheries. The introduction of a re-aligned facade, punctuated with glazing and cantilevered balconies, provides solutions to both these design challenges. The voids created between the realigned facade and the skin of the building allow sheltered outdoor spaces and cantilevered balconies to be created. The human movement to and from these spaces enlivens and animates the new building (Fig. 2).

Configuration and functionality of the floor space is arranged to maximise use of the available light and space, facilitated by the facade innovations (Figs. 3 to 8). Additional natural light is also transmitted from sky lights downwards through the core of the building via open tread stairwells, glazed balustrades and landing treads. (Figs. 9 to 11)

Thin Flat's roof area is a multi-functional space providing a much needed outdoor leisure area for residents and a south facing array of solar thermal panels to heat domestic hot water systems (Figs. 12, 13, 14). This water flows sparingly through flow restrictors to its end use via lagged storage and distribution pipes. The planted roof is integral to the storm water harvesting for irrigation (Figs. 14, 15)

The facade and energy efficient building envelope insulation details are illustrated in (Figs. 16 to 20).

Thin Flats are the first Leed-H Platinum duplex residences in the U.S.A.

Population | 1,540,351

Coordinates | 39°57'12"N
75°10'12"W

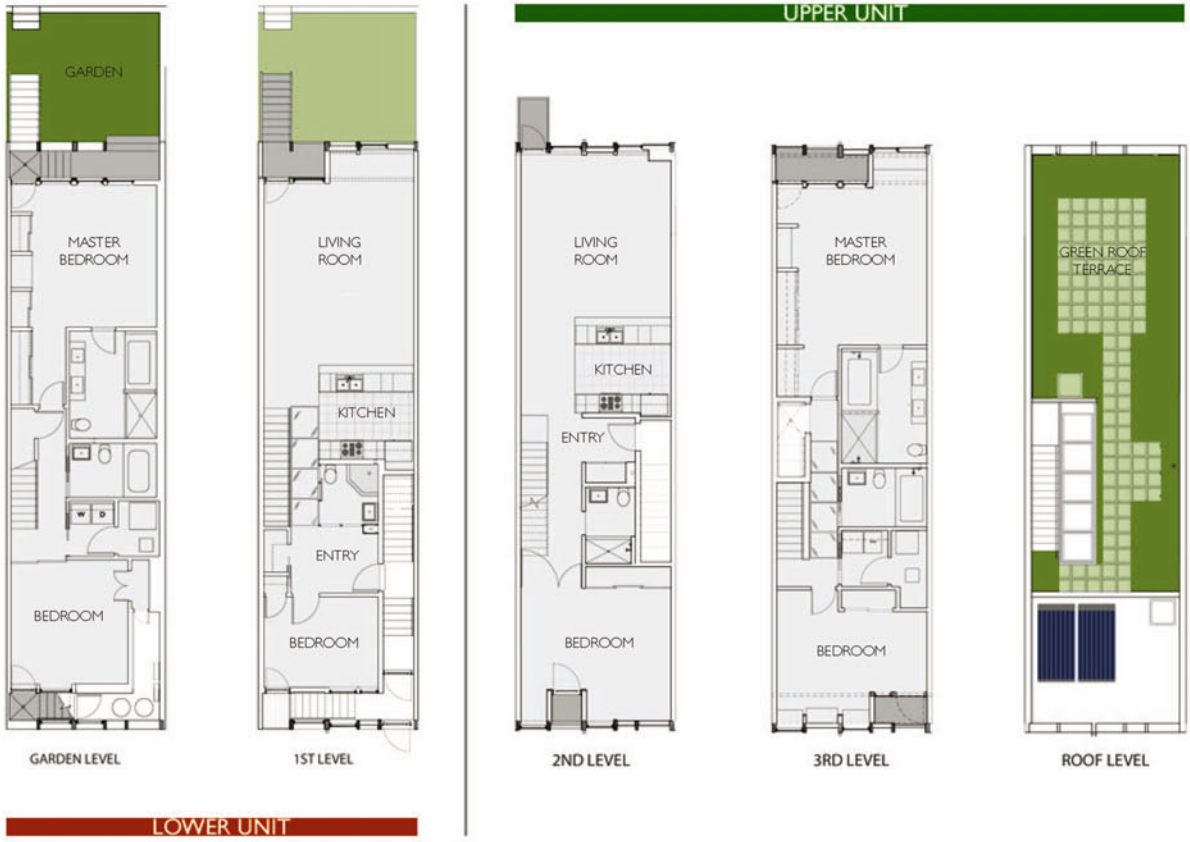
Elevation | 12 m (39')

Precipitation | 42.05 mm (1.068")

Temperature| Average High:
63.3 C (17.4 F)
Average Low:
47.6 C (8.7 F)

Humidity | 65.5%

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_17, © Springer Science+Business Media B.V. 2011


GARDEN
MASTER BEDROOM
BEDROOM
GARDEN LEVEL
LIVING ROOM
KITCHEN
ENTRY
BEDROOM
1ST LEVEL
LOWER UNIT
UPPER UNIT
LIVING ROOM
KITCHEN
ENTRY
BEDROOM
2ND LEVEL
MASTER BEDROOM
BEDROOM
3RD LEVEL
GREEN ROOF TERRACE
ROOF LEVEL

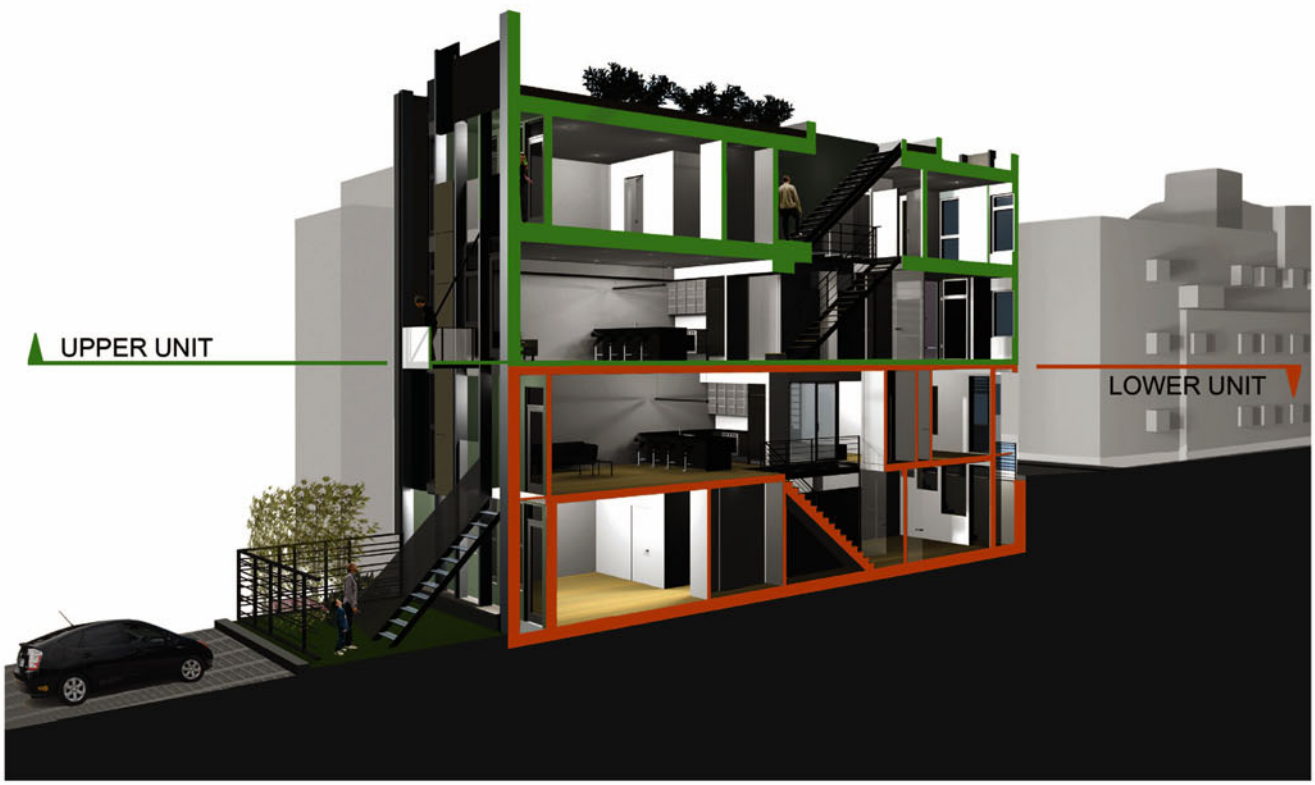
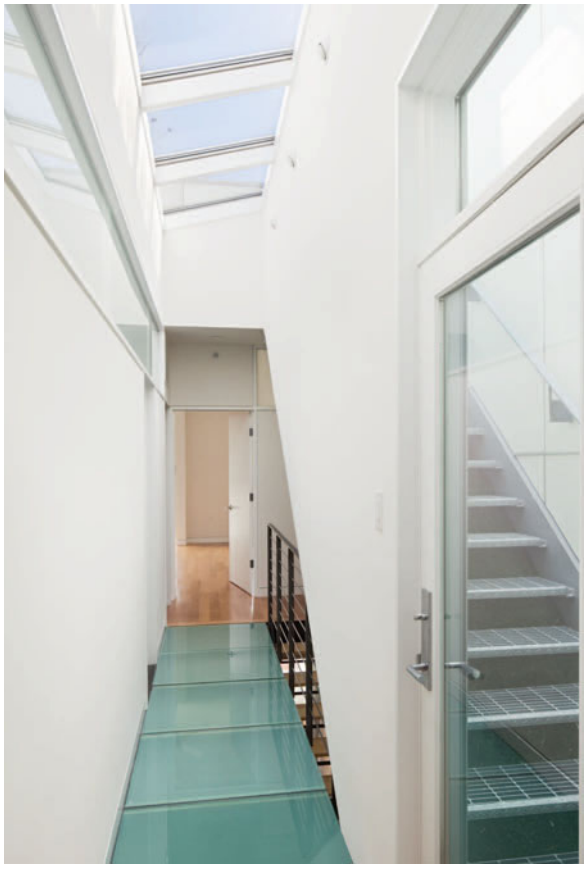
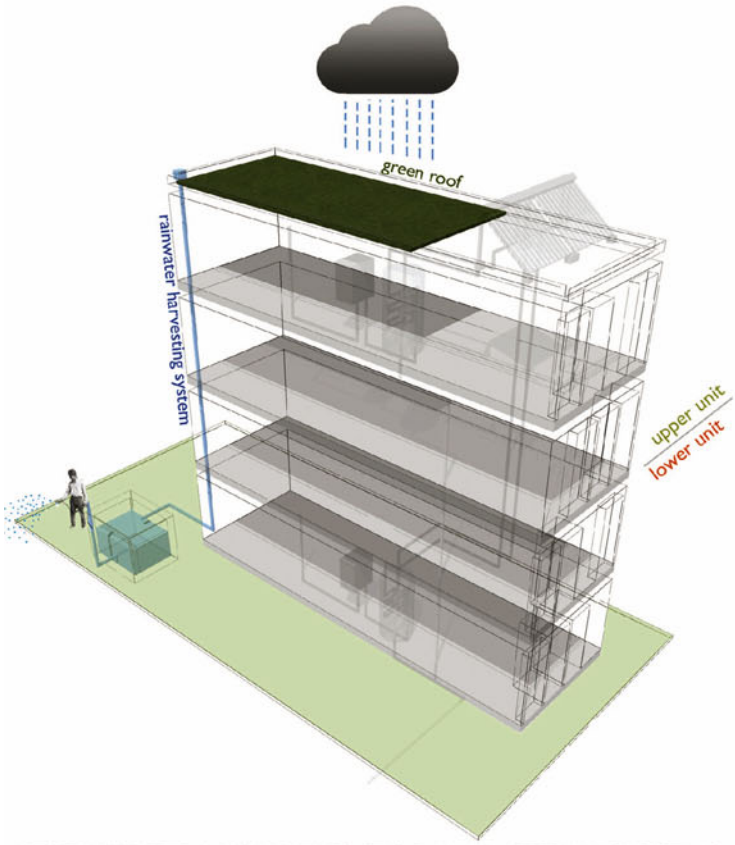

UPPER UNIT
LOWER UNIT

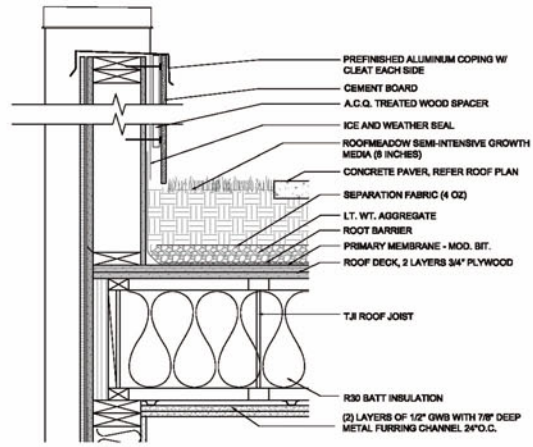
Fig. 5 below

Fig. 9 below

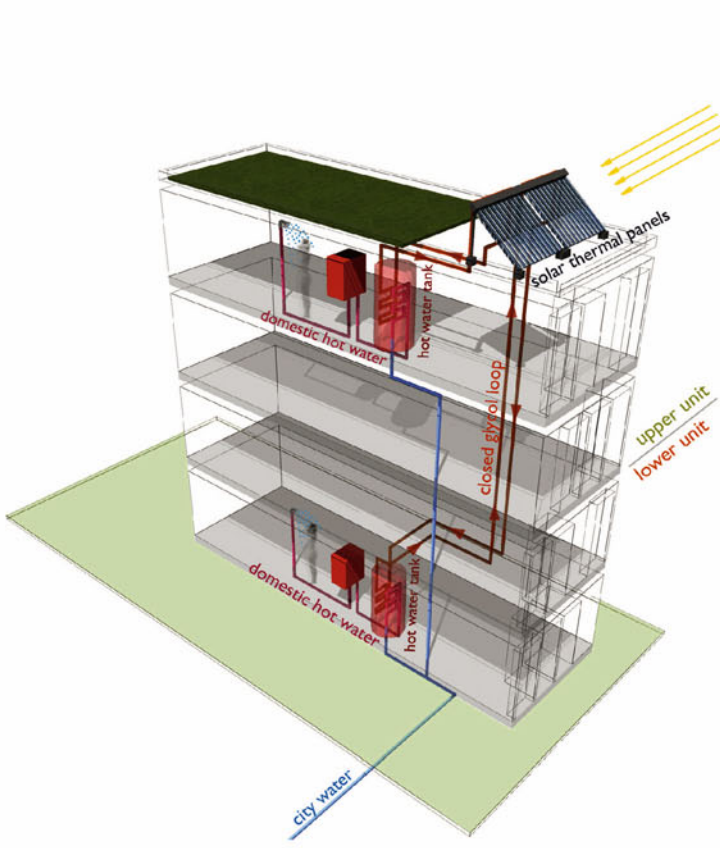




STORM WATER MANAGEMENT & RAIN WATER HARVESTING



8" INTENSIVE GREEN ROOF SYSTEM



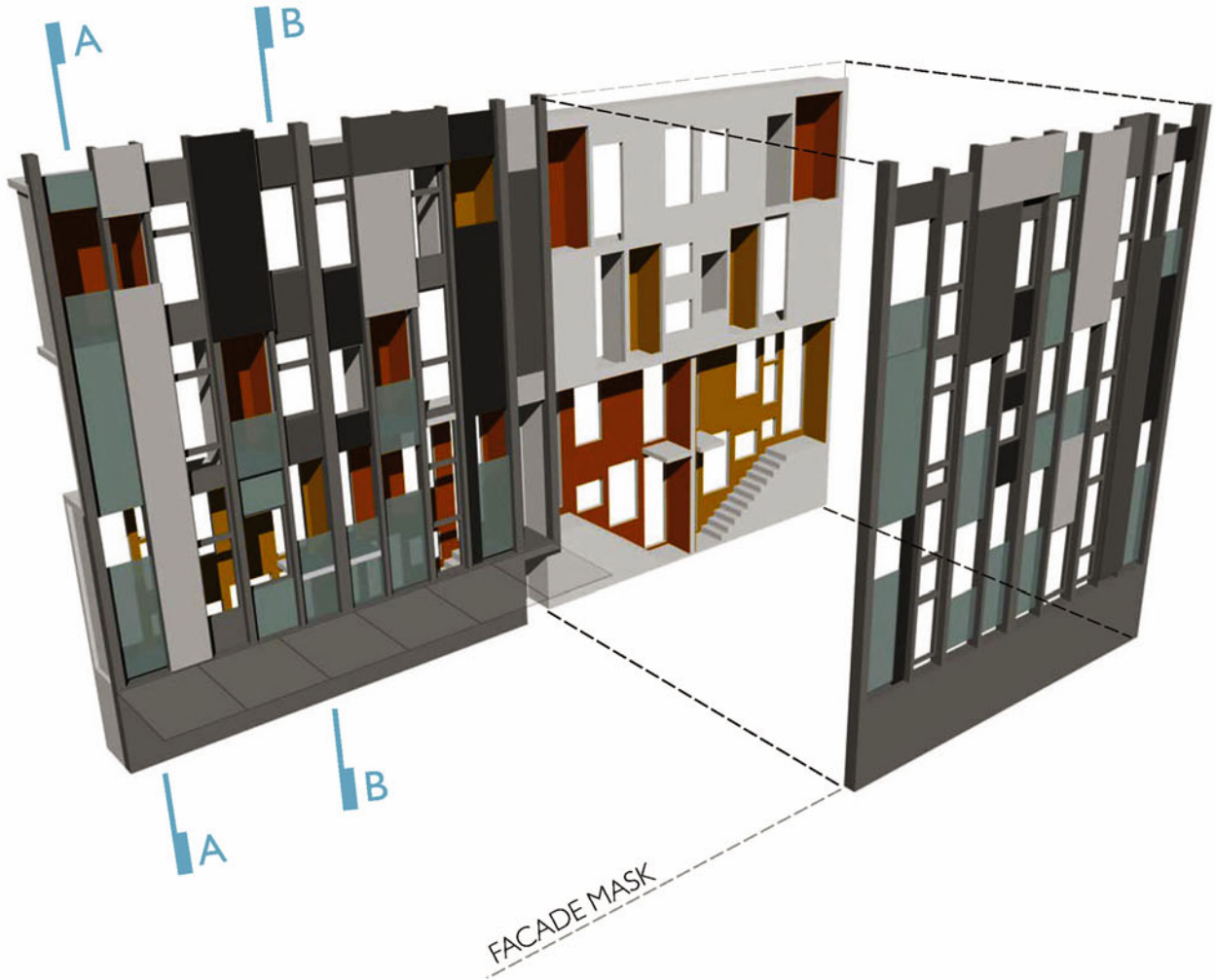
SOLAR THERMAL SYSTEM: DOMESTIC HOT WATER

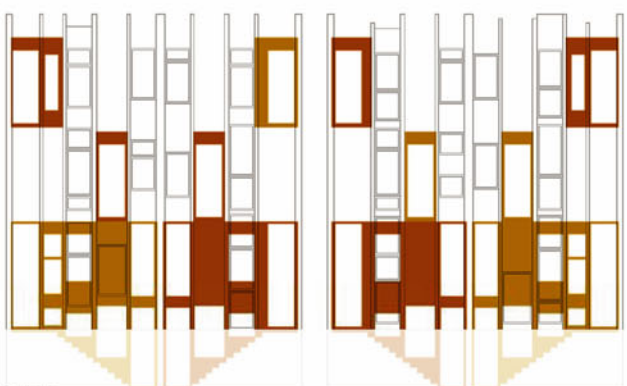
FLAT PLATE SOLAR THERMAL PANELS: IMG 012


1000-1010 N HANCOCK

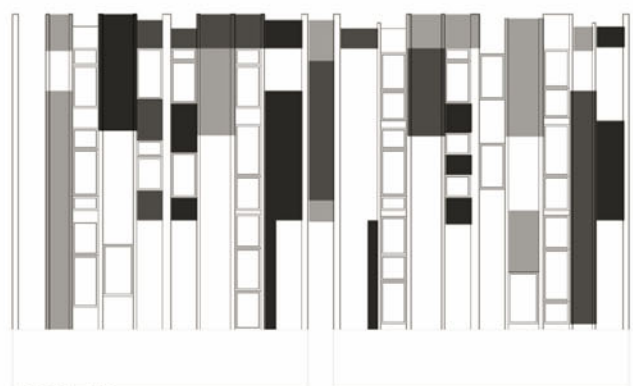
VOID: SURFACE: VEIL

The façade of Thin Flats is at once a surface and a void, blurring the limits of the units within. The façade of the lower units is pushed back from the sidewalk to accommodate circulation, flood a 'basement' space with light, aid in solar shading and create a veil from public view. Balconies on upper floors recess from behind the surface of the veil to create opportunities for civic engagement within the thin space of the façade.



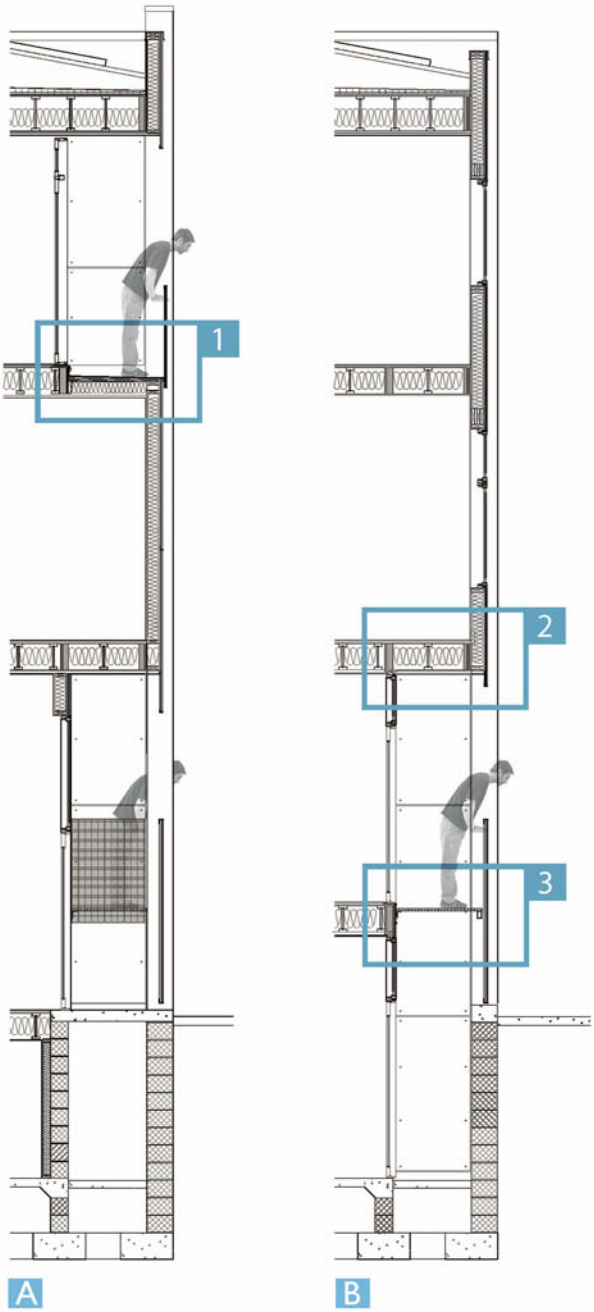


VOID: polychrome trespa panel



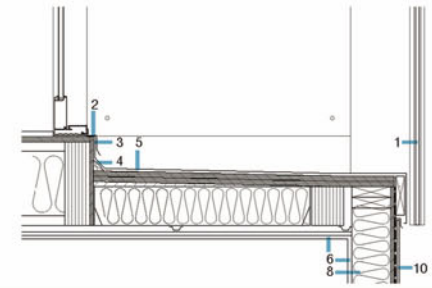
SURFACE: monochrome trespa panel


ONION
FLATS.com



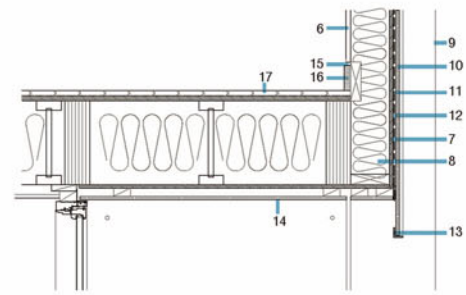
KEY NOTES

1 GLASS OR RESIN FIBER PANEL GUARD RAIL
2 ALUM. FLASHING CONTINUOUS BENEATH DOOR THRESHOLD
3 WRAP FIBERGLASS UNDER SILL
4 CANT STRIP
5 MONOLITHIC FIBER GLASS DECKING OVER 2 LAYERS PLYWOOD
6 GYPSUM WALL BOARD
7 PLYWOOD SHEATHING
8 SPRAY FOAM INSULATION
9 GALVANIZED STEEL COLUMN ENCLOSURE
10 GLASS OR RESIN FIBER RAINSCREEN CLADDING
11 DRAINAGE BOARD
12 WATERPROOF MEMBRANE
13 ALUM. TRIM ANGLE
14 RESIN FIBER BOARD SOFFIT PANEL
15 ALUM. TRIM
16 PAINTED WOOD BASE TRIM
17 FSC CERTIFIED T&G WOOD FLOORING
18 GALVANIZED BAR GRATING
19 GALVANIZED STEEL ANGLE
20 ALUM. FLASHING
21 GALVANIZED STEEL TUBE



1

SCALE: 1/2" = 1'-0"



2

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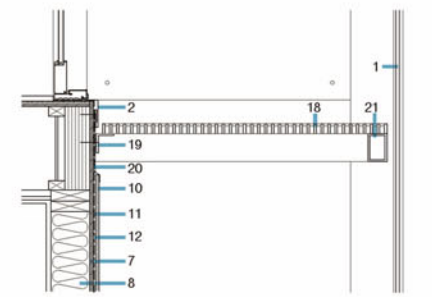

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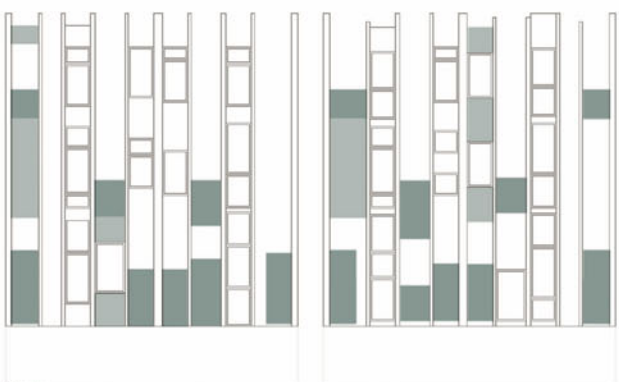


VEIL: translucent glass

BALCONY DETAIL: IMG 004

La Petite Maison du Weekend

Any Outdoor Site

1999

Patkau Architects Inc.

www.patkauarchitects.ca

La Petite Maison du Weekend was constructed for the Fabrications Exhibition at the Wexner Center for the Arts in Columbus Ohio. This prototype of a two person, self-sufficient dwelling, can be likened to the 'concept' cars to be found on the stands of forward thinking manufacturers at the Geneva Motor Show.

La Petite Maison is a working demonstration of minimalist accommodation. The unit was designed to be located on any unserviced outdoor site, providing the basic requirements to comfortably sustain life in a sheltered environment.

The shelter includes a raised loft for sleeping. A basic kitchen including sink, food storage and a small propane burner for cooking is contained in a hinged closet. The toilet and hand wash basin are located in a cubicle. A separately located gravity shower completes the ensemble.

The sophisticated design enables generation of electricity, collection and distribution of rainwater and the composting of waste.

The basic components of this prototype unit are shop manufactured for assembly on site. Fabricated steelwork forms the base and superstructure which is clad with a composite plywood and timber shell. The glass and photovoltaic canopy provides shelter from the rain and generates electricity for low voltage lighting and a high efficiency refrigerator. The slight fall on the canopy sheds rainwater into the canvas reservoir (Fig. 3).

As a prototype, La Petite Maison provides food for thought and diverse development potential from the pursuit of leisure to disaster relief. It also serves as a reminder that the bare necessities are often the mother of invention (Fig. 1 below shows two separate horizontal sections).

Population | 2

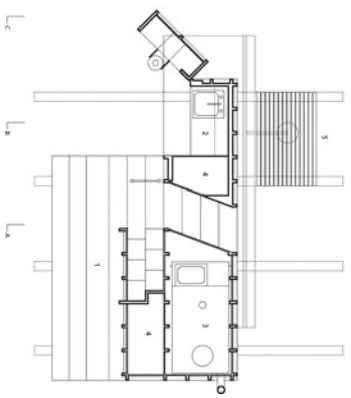
Coordinates | Any outdoor site

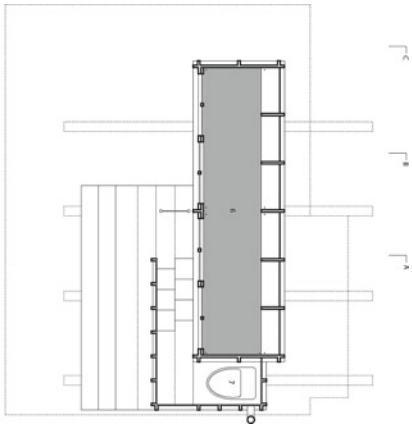
Elevation | Above sea level

Precipitation | Welcomed

Temperature | Variable

Humidity | Variable





J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_18, © Springer Science+Business Media B.V. 2011

Lohbach Multiple Independence

Innsbruck, Austria

2008

driendl*architects

www.driendl.at

Named after the river Inn on which it lies, the city of Innsbruck, is the main conurbation in the Austrian Tyrol. To the north lie the Bavarian Alps, and to the south, the Oztal and Zillertall Alps. Within this western tail of the country, narrowed by mountains, Lohbach Multiple Independence provides a response to the rapidly increasing demand for affordable living space.

In the city of Innsbruck, urban planners considering expansion identified the need for a high density, high quality, social housing project. Innsbrucker Stadtbau GmbH (an agency of the city) in consultation with the local community, commissioned driendl architects to design the Lohbach scheme. The project will eventually include shopping facilities and a residence for senior citizens, as well as walkways connected to Innsbruck and the surrounding countryside.

The first phase of construction included 154 apartments for rental and ownership. The subsidised development consists of one six storey, and two seven storey buildings, on a single site with shared infrastructure (Fig. 4).

Each of these buildings is both divided and connected down the centre line by an oval shaped, light filled atrium (Fig. 6). This canyon contains the stairwells and bridged walkways which create an animated, transparent access to the individual residences (Fig. 2, Fig. 5, Fig. 10). The open transitional zone divides each of the buildings into an East and a West Wing. The gentle gradients of the staircases are free from barriers and contain a continuous, tactile system to aid visually handicapped persons. The considered design facilitates a neighbourly social interaction between the residents.

Population | 119,249

Coordinates | 47°16'N 11°'23'E

Elevation | 574 m (1,883 ft)

Precipitation | 94.7 mm (37.28")

Temperature | Average High: 14.3 C (57.7 F)
Average Low: 3.8 C (38.8 F)

162 Lohbach Multiple Independence | Innsbruck | Austria | Fig. 1 above | Fig. 2 opposite

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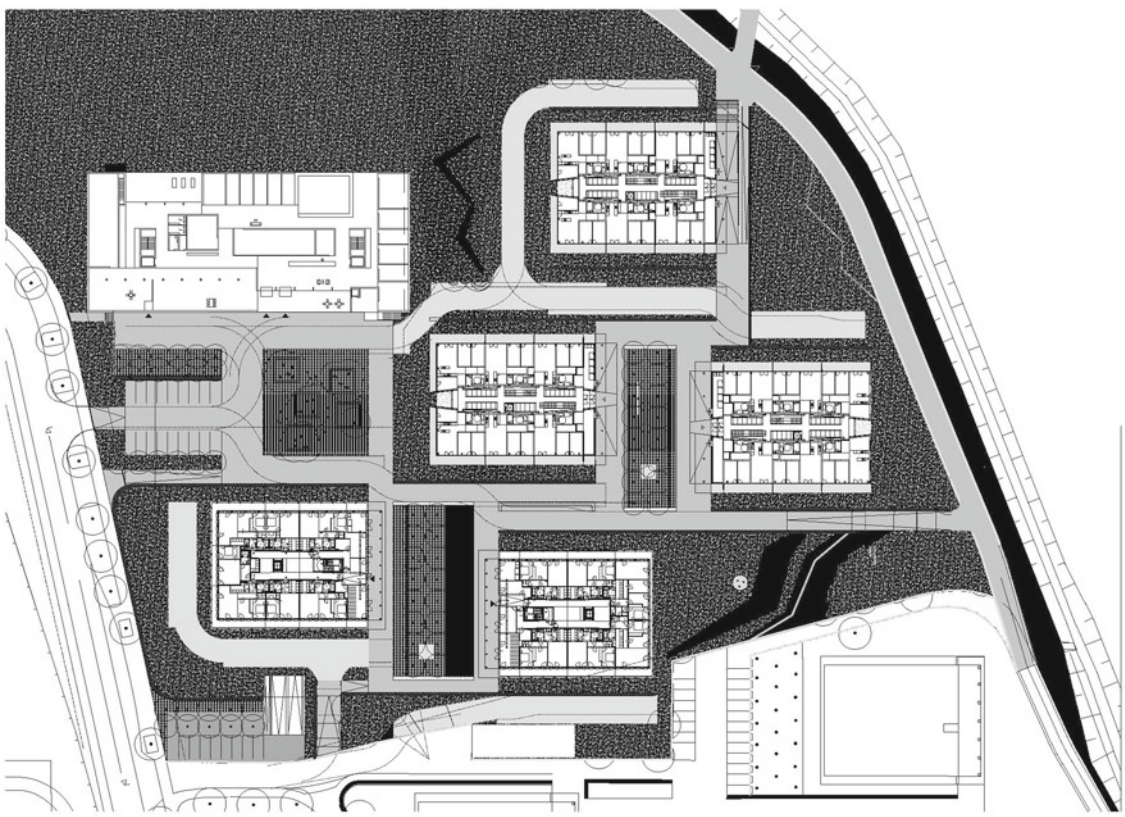
30G

Fig. 3. above | Fig. 4. below



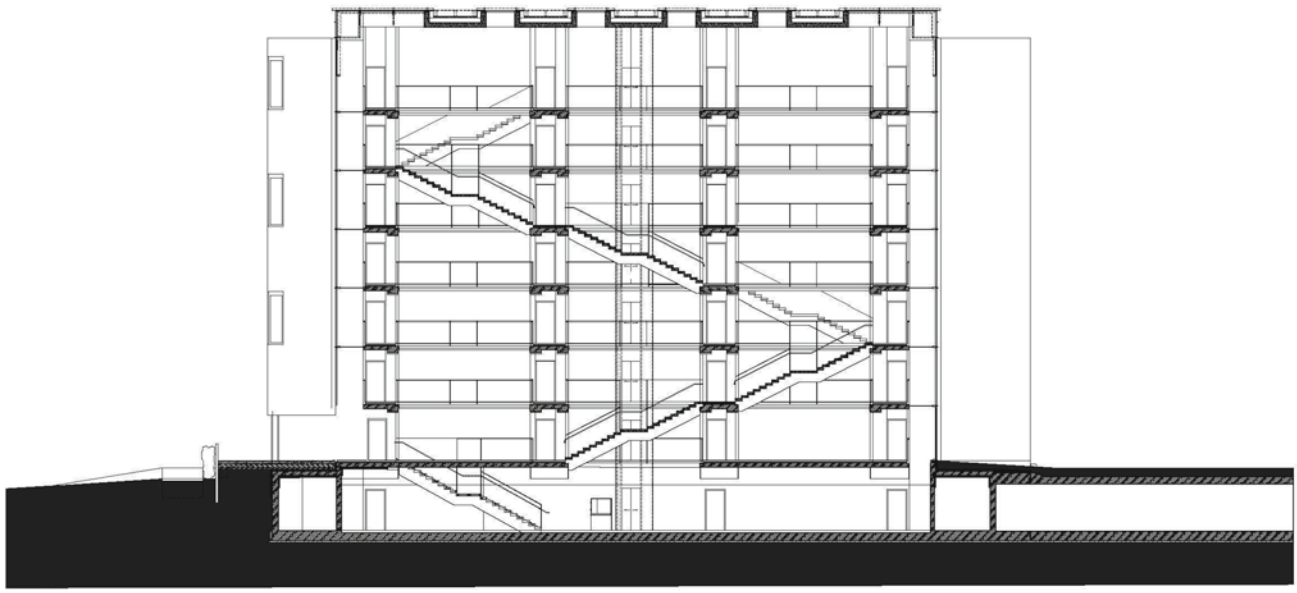
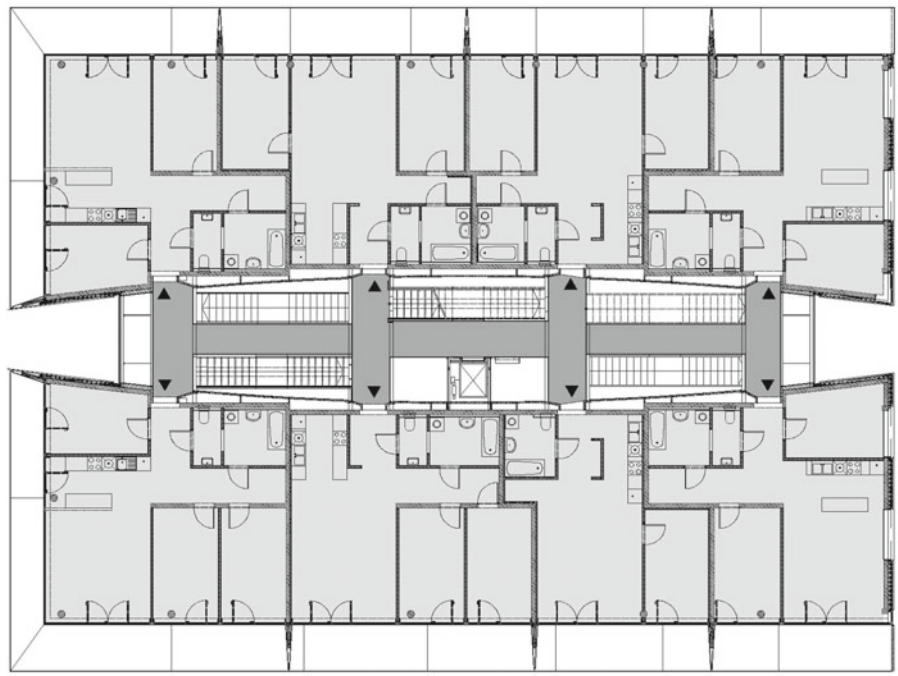


Fig. 5. above | Fig. 6. below



The architects sought to integrate and orientate the buildings to the spectacular surroundings which are seldom found directly in a city (Fig. 7).
All of the apartments face to the South, East and West. Full height glazed walls connect each living space to a 2 metre deep balcony running the full length of each unit (Fig. 8, Fig. 11). Each balcony is fitted with a room height, moveable, solar shade. The balconies are a continuation of the living space and are set at the same floor level to provide a seamless transition between indoor and outdoor living.
These innovations allow the residents to connect with the outstanding scenery surrounding the city. The addition of the moveable shades enhances the privacy of the individual apartments. The independence and individuality of the residents was central to the aims of the design team.
Economy and ecology were also high priorities in the design and construction. The units conform with low energy standards for high density housing. Roof mounted solar thermal units can be adapted for water heating. Construction materials were carefully sourced with regard to environmental impact. The design of the staircases incorporates the service ducts carrying electrical power, water, heating and drainage systems. Access for maintenance and remedial work is gained from outside of the apartments, reducing inconvenience for residents.
A further benefit of the stairwell atrium is that daylight penetrates right down to the basement level. This area contains a huge indoor playground provided for the use of the the many children living in the building. Severe cold winters and heavy snowfall in Western Austria will often prevent outdoor activity for prolonged periods.
The finished apartment complex also includes garaging.
Lohbach Multiple Independent living fulfils the aspirations of social housing planners by putting the needs, and quality of life of the individual and collective inhabitants before the aesthetic of the building itself.

Fig. 8. below

Lohbach Multiple Independence | Innsbruck | Austria | Fig. 11 above 169

The Margarido House

Oakland, USA

2008

Plumbob LLC

www.onionflats.com

The city of Oakland is located in the San Francisco Bay area. This coastal land was inhabited by the Ohione people for thousands of years before Spanish settlers arrived in the 18th and 19th century.

Under Spanish rule the land was known as Alta California and held under the Rancho San Antonio Land Grant by the Peralta family. From 1821 to 1846 the region was known as Mexico and was free from Spanish rule. American forces conquered the region in 1846 and were quickly followed by settlers laying legal claims to the land once held by the Peraltas.

This turbulent period on the Western frontier eventually culminated in the new legislature of California, incorporating the town of Oakland in 1852.

Embedded into this hilly landscape, the Margarido House exemplifies the pioneering spirit of the new frontier, employing multiple, sustainable elements in its design and construction.

The greatest challenge stemmed from the site's 17% slope. Height restrictions and adjacent properties resulted in the house being dug into the hillside to the rear of the plot (Fig. 2). The entrance to the Margarido House (Fig. 3) is sited at the mid-point, or "knuckle", where the property emerges from the ground.

The organisation of space stems from the "knuckle" of the building, with the more social elements of the kitchen, living room and dining areas positioned to the elevated, daylight filled front section (Fig. 4, Fig. 5). The grounded spaces to the rear of the site provide the more secluded and private rooms being sheltered by the enveloping terraced planters (Fig. 7).

Population | 404.155

Coordinates | 33°45' 30" N
118°21' 51" W

Elevation | 12.8 m (42')

Precipitation | 582.7mm (22.94")

Temperature | Average High:
19.4 C (67 F)
Average Low:
11.1 C (52 F)

Humidity | 79%

170 The Margarido House | Oakland | USA | Fig. 1 above | Fig. 2 above right | Fig. 3 below right

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_20, © Springer Science+Business Media B.V. 2011

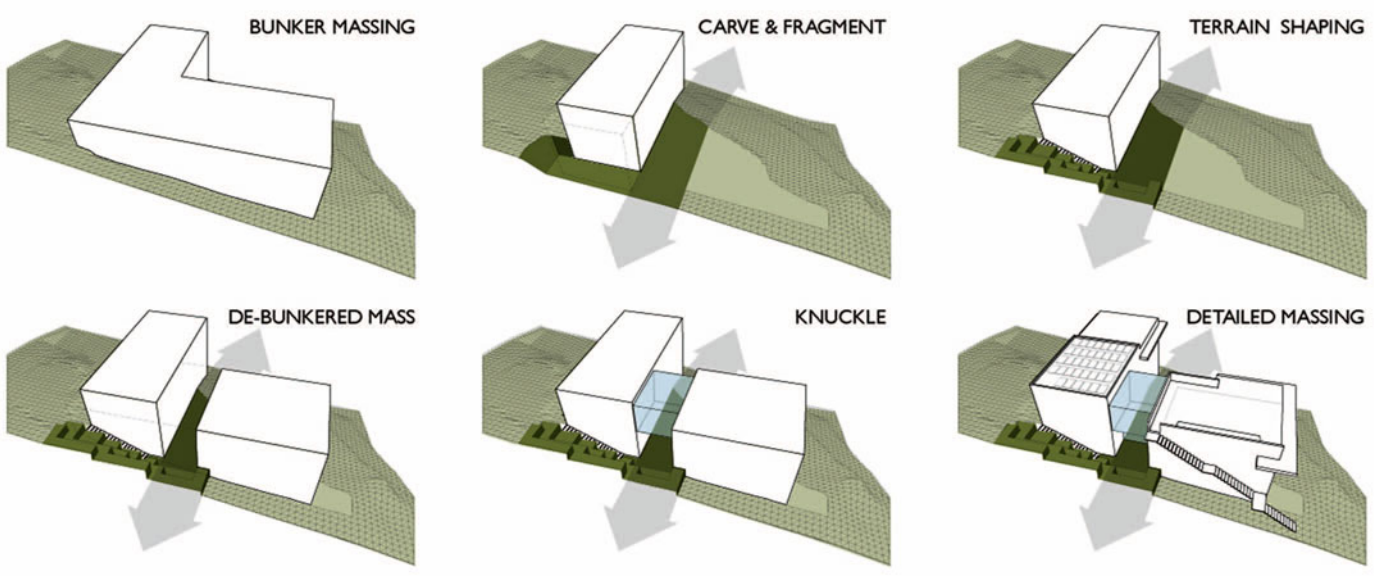
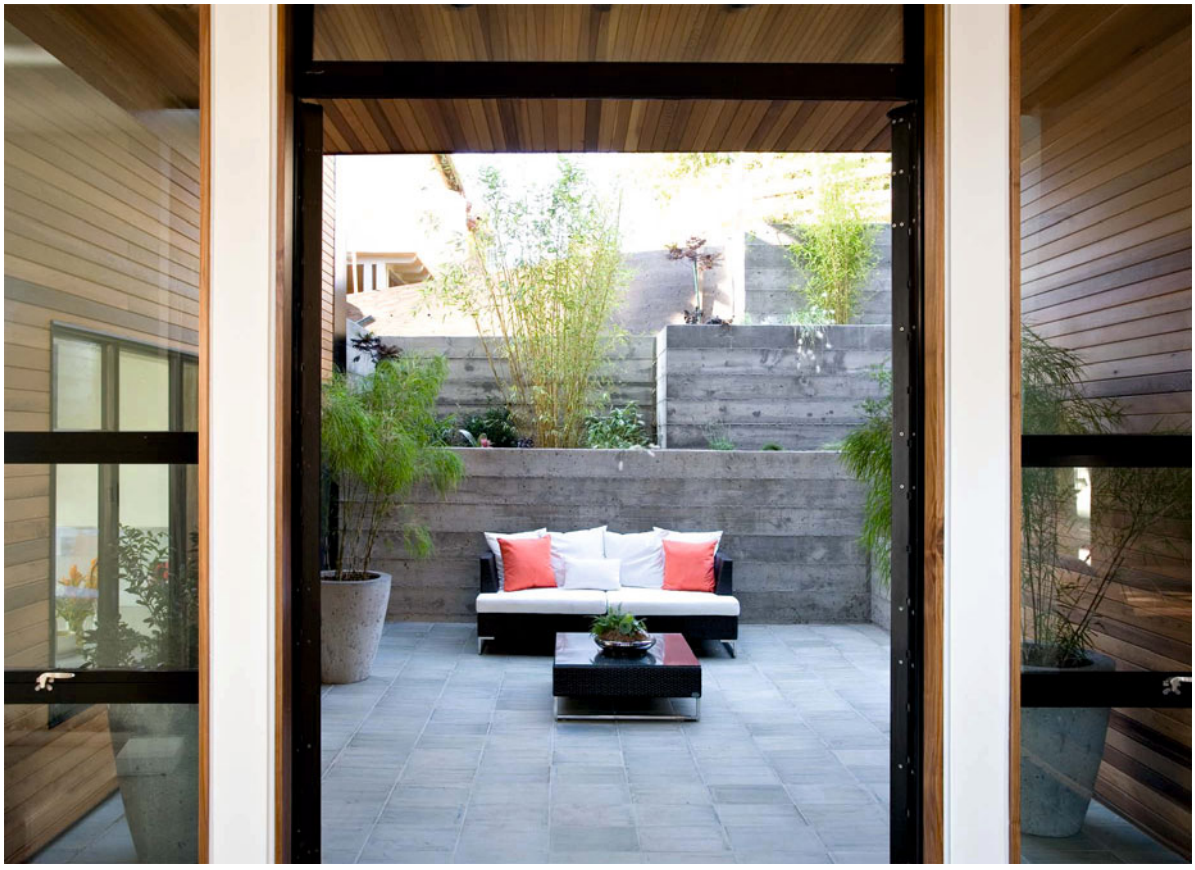

BUNKER MASSING
CARVE & FRAGMENT
TERRAIN SHAPING
DE-BUNKERED MASS
KNUCKLE
DETAILED MASSING

Fig. 4 below



The design strategy for the Margarido House skillfully integrated contemporary architectural styling with cutting edge, green technology. The photovoltaic canopy positioned at second floor level combines the requirement to supplement electrical power with shading of the first floor living rooms. The positioning of the cantilevered support structure also defines the building's elevations (Fig. 8, Fig. 9).

Concrete flooring and walls created a thermal mass for heating and cooling. The concrete used on the site contained a minimum of 25% fly ash. The external concrete retaining walls were also designed to function as terraced planting beds, softening the harsh topography of the site (Fig. 7).

A substantial array of solar panels mounted on the rear flat roof provide the hot water requirements of the stylish, minimalist bathrooms. Flow restrictors on the showers ensure that this resource is not squandered (Fig. 6).

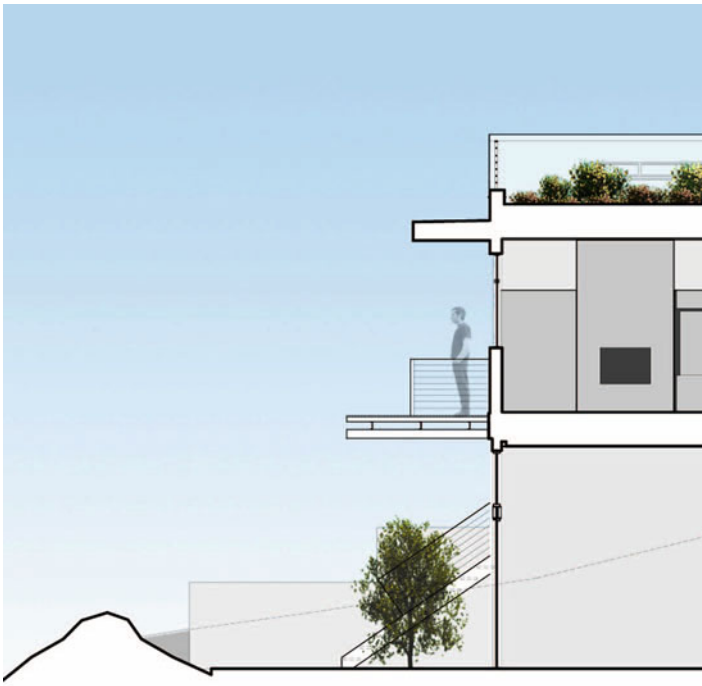
The natural daylighting is provided by the locally sourced, thermally broken windows. The insulation value of these units is almost as high as the soy based spray insulated external walls. The supplementary lighting system throughout the property employs low energy LED fittings (Fig. 5), controlled by a programmable system, designed to maximise the efficiency of both the lighting and the under floor hydroponic heating systems.

As a result of the holistic approach reducing energy consumption, the Margarido House is reported to be 55% more efficient than other properties when measured against the stringent California Title 24 standard.

The policy of using locally sourced, zero VOC finishes, fixtures and fittings further enhanced the green credentials required to deliver Northern California's first LEED-H Platinum custom home.

Oakland's temperate and seasonal Mediterranean style climate produces lengthy, warm, dry summers which are conducive to an outdoor lifestyle. The crowning glory of the Margarido House is the intensive green roof. The lightweight planting medium and drought tolerant plants provide further insulation to this landscape embedded property.

The green roof and water permeable driveway are an integral part of the rain and ground water harvesting system, ensuring that the 4,000 gallon underground cistern is fed with the site run-off. The roof garden also provides a peaceful haven to enjoy the dramatic, panoramic views of San Francisco Bay (Fig. 12).



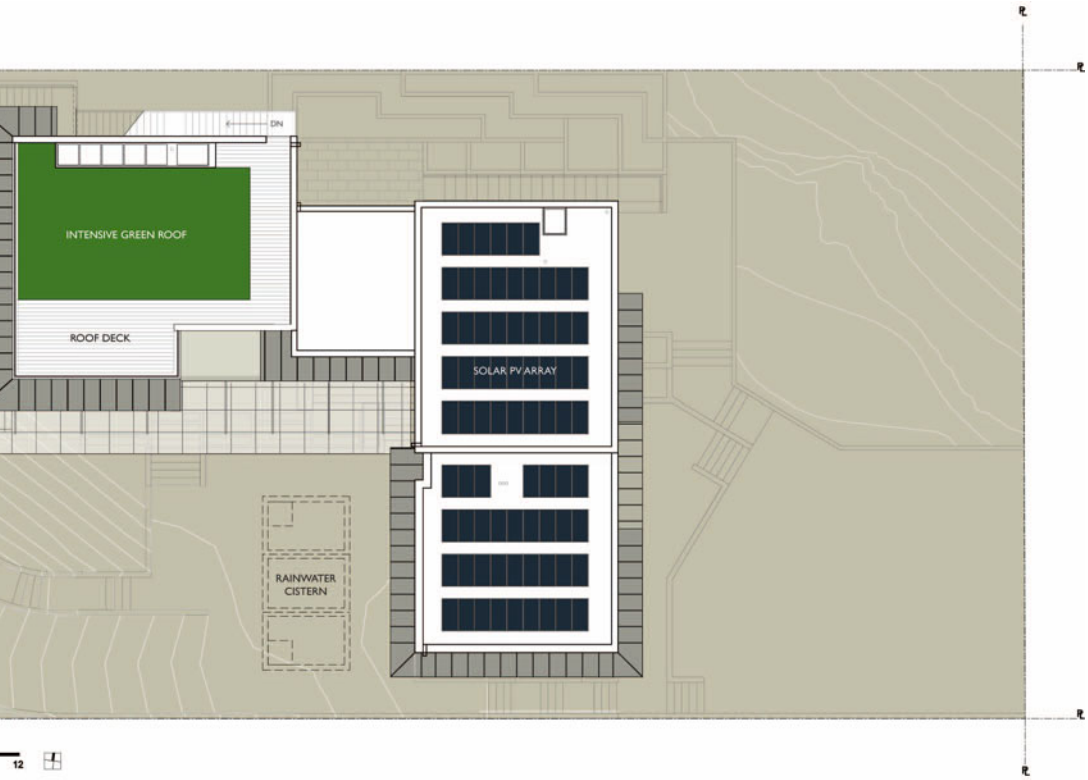

DN
INTENSIVE GREEN ROOF
ROOF DECK
SOLAR PV ARRAY
RAINWATER CISTERN

Fig. 10 above, water permeable driveway| Fig. 11 below

Gap House

London, England

2009

Pitman Tozer Architects

www.pitmantozer.com

Placed improbably between a pair of historical listed buildings, the contemporary facade of Gap House is a mere 2.3 metres wide. This newly built, four bedroom family home is the winner of the 2009 R.I.B.A. Manser Medal.

Situated in a conservation area in West London, the challenging site was used by the practice as a case study in energy generation and conservation. As the plot was constrained, it was originally an alleyway and a rear garden, the considered use of space was vital to the creation of a functional dwelling.

The innovative design stacks three individual bedrooms in the narrowest section of the plot. These sleeping quarters are located on the street elevation. The natural light and ventilation to these rooms is directed and controlled by opening windows and louvered shutters.

The stucco rendered finish allows Gap House to blend seamlessly into the terraced street. However, the property's distinctive fenestration, shutters and front door provide the new building with a deserved individual architectural identity (Fig. 2).

Bedrooms and bathrooms are accessed by a central stairwell, which also acts as a light shaft (Fig. 1). There is a gap between the stairs and the walls to enhance light transmission.

To the rear of the plot, the property is arranged as a series of cascading, projecting cubes, descending to a ground floor reception area. This space, accommodating the kitchen, dining area, lounge and study, merges with a light-filled, outdoor courtyard, (Figs. 3 to 9).

Population | 7,556,900

Coordinates | 51°30'29"N
0°7'29"W

Elevation | 24 m (79')

Precipitation | 582 mm (22.91")

Temperature | Average High:
14.8 C (58.6 F)
Average Low:
7.2 C (45 F)

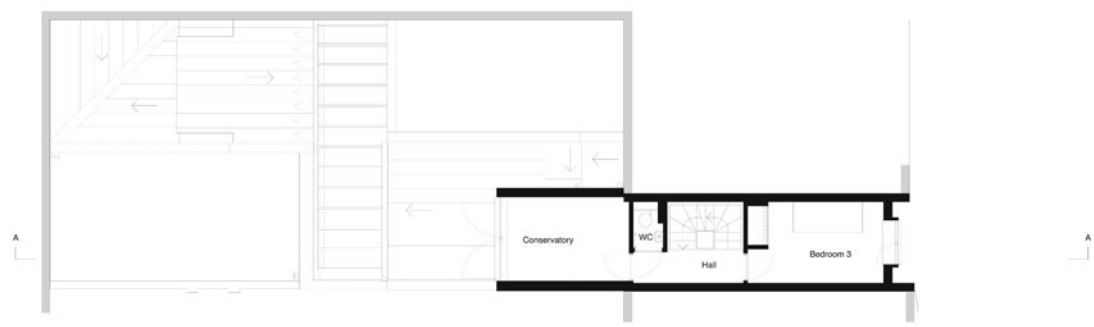
Humidity | 79.6%

178 Gap House | London | England | Fig. 1 above | Fig. 2 right

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_21, © Springer Science+Business Media B.V. 2011


FX04 TNJ

Third Floor Plan



Second Floor Plan

First Floor Plan

Ground Floor Plan

Throughout the design and construction of Gap House, a primary goal was to reduce the running costs of the finished accommodation. The aspirational target was to cut energy consumption by 70% compared to a similar sized unit built to current building regulations.

Multiply strategies were employed to achieve this goal. Three, 50 metre deep bore holes were drilled below the rear courtyard to serve a 12 kW ground coupled heat pump. This technology provides all the heating and hot water requirements for the property, including under floor heating.

This strategy was coupled with high levels of insulation to the walls and roof (U value 0.15 W/m^2K). This factor, along with the passive solar gain, minimise the overall supplementary heating requirement.

In the summer months the stack effect of the central stairwell provides passive ventilation via the opening skylight (Fig. 6).

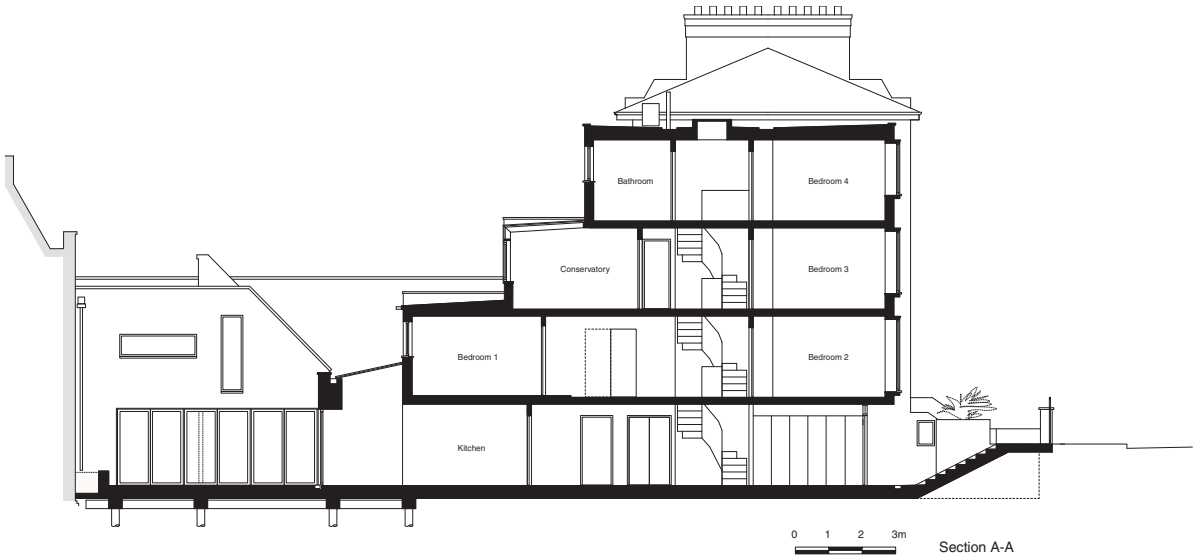
Water conservation was also targeted, with rainwater falling on the site being channelled and collected for re-use in flushing the toilets.

Wherever possible, naturally occurring, sustainable materials are used, for example, the internal walls and floors are insulated with lamb's wool. A composite larch board is used for the stair structure, and timber window frames are made from sustainable spruce.

Following completion, the property achieved an "Exemplary" grade 4 rating under the Code for Sustainable Homes. Energy bills are estimated to be £500 to £800 per annum cheaper than similar sized properties in the Greater London Area.

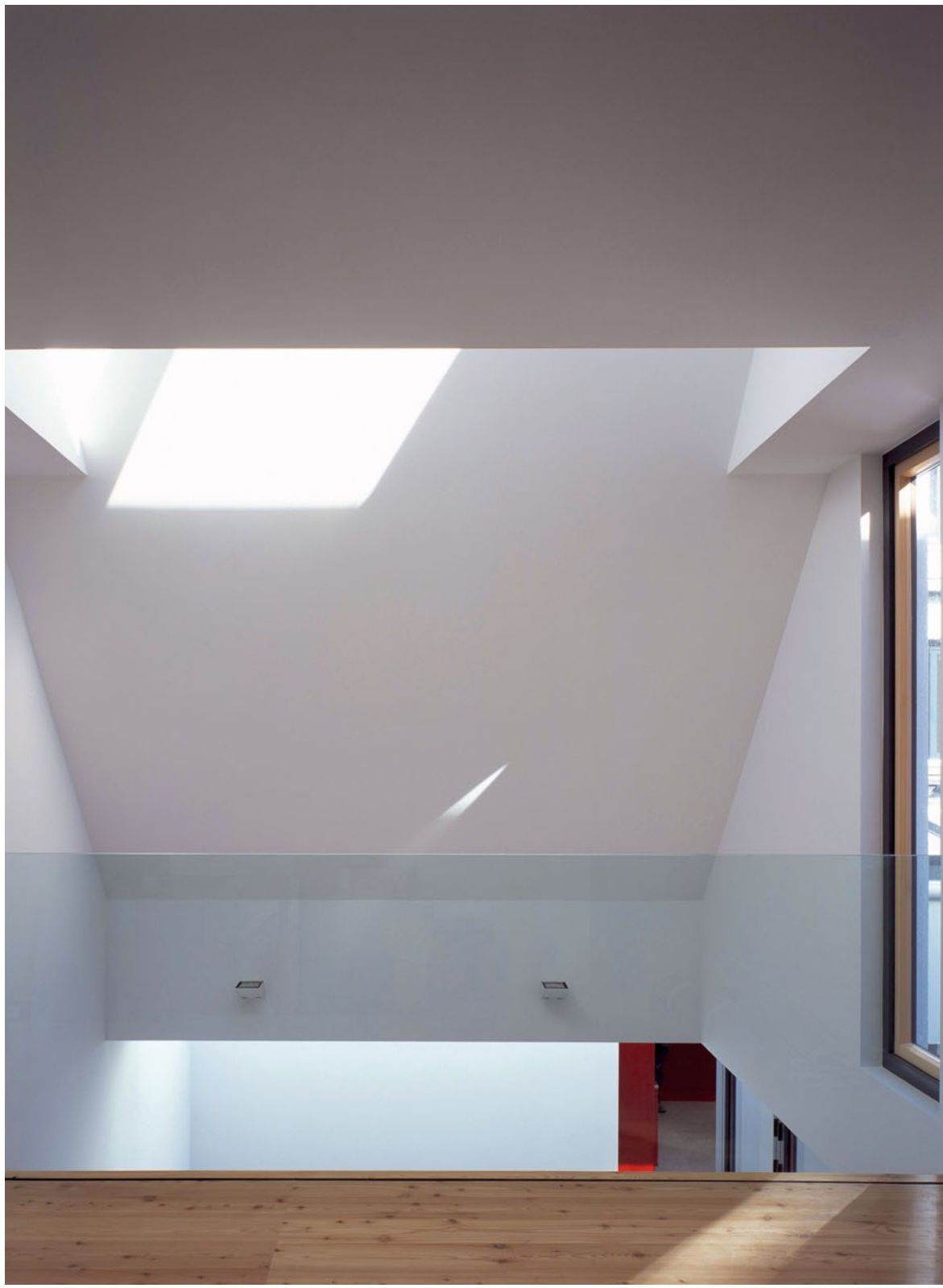
The reception area is constructed at double height (Fig. 5, Fig. 6, Fig. 7). This provides the opportunity to bring daylight in from above the courtyard via horizontal and vertical windows (Fig 8, Fig. 9).

A study placed at mezzanine level completes the clever use of the building's volume, providing a secluded haven above the open plan reception space (Fig. 7, Fig. 8).



Section A-A

Monmouth Road



Ehrlich Residence

Santa Monica, USA

2004

John Friedman Alice Kimm Architects

www.jfak.net

The Ehrlich Residence is built on a corner plot, adjacent to the busy San Vincente Boulevard, close to the Pacific Ocean in Santa Monica.

The property was developed to provide a continuous flow between lightly defined indoor spaces with a strong connection to the outdoor walled garden. Maximum natural light penetration to the indoors and a desire to eliminate air conditioning units were also considered as high priorities for this sustainable design.

The architect's site and first floor plan (Fig. 2), details an "L" shape flow of living spaces rotating around the garage. All the main living spaces generally face north east, and are characterised by full height, sliding, glazed walls opening on to the garden. Ocean breezes are permitted to penetrate the interior of the house due to the open plan layout. The living room corner is sited adjacent to a large Koi pond to cool the air entering the room. Within the living spaces the boundaries between outdoors and indoors are diminished. Horizontal alignment of the first floor further enhances the connection with the external landscape (Fig. 1, Fig. 2), with the "L" shape plan being perpetuated in the paths and patios.

Southerly breezes and light enter the property through various diagonal channels in plan and section, including one route allowing a cross breeze and afternoon light into the foyer, dining room and kitchen via a slot in the office wall. A second floor window or "monitor", 9 feet high by 16 feet long, allows a huge southerly light shaft to dramatically penetrate the most northerly corner of the house.

The natural heating and cooling scheme is illustrated in the architect's section (Fig. 7).

Population | 87,664

Coordinates | 34°01'19"N
118°28'53"W

Elevation | 32 m (105')

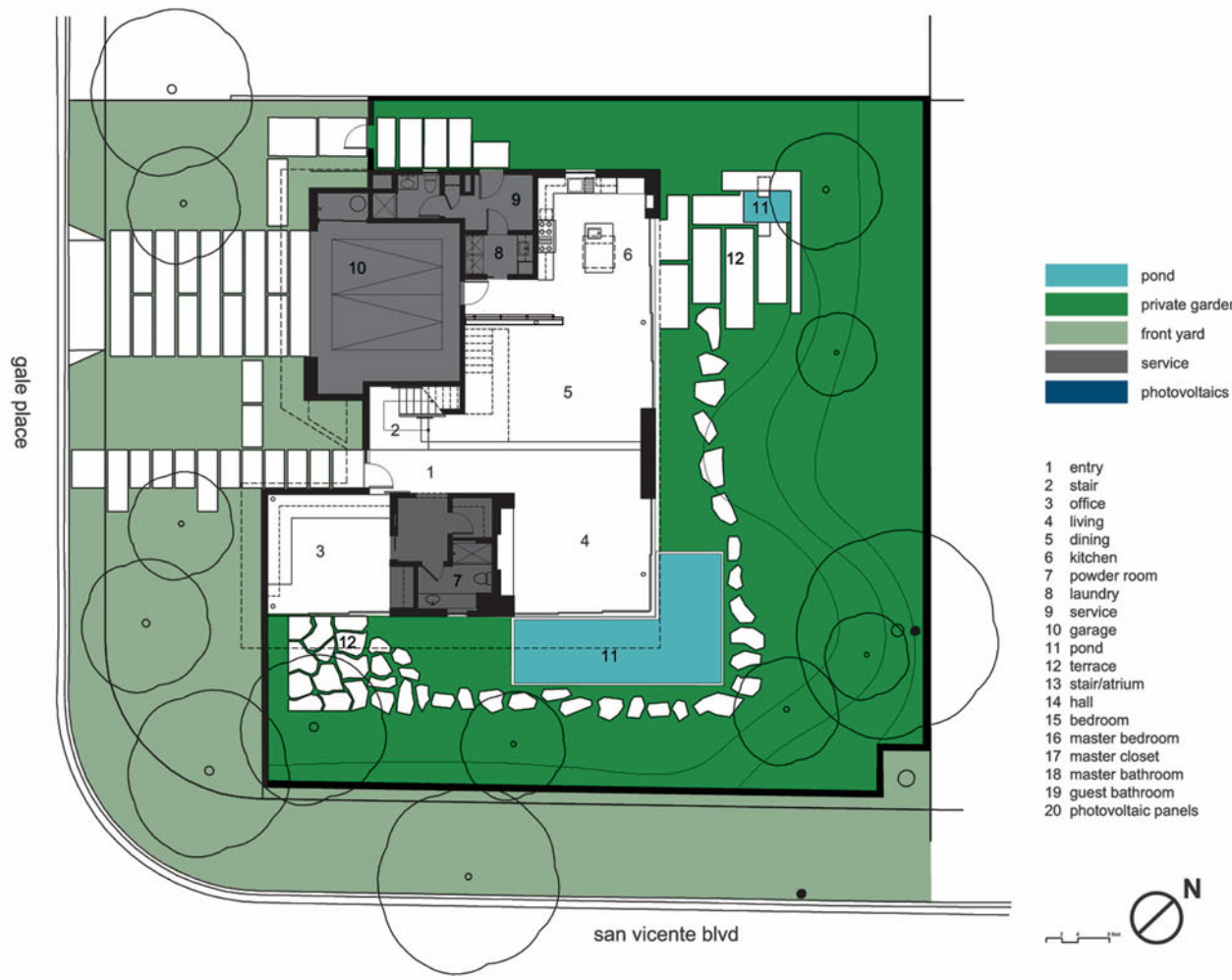
Precipitation | 337 mm (13.27")

Temperature | Average High:
31 C (87.8 F)
Average Low:
10 C (50 F)

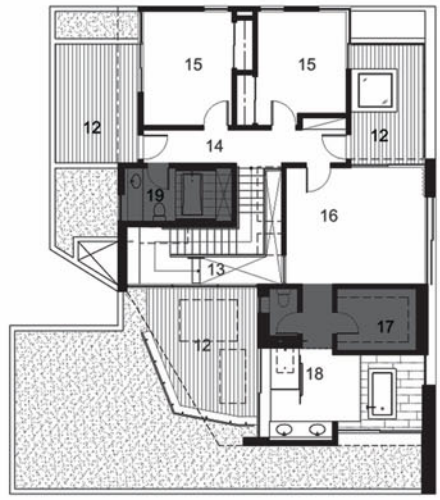
Humidity | 71.5 %

186 Ehrlich Residence | Santa Monica | USA | Fig. 1 above | Fig. 2 opposite

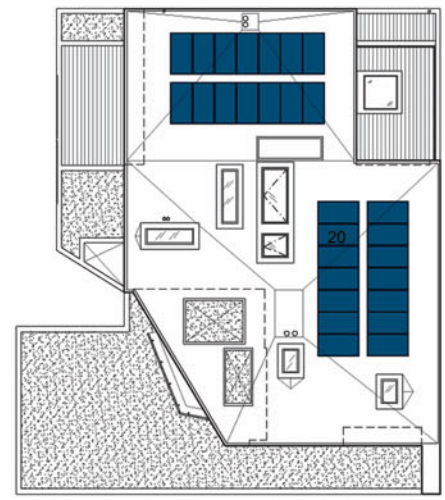
J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_22, © Springer Science+Business Media B.V. 2011



SITE AND FIRST FLOOR PLAN



SECOND FLOOR PLAN



ROOF PLAN

Fig. 3 above corner view across San Vincente Boulevard | Fig. 4 below foyer, stairwell and atrium

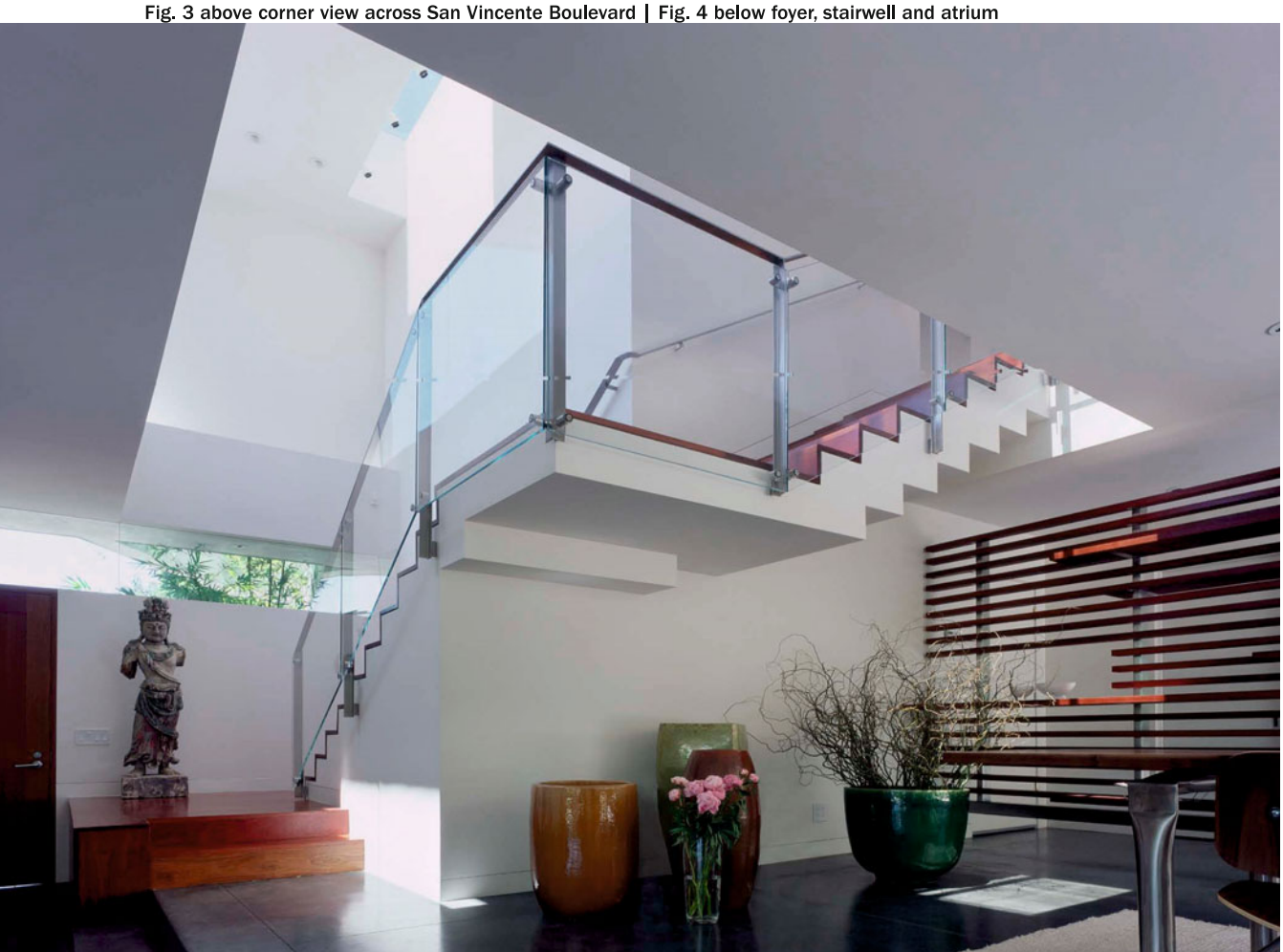
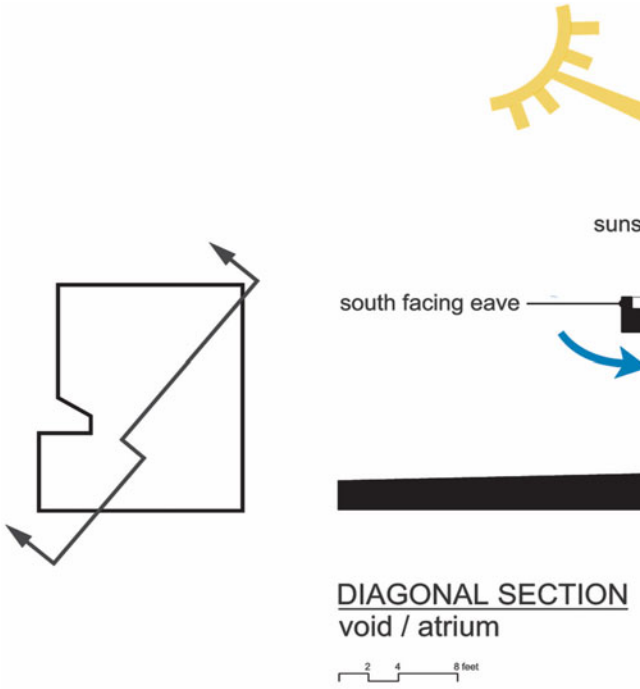


Fig. 5 above office with clerestory windows | Fig. 6 below Koi pond, living room, dining room and kitchen

The solid, service elements of the Ehrlich Residence create a vertical internal massing which rises with the stairwell from 1st to 2nd floor. The creation of this atrium is a key element of the multiple "passive" strategies of sustainable design. Warm air is gathered and vented via the atrium through motorised roof skylights. Negative pressure created by ocean breezes passing over the roof adds to the "stack effect", drawing warm air from the house (Fig. 7).
A further example of the "passive strategy" is the concrete floor being designed to act as a heat sink, absorbing and storing heat during the day and emitting it at night. Additionally, careful solar studies resulted in the south facing eaves being strategically placed to allow winter sunlight to penetrate. The higher rotation of the summer sun is blocked out. Western facades are generally solid to mitigate solar gain in the hot summer afternoons.
The property's green credentials are further increased by the active systems incorporated into the fit-out element of the property. These include the recycling of greywater from sinks, bathtubs, showers and the washing machine. The water is re-used to irrigate parts of the garden.
Radiant floor heating water is raised to temperature using a high efficiency gas powered boiler unit.
A 4 kW rooftop photovoltaic system supplements the energy requirements of the property.
Comparison studies of the Ehrlich Residence report that the new property can be maintained 10 degrees cooler in summer, and 7 degrees warmer in winter, than the previous property sited on the plot. The new property uses 55% less energy per square foot than the comparison property built in 1953.
The materials used in the construction of the Ehrlich Residence were selected carefully as follows.

Externally (Figs. 1, 3, 6, and 8).
Cement Board exterior siding.
Smooth trowelled plaster cladding.
Concrete flooring to first level.
Insulation from recycled cotton denim.
Hardwood used sparingly from sustainable sources.

Internally (Figs. 4, 5, 6, 9, 10 and 11).
Hardwood used sparingly from sustainable sources.
Formaldehyde free MDF cabinets.
Low Voc paints.
Man made countertops, Quartz Ceaser stone.



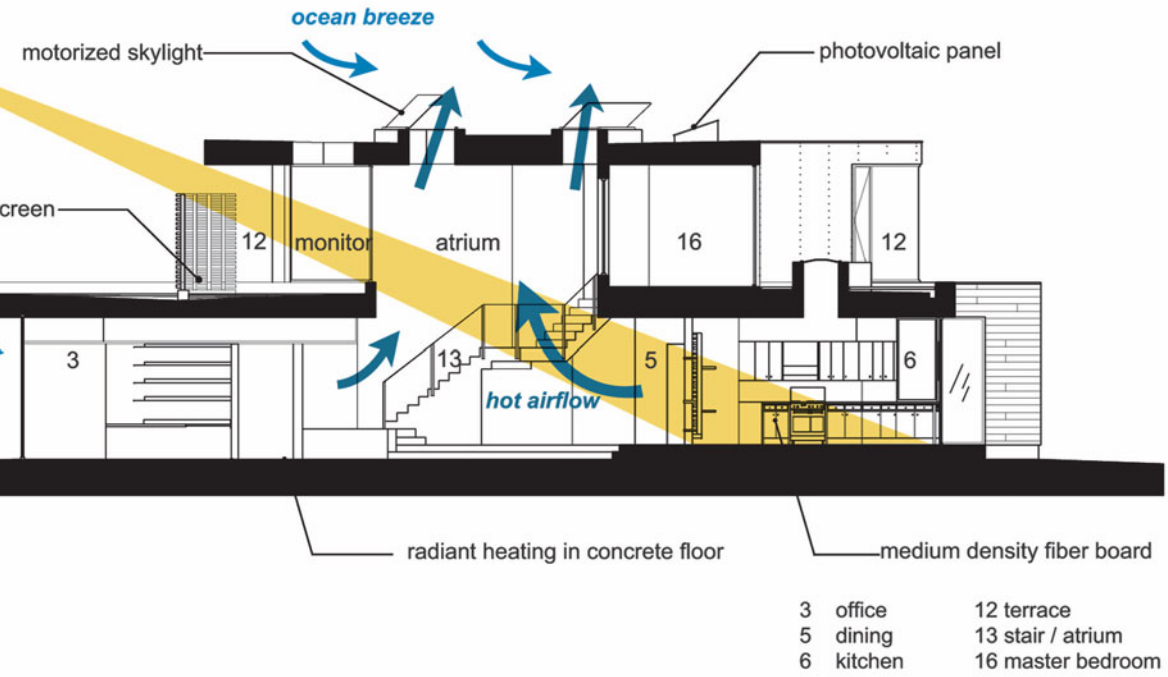

ocean breeze
motorized skylight
photovoltaic panel
creen
12
monitor
atrium
16
12
3
13
5
6
hot airflow
radiant heating in concrete floor
medium density fiber board
3 office
5 dining
6 kitchen
12 terrace
13 stair / atrium
16 master bedroom

Fig. 9 below


TAKEN OUT
AND SHOT"
BEATEN

opusHouse

Darmstadt, Germany

2007

opus ARCHITEKTEN BDA

www.opus-architekten.de

opusHouse is a mixed used development, typical of the renewed enthusiasm for living and working in European cities. Situated on Ploenniesstrasse in Darmstadt, the development completes a perimeter block of 3 to 4 storey Wilhelminian houses. In contrast with the majority of the street elevation, one of the existing properties was originally only two storeys (Fig. 5) and adjacent to an open space in the otherwise continuous terrace.

The two storey property was renovated and a third storey was added in the architectural style of the original building. A fourth storey was then constructed under the new pitched roof. The penthouse is characterised by the clerestory type glazing upon which the new roof appears to float. This feature provides a transitional link between the ornamentally detailed, historically referenced, apartment house, and the contemporary high-tech. glazed facade of the 'infill' office building (Fig. 1). A daylight filled stairwell serves both the duplex apartments created in the older building and the new office building. Thus, a mediation is formed between the living and working space (Fig. 2). The grounded two storey apartment has access to an open courtyard, whilst the apartment above incorporates an outdoor roof terrace at the highest floor level (Figs. 1 and 2). As the proportions and floor levels of the office space respond to those of the neighbouring buildings, they form a series of elevated bridges suspended in the transparency of the glazed facades. An elevated, ground-level garage provides off-street parking for the live-work development. One storey height, opening glazed units provide natural ventilation to the office units as required.

Population | 143,332

Coordinates | 49°52'0"N
8°39'0"

Elevation | 144 m (472')

***Precipitation** | 620.7 mm (24.4")

***Temperature** | Average High:
14.4 C (57.9 F)
Average Low:
5.8 C (42.4 F)

Humidity | 62.5%

*Frankfurt Am Main

194 opusHouse | Darmstadt | Germany | Fig. 1 above | Fig. 2 opposite

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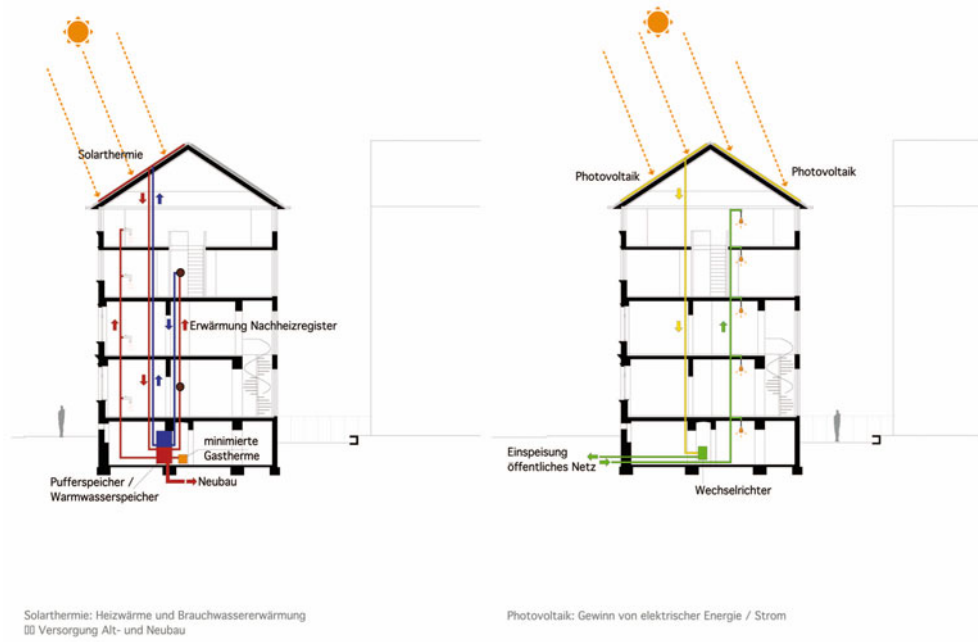
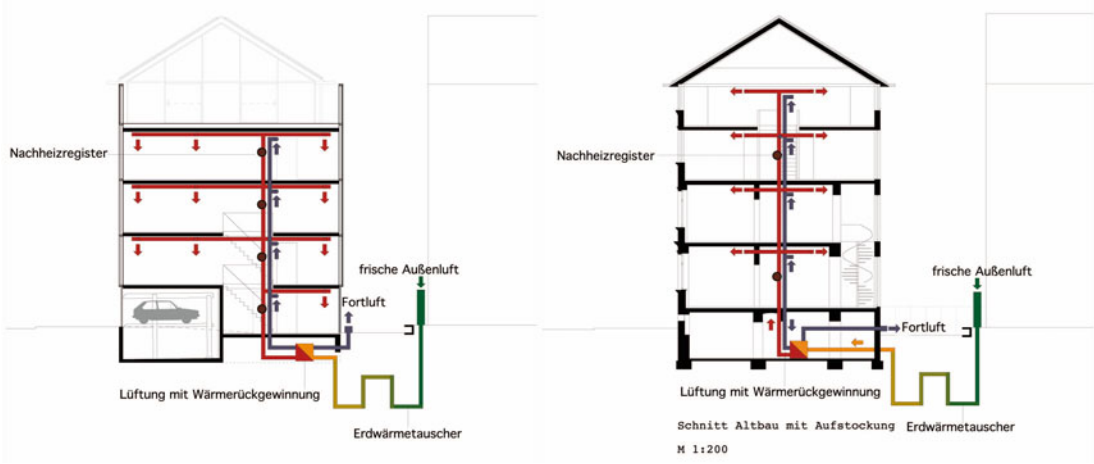
The design team employed a mainly passive strategy towards the goal of achieving an energy efficient development. A triple glazed facade with krypton filled cavities ensures the high insulation values of the building's envelope.
The internal environment is controlled zonally by each tenant via an adjustable ventilation system, complete with heat recovery unit to mitigate energy loss. A ground heat exchanger provides additional temperature balancing. If heat energy is required, the air temperature can be raised and controlled by a minimised gas calorific value thermostat.
To supplement this strategy, the new sloping roof is covered with both solar thermal and photovoltaic panels. The solar thermal units warm the domestic water and support the heating system. Energy costs for opusHouse are reduced by feeding the energy from the photovoltaic units into the public network. The detailed systems are illustrated on the architect's schematic drawings (Fig. 11, Fig. 13).
The construction details and colouring of the pitched eco-roof were carefully considered to blend with the existing roofscape of the perimeter block (Fig. 4, Fig. 12). Rainwater falling onto the building is collected and stored in a cistern for re-use in flushing toilets or garden watering.
Inside the building, the white finishes to walls and ceilings maximise the natural daylight provided by the glazed external walls and clerestory windows. A contemporary, engineered finish to the fixtures, flooring and staircases completes the transformation from an Empirical cellular layout, to 21st century, open plan, flexible accommodation (Fig. 5, 6, 7, 8, 9, 10).
The bold modernisation of the streetscape is tempered to a certain extent, as opusHouse provides mirrored reflections of surrounding properties on its glazed, faceted frontage (Fig. 6). Furthermore, the tree filled open space in the centre of the block is enveloped and preserved by the closure provided by the scheme (Fig. 4).

Fig. 11 below



Solarthermie: Heizwärme und Brauchwassererwärmung
Versorgung Alt- und Neubau

Photovoltaik: Gewinn von elektrischer Energie / Strom


Nachheizregister
frische Außenluft
Fortluft
Lüftung mit Wärmerückgewinnung
Erdwärmetauscher
Nachheizregister
frische Außenluft
Fortluft
Lüftung mit Wärmerückgewinnung
Schnitt Altbau mit Aufstockung
M 1:200
Erdwärmetauscher

The Judkins Park House

Seattle, USA

2007

b9 architects inc.

www.b9 architects.com

Seattle, situated on America's Pacific North West coast, has a strong reputation for pro-active civic policy. Urban design, building standards and the use of clean energy technologies are constantly reviewed. Seattle's public leaders announced in February 2010 that the city aspires to become carbon neutral by 2030.

Prior to this announcement, the city's architects were already working towards this goal. Judkins Park House in Seattle was built by Bradley Khouri of b9 architects as a speculative, sustainable design development. The aim was to maximise the allowable density on a plot already occupied by a single storey farmhouse built in 1900. Bradley and his wife were resident owners of the existing farmhouse and developed a design strategy to recognise the constraints of the site.

The new property would be scaled appropriately, preserving daylighting for the farmhouse. The Judkins Park House was located along the full length of the under-utilised, existing driveway with a roof sloping up and away from the farmhouse. The frontages of both dwellings are approximately the same width, and the set back from the road is identical. This considered plot layout facilitates consistency in the urban setting, with the new home providing the infill (Fig.1, Fig. 2).

The shared off-street parking area is constructed from Grasscrete, providing a green, durable, water permeable surface. Concrete slabs, broken up during the clearance of the old driveway, were recycled for use as paving material. The street-front garage is heated and illuminated, suggesting an inhabited space behind the glazed door (Fig. 2).

Population | 617,334

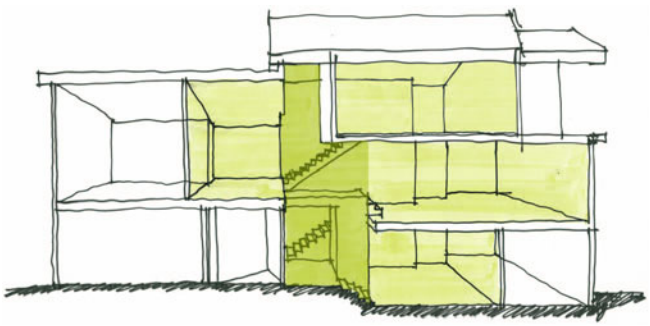
Coordinates | 47°36'35"N
122°19'59"W

Elevation | 0–158 m (0–520')

Precipitation | 919 mm (36.2")

Temperature | Average High:
24 C (75 F)
Average Low:
2 C (36 F)

Humidity | 70.0%



202 The Judkins Park House | Seattle | USA | Fig. 1 above | Fig. 2 opposite

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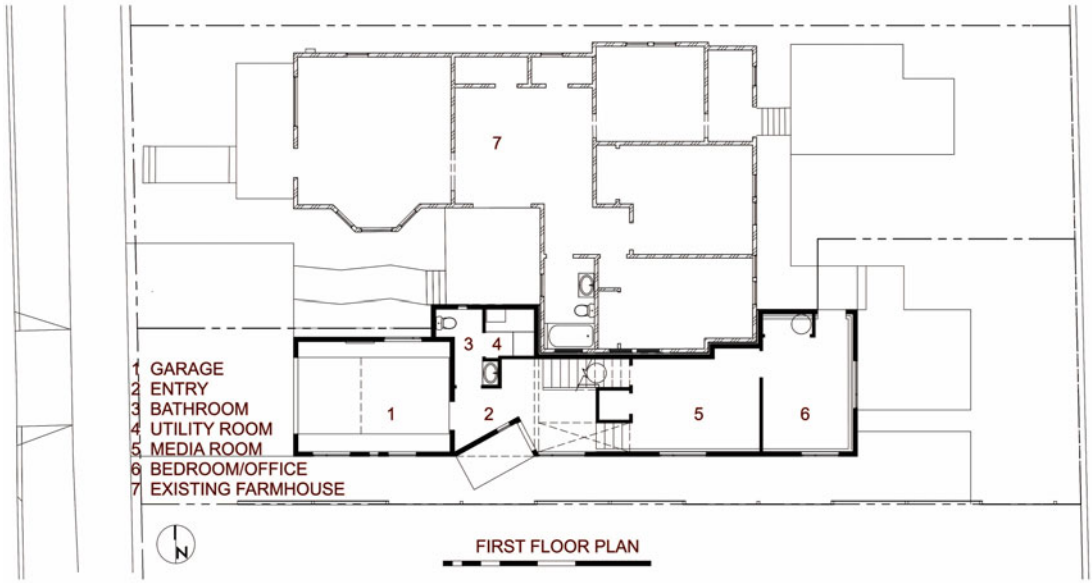
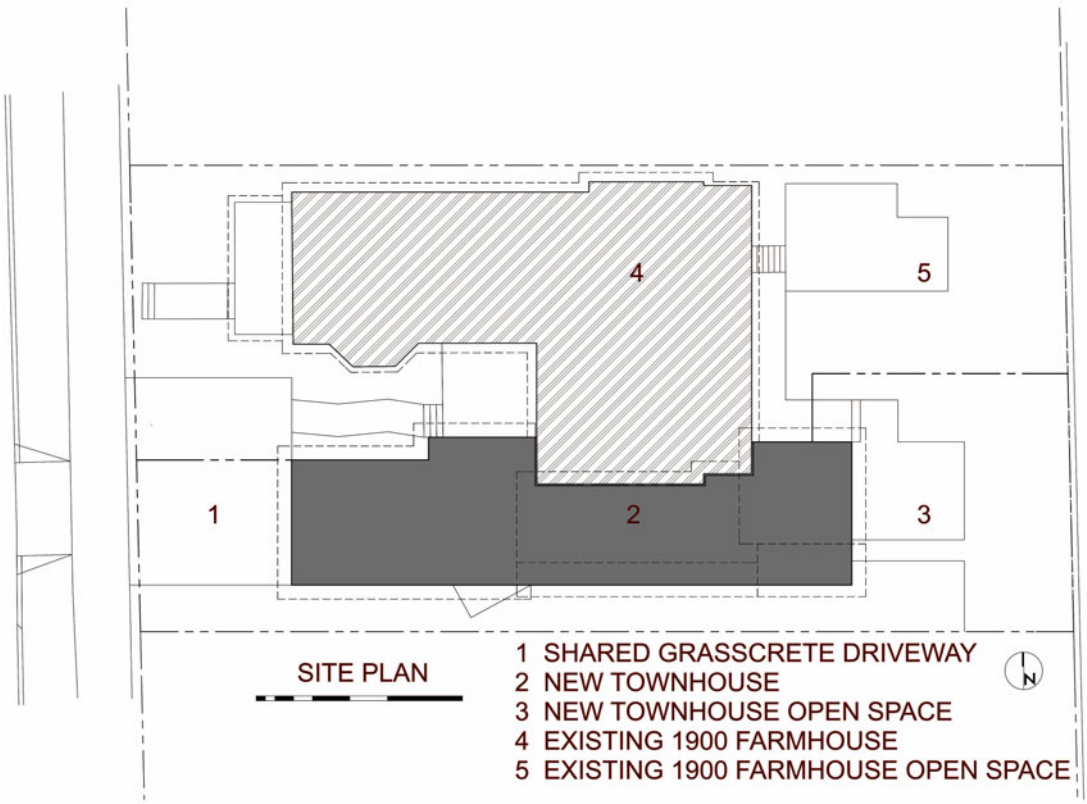


Fig. 3 above | Fig. 4 below



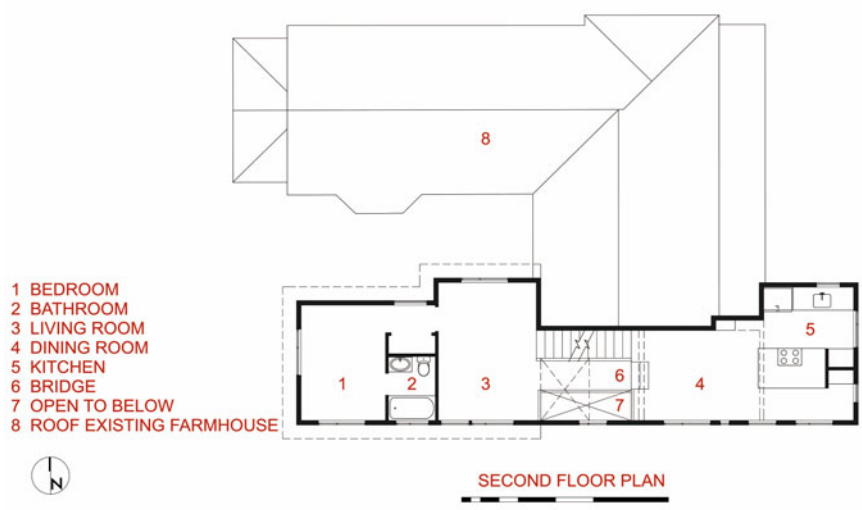
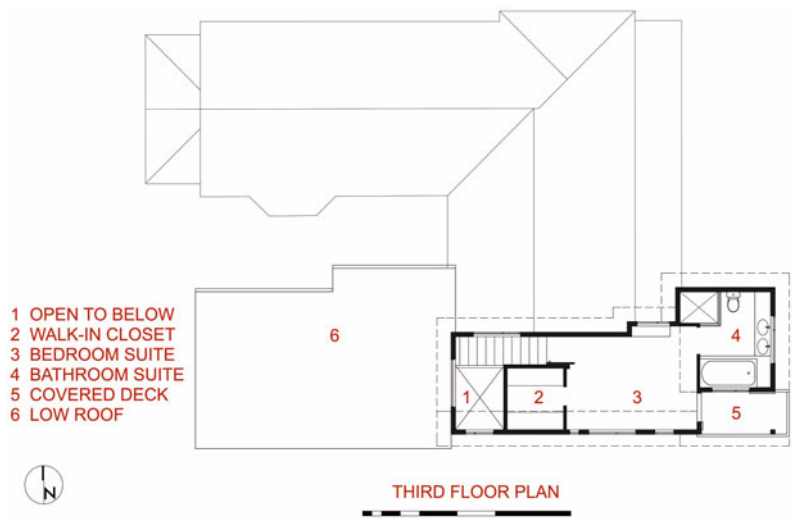


Fig. 5 above | Fig. 6 below



The project's plans and sections (Fig.3, Fig. 4, Fig. 5, Fig. 6, Fig. 12) illustrate how b9 architects skillfully maximised the building's volume. The internal widths vary from 9.75 feet to 15 feet, with heights ranging from 8 feet to 29.75 feet.

The entrance hallway at ground level provides access to a media room and, subsequently, a bedroom. The open living spaces are arrayed above the entrance hall and accessed by a staircase located against a party wall, where the two dwellings meet (Fig. 7).

The first floor level kitchen and dining room are to be found at the top of the first stair flight (Fig. 8, Fig. 9). This area is linked to a living room by a bridge spanning the open space above the entrance hall (Fig. 10). Bedrooms and bathrooms are located behind the living room and at the top of another stair flight (Fig. 8, Fig. 10, Fig. 11).

This customised use of space provides a new 1,940 square feet home attached to the existing 1,200 square feet farmhouse.

The new home was designed and constructed with sustainability in mind. Preservation of the original farmhouse building now enables two families to enjoy neighbourly living on the previously under-utilised plot.

Technologies employed include the use of a roof top, solar powered system for the pre-heating of domestic and heating water. Greywater is re-used via a Brac System and dual flush toilets are installed throughout the property. Strategic placement of opening windows provides daylighting of the interior spaces and cross ventilation. In the kitchen, 100% recycled, locally sourced paperstone countertops cover the base units (Fig. 9).

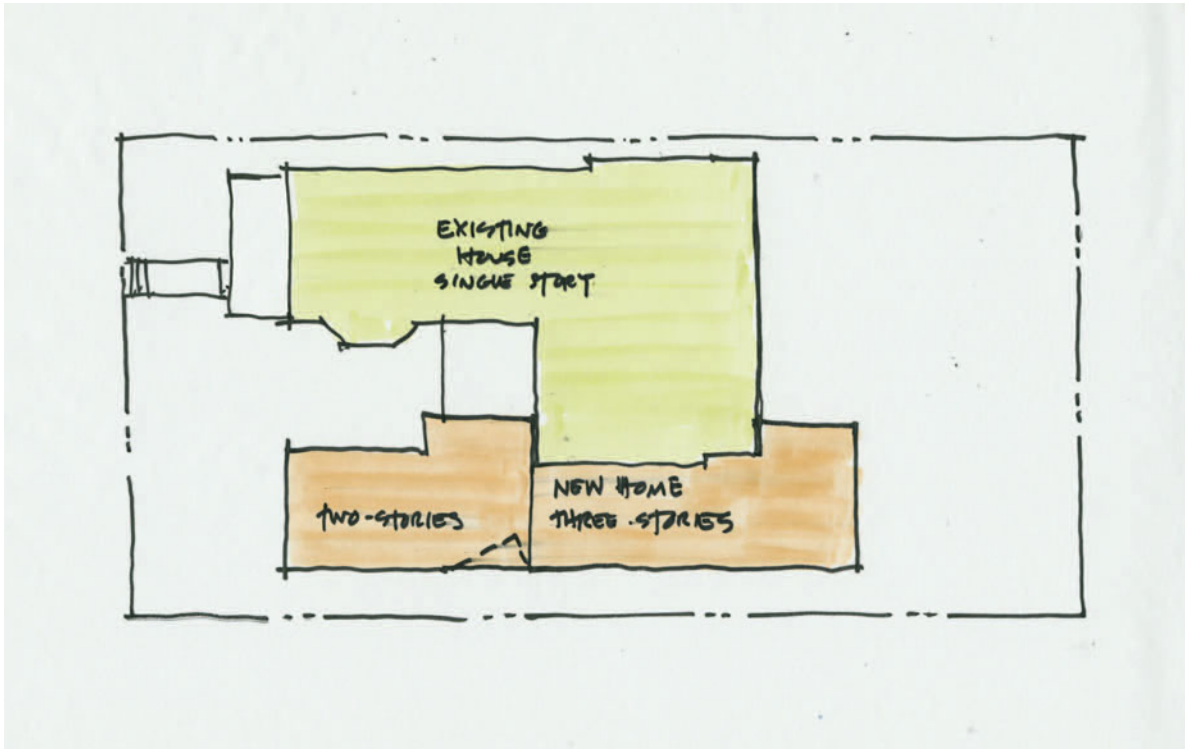
The external walls and roof construction are heavily insulated. A rain screen moisture barrier was applied to the external walls, this allows the timber siding to act primarily as a solar shade (Fig. 13)

The combination of all these elements resulted in Judkins Park House achieving the second highest Built Green rating of four stars.

Fig. 9. below

Fig. 12 below


1 ENTRY
2 LIVING ROOM
3 EXISTING FARMHOUSE
TRANSVERSE SECTION
1 BEDROOM/OFFICE
2 MEDIA ROOM
3 ENTRY
4 GARAGE
5 BEDROOM
6 BATHROOM
7 LIVING ROOM
8 DINING ROOM
9 KITCHEN
10 BATHROOM
11 BEDROOM
LONGITUDINAL SECTION


EXISTING
HOUSE
SINGLE STORY
NEW HOME
THREE STORIES
TWO-STORIES

Solar Tube

Vienna, Austria

2001

driendl*architects

www.driendl.at

Austria's largest city, Vienna, is the cultural, economic and political centre of the country. Approximately 2.3 million people (more than 25% of Austria's population) live within the metropolitan area. In 2001 the city centre was designated as a UNESCO World Heritage Site.

Dobling, a leafy, rather wealthy, residential area of single-family homes sits on the north-western outskirts of the city. If one of Dobling's residents had taken a five month vacation from April to August in 2001, they could have been forgiven, if upon their return, they had thought a spaceship had descended into their quiet neighbourhood.

Architect Georg Driendl was inspired to design and build the dwelling using the solar tube as his guiding principle. The solar tube is a vertical tube with a mirrored lining, which is inserted through the roof of a house to guide and diffuse natural light from the outside, to illuminate the space within. Driendl's development of the idea was to use the entire volume of the house as a solar collector, minimising the requirement for heating, cooling and illumination. The basic shape, structure and choice of materials all stem from this guiding principle (Fig. 1 and 2)

The opportunity to successfully apply this design was provided by the nature and topography of the site in Dobling. The plot is long and narrow, 1,300 square metres in total, and slopes from south to north up and away from the street. The dwelling follows this route and is naturally ventilated as a consequence. The abundance of deciduous trees was vital to the design, proving shade in summer and increased light in the winter months when leaves are shed. Solar Tube functions only by keeping the natural resources of the plot intact.

Population | 1,680,266

Coordinates | 48°12'32"N
16°22'21"E

Elevation | 190 m (623')

Precipitation | 620.3 mm (24.42")

Temperature | Average High:
25.6 C (59.5 F)
Average Low:
-2 C (28.4 F)

Humidity | 71.4%

210 Solar Tube | Vienna | Austria | Fig. 1 above | Fig. 2 right

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_25, © Springer Science+Business Media B.V. 2011

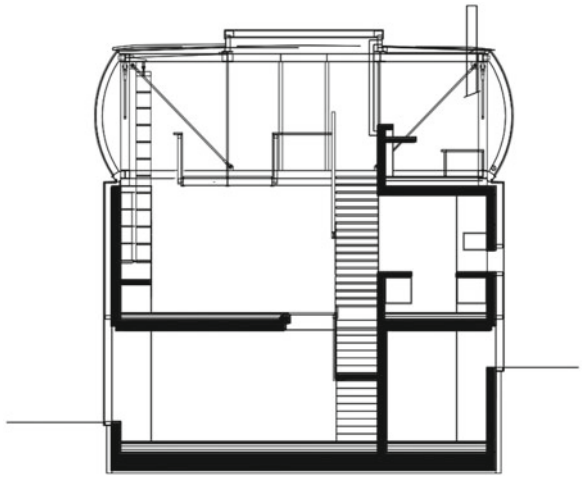

19

The space within the dwelling circulates around a glazed atrium containing the stairwells. By utilising slatted decking in these areas, light is transmitted and filtered through the central core of the building. In the summer months, heat build up is mitigated via the central stairwell chimney effect, and exhausted via the opening roof panels (Figs. 3 and 5).

The openness of the interior design succeeds through the custom designed furniture for the kitchen, bedrooms and bathrooms. The lounge, and library spaces are also carefully integrated into the architecture (Figs. 4, 6, 7, 8).

By utilising a high proportion of pre-fabricated components, the site construction phase was reduced to only five months. This policy ensured minimum impact on the heavily wooded plot (Figs. 9, 10).

The symbiotic relationship between the building and its immediate external environment provides the compound benefits of energy saving with the pleasing ambience of a simple tree house.



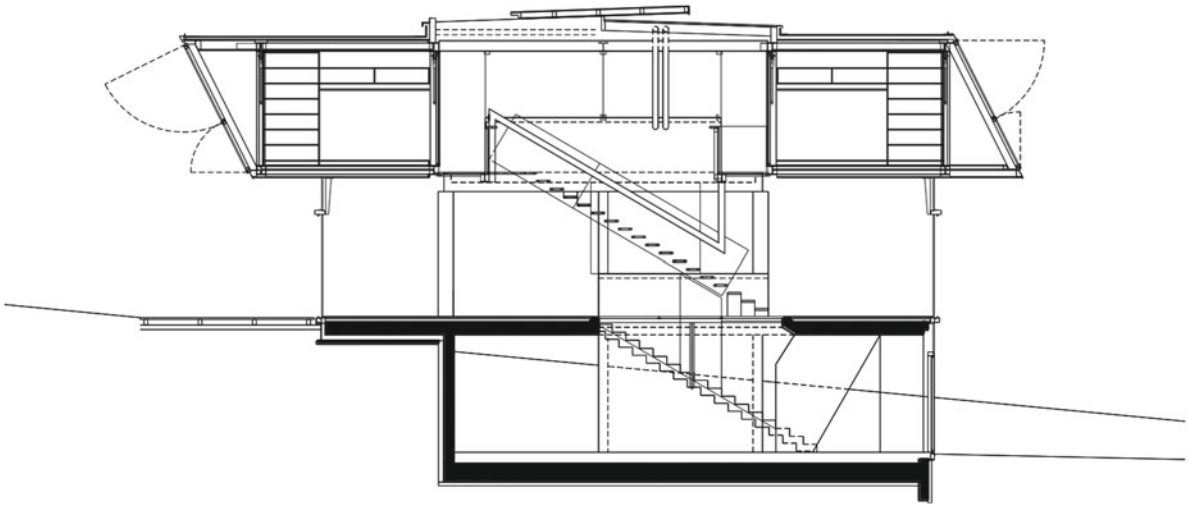
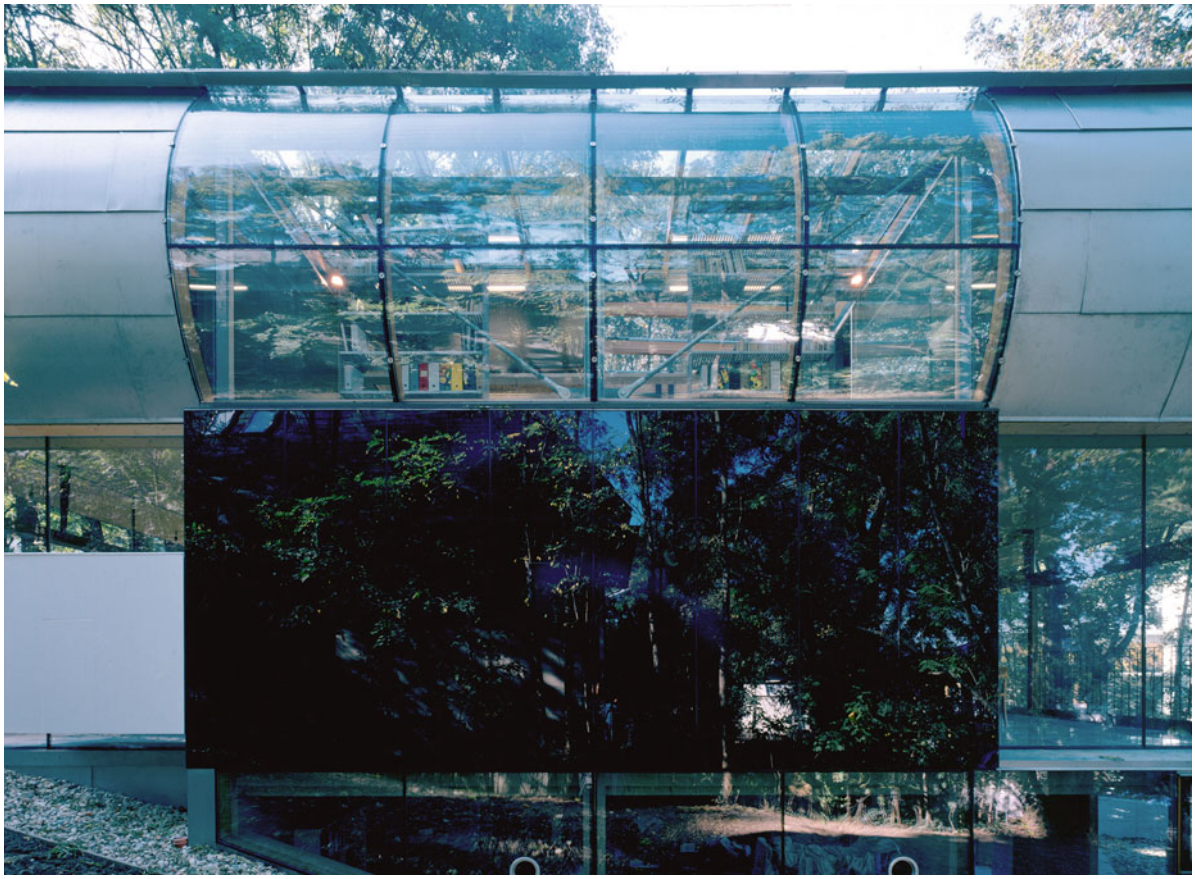


Fig. 7 below left | Fig. 8 below right



Solar Tube | Vienna | Austria | Fig. 10 above 215

The RainShine House

Decatur, USA

2009

Robert M. Cain, Architect

www.robertmcain.com

The State of Georgia in the South Eastern United States enjoys a humid, subtropical climate. In winter, occasional polar air masses can bring cooler weather, however, Georgia is characterised by its typically hot and humid summers. The State can be affected by neighbouring Florida's hurricane season. The hurricanes tend to weaken overland, becoming tropical storms of heavy rain and strong winds.

Average rainfall is moderate to heavy, varying from 45 inches in the central state to 75 inches in the mountainous northern part of Georgia.

Georgia's state motto "Wisdom, Justice, Moderation" may well have been applied in bringing the RainShine House project to fruition.

The challenge for architect, Robert M. Cain, was to design and construct a customised, sustainable home on a 1/3rd acre plot with a constrained buildable area. The plot, located close to downtown Decatur, was blighted by a man-made flood plain. Inadequate municipal culvert design, run off from a nearby parking area and a sewer easement dictated that the building area would be a trapezoidal shape totalling 3,778 square feet.

However, the client's lifestyle choice of walking, cycling and enjoyment of the daily opportunities afforded by Decatur's diverse community culture could all be realised from this problematic plot.

The challenges were addressed directly by orientating the open aspects of the house towards the open space afforded by the easement and the stream's buffer requirement.

The customised use of floor space is illustrated on the architect's drawings (Figs. 3, 4, 5, 6).

Population | 18,147

Coordinates | 33°46'17"N
84°17'52"W

Elevation | 318 m (1,043')

Precipitation | **1326 mm** (52.22")

Temperature | Average High 2010:
37.4 °C (99.32 F)
Average Low 2010:
-9.6 °C (14.72 F)

Humidity | 69.1%

J. A. Flannery, K. M. Smith, *Eco-Urban Design,* DOI 10.1007/978-94-007-0369-8_26, © Springer Science+Business Media B.V. 2011

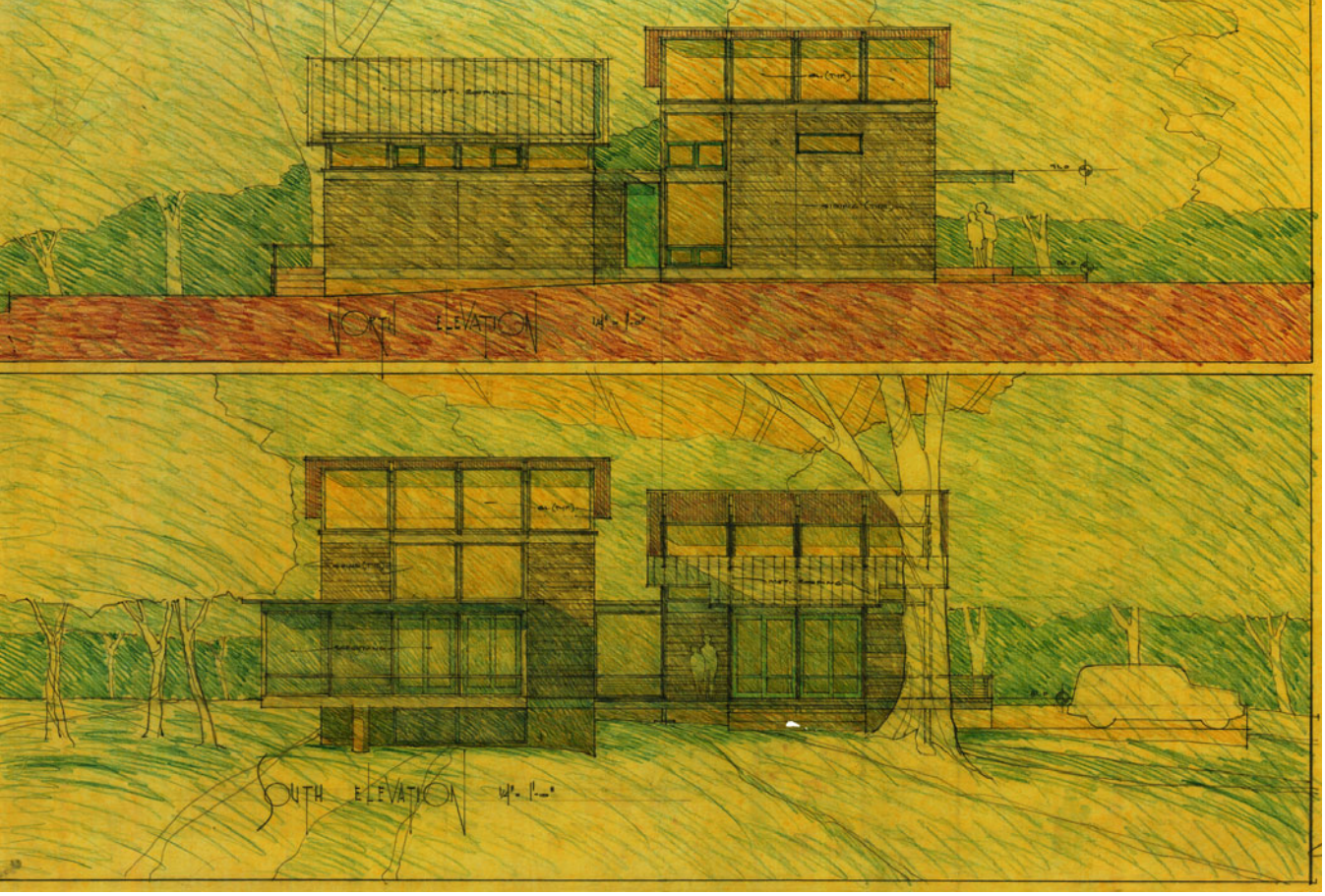


Fig. 3 above | Fig. 4 below

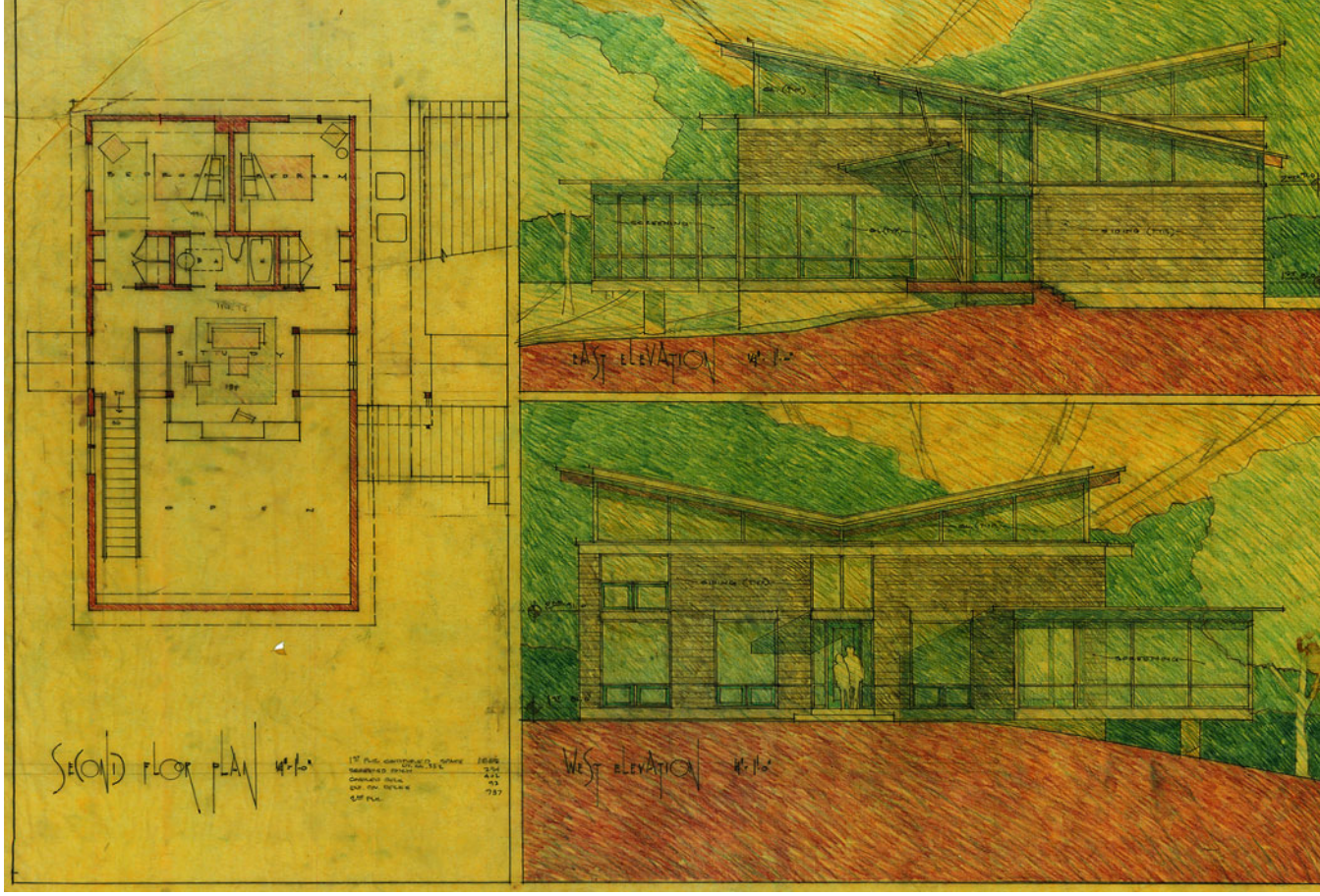
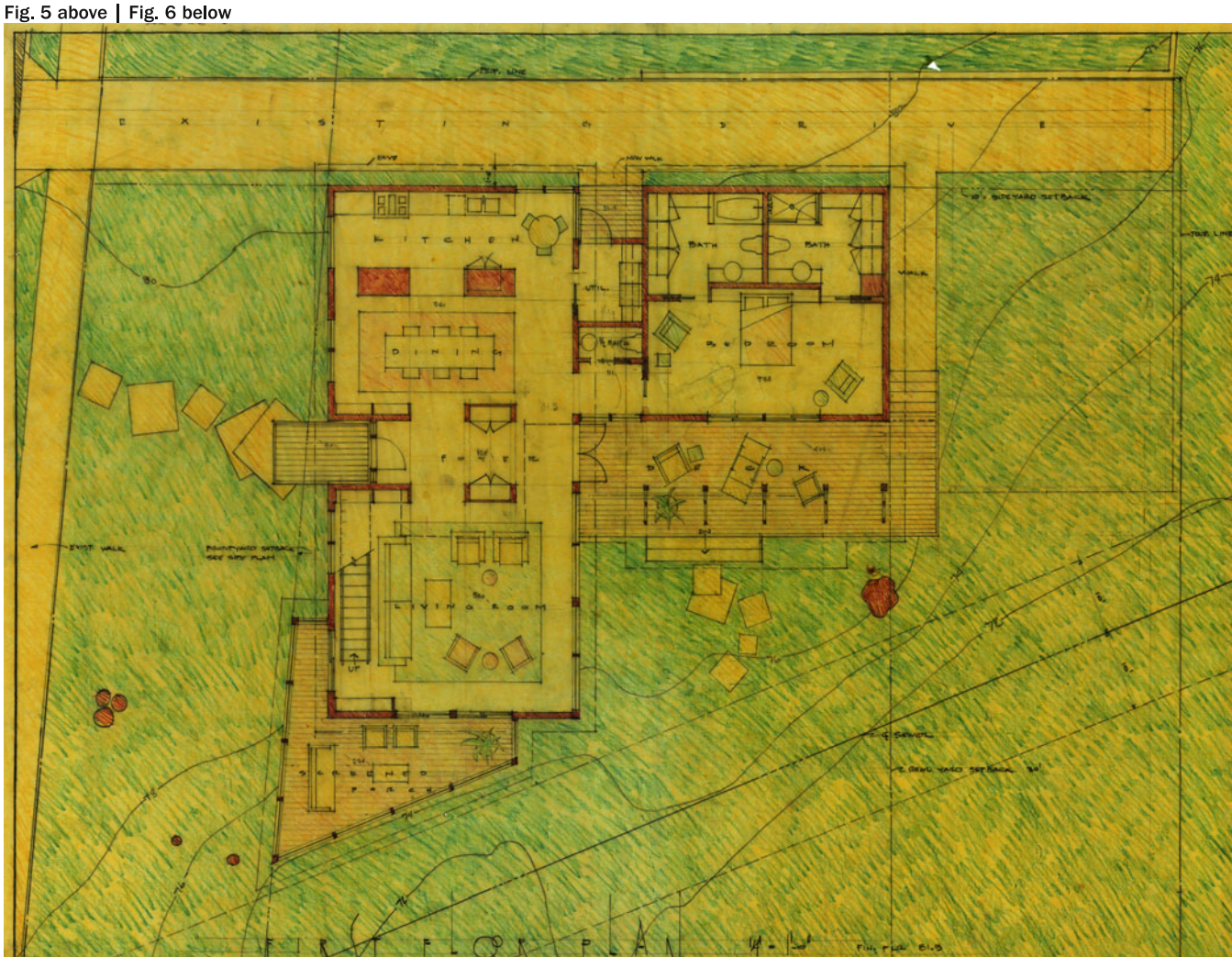


Fig. 5 above | Fig. 6 below



The most striking design feature of RainShine House is the inverted shape of the roof (Fig. 2), (Fig. 5), likened to that of a butterfly's wings. This roof shape facilitates the capture of rainfall (**Rain**) and virtually eliminates the need for high maintenance gutter and fall-pipe systems. The captured water is stored in 5 x 500 gallon cisterns located in the basement of the house. The roof is oriented to the south, maximising the efficiency of a 3.1 kW, roof-mounted, photovoltaic system (**Shine**). The long roof spans are supported by a framework, locally fabricated from 100% recycled content steel (Fig. 9).

Further contributions to the property's energy efficiency include geothermal heat pumps, energy recovery of the naturally cross-ventilated spaces and LED lighting systems. All household appliances were selected on the basis of energy efficiency. The facade glazing is designed to minimise solar gain.

Architect Robert M. Cain provides the following Energy Cost Projections :

	kWh/yr	**$ cost / year**
Annual Heating	4,932	562.24
Annual Cooling	2,576	274.91
Hot Water	975	104.03
Lighting	923	98.48
Household Appliances	3,061	326.61
Energy Recovery Ventilator	810	86.43
Rain Water Harvesting.	24	2.56
Gross Total **	13,301	$1,419.27
Photovoltaic Production *	7,500	-$1,330.50
Nett Energy Consumption	5,801.5	

** Georgia av' Sept 08 rate per kW/h 0.1067
* Georgia Power nett meter rate per kW/h 0.1774
Total Cost per year **$88.77**
Monitoring in June, July 2009 verifies the estimates.

RainShine House achieved **Leed platinum** for Homes

Platinum Threshold (points)	97
Sustainable sites	20/21
Location and linkages	8/10
Water efficiency	14/15
Energy and Atmosphere	29/38
Materials and Resources	12/14
Indoor Environmental Quality	14/20
Innovation and Design	9/9
Awareness and Education	2/3
Total Points Achieved	**108**

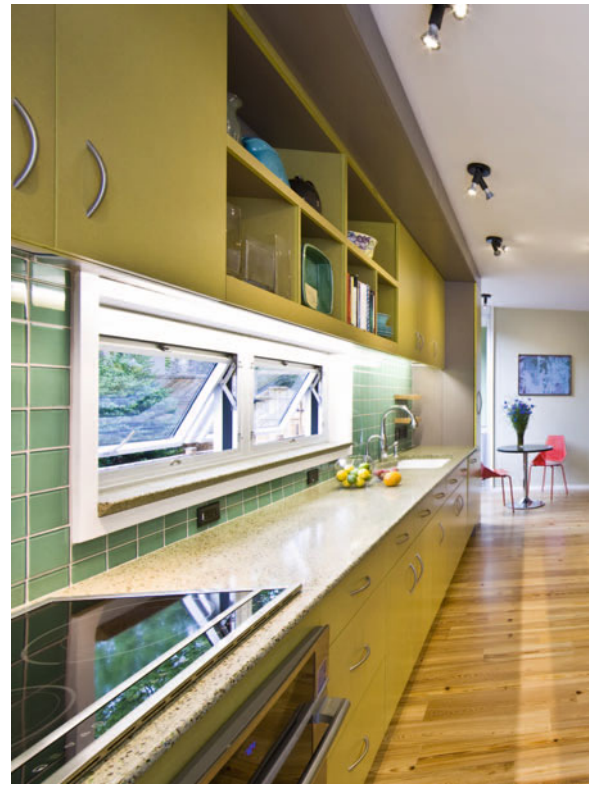


Fig. 11 above, opening clerestory windows provide natural ventilation. | Fig. 12 below, zero VOC interior paints and stains

Fig. 13 above, ceiling fans reduce reliance on HVAC. | Fig. 14 below, wood floor 100% recycled heart pine from local source.

Photo Credits

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6 Environmental Protection Agency Region 8 Headquarters , Denver, USA
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Social Housing

Private Homes

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