



No 1 Moulmein Rise

Singapore, Singapore



Architect: WOHA Architects / Wong Mun Summ, Richard Hassel

Client: UOL Development Pte Ltd

Built Area: 6'491 m²

Cost: US\$ 9'136'735

Most high-rises in the tropics do not exploit the fact that the climate is gentler higher up. This 28-storey apartment block does, redeploying several climatic strategies used in vernacular construction. Cross-ventilation is achieved by the plan, with two apartments per floor. Projecting ledges and perforated metal cladding provide shade and conceal air-conditioning. A 'monsoon window' - a bay window incorporating a sliding aluminium shelf - allows breezes in without rain. The building provides 48 apartments, 2 penthouses, a lap-swimming pool and parking. Its diverse curtain wall mixes planters, bay and casement windows, screens and sliding doors.



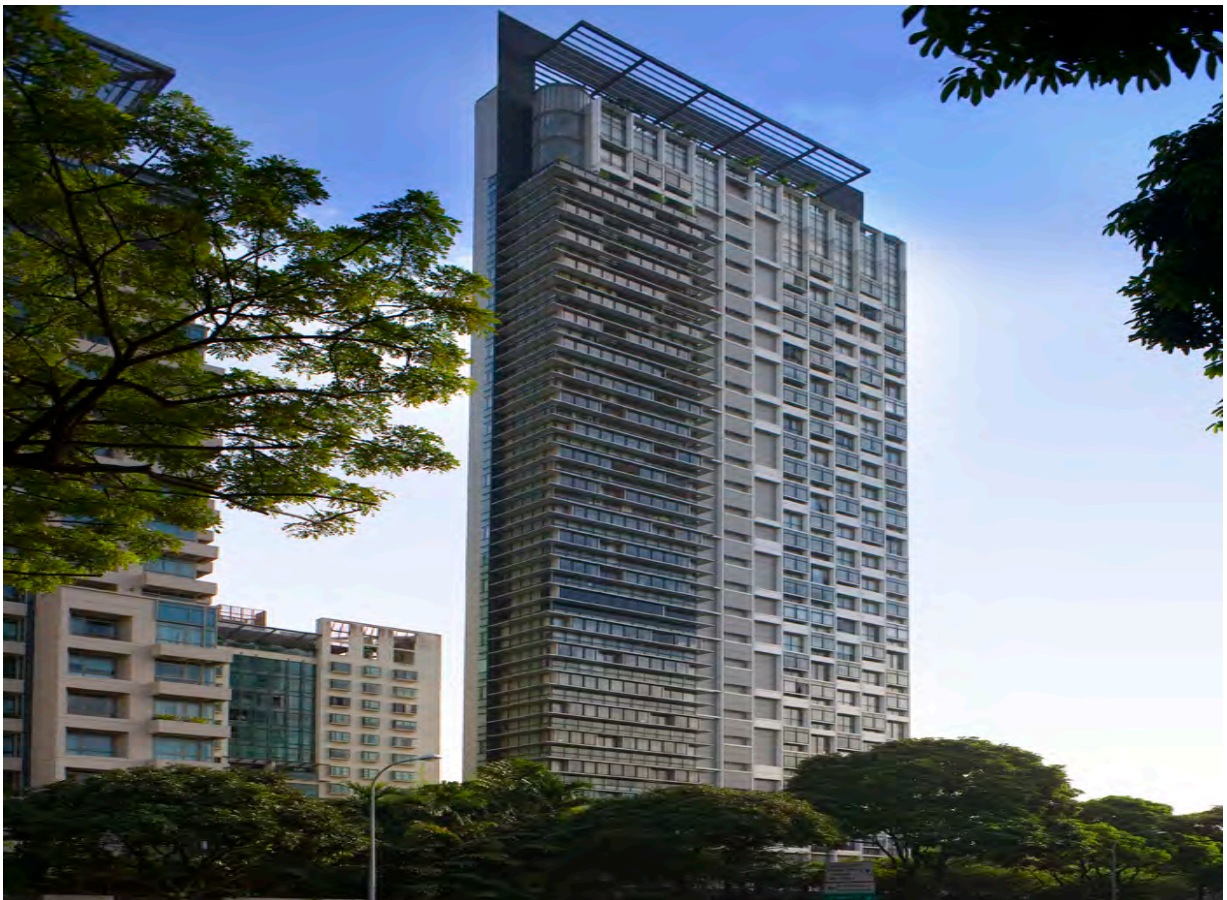
2007 On Site Review Report

3291.SIN

by Zainab Faruqui Ali

No1 Moulmein Rise

Singapore



Architect

WOHA Architects / Wong Mum Summ, Richard Hassel

Client

UOL Development Pte Ltd

Design

1999 - 2001

Completed

2003

No. 1 Moulmein Rise

Singapore

I. Introduction

No 1 Moulmein Rise, designed by WOHA Architects, is a 28-storey residential building containing 50 apartments. The building addresses the issues of providing privacy and environmental comfort for its inhabitants while responding to commercial needs and creating a contemporary urban identity. It incorporates popular design elements such as bay windows, monsoons windows, sunshades, air-conditioner ledges and planters, but with due respect for efficiency and profit requirements. In relation to the present awareness of conserving energy and the renewed respect for tradition in Singapore, No 1 Moulmein Rise may be considered a trendsetter. With its pleasing proportions and new look, it is a building suited to its time and responsive to its users.

II. Contextual Information

A. Historical background

Singapore was founded as a British trading colony in 1819. It joined the Malaysian Federation in 1963 and became independent two years later. Singapore's journey from a small colonial port to a prosperous trading city is reflected in the changing architectural arena of shop-houses, public housing, parks and high-rises.

Singapore is a signatory to international agreements on the environment including Biodiversity, Climate Change, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Ozone Layer Protection and Ship Pollution. Efforts by the people to contribute to an energy-conscious, eco-friendly environment are also on the rise.

The median age of population is 36, and life expectancy is 81 years. Combined with a GDP growth rate of 8.1 per cent, this gives a sizeable population capable of owning property.

B. Local architectural character

In the first decades after independence, Singapore's high-rise architecture copied Western styles (meaningfully or not). Like Bangkok or Hong Kong, it became known as a global city that 'could be anywhere'. However, during the 1990s the country began to define its distinctive identity, which also led to a revisiting of its roots. Now Singapore, like other contemporary Asian cities, has its own notion of modernity, its own enthusiasm, and its own references to the architectural traditions of the past. The present architectural scenario is an exciting one, combining aspirations towards globalisation with a sensitivity towards the locale.

C. *Climatic conditions*

Singapore has a tropical climate, hot, humid and rainy. Its maritime exposure ensures a largely uniform temperature and pressure. The two main seasons are the Northeast Monsoon season from December to March and the Southwest Monsoon season from June to September. In between there are two relatively short periods characterised by afternoon thunderstorms. Daytime temperature range from 23°C (minimum) to 34°C (maximum). The mean relative humidity is 84 per cent, and rainfall occurs mostly during the months of December and April.

D. *Site and surroundings*

The building is set in a quiet residential area of the city with a mix of mid- to high-rises and single-family homes. The green area immediately to the south is state land, where building heights are restricted to four storeys. Further south still there is a designated national park with a compound containing the president's residence. For security reasons, buildings are not allowed to face directly onto the compound. No. 1 Moulmein Rise is just outside of this zone.

All of these factors are advantageous. The high-rise enjoys uninterrupted views of the open spaces and the downtown area beyond them. The expanse of greenery nearby creates a microclimate that is cooler than the city centre. There is easy access to major roads and public transport. The building is within five minutes' walk of Novena MRT station and the bus stop on the main road.

D. *Topography*

The site is mostly flat, with a slight undulation.

III. Programme

A. *History of the inception of the project*

United Overseas Land (UOL) Development Pte Ltd acquired a plot of 2,324 square metres in Moulmein Road. The market study called for a mid- to high-rise apartment building in the mostly residential neighbourhood. The site enjoyed extensive views, being located next to a conservation area with low buildings and vast swathes of greenery. The only disadvantage was that its configuration was somewhat triangular. UOL wanted the building to provide modern amenities to the buyers and to have a prestigious look. In order to get the best possible design solution, they decided to hold a competition.

B. *How were the architects and specialists chosen?*

WOHA was selected through a limited competition among four architectural firms in 1999. All other consultants were appointed directly by the client.

C. *General programme objectives*

The architectural solution aimed:

- For the residents to have apartments that are comfortable, efficient and elegant
- For the public to have a pleasing addition to the city skyline
- For the developer to maximise the return on the investment

WOHA worked to understand the commercial needs of the developer, and to create good architecture out of the client's goals.

D. *Functional requirements*

The client wanted to have 40 to 50 apartments in a mid-range development that would maximise returns. Common facilities such as parking, gymnasium and swimming pool were also to be incorporated. The developer initially called for a lower building with a deeper plan, but the architects increased the height to take advantage of the southern exposure of the site. The designed setback also improves natural ventilation and daylight, and of course views.

IV. **Description**

A. *Project data*

The building contains 48 typical apartments and 2 penthouse apartments. The ground floor contains a 50-metre lap-swimming pool cascading over three levels, a tropical garden, a small gym and an underground car parking area for 52 cars. It has two apartments per floor, each open on three sides. There are two private lifts that open into each resident's apartment, and a public lift for visitors. These amenities were very good selling-points.

Ground floor area	230 square metres
Total combined floor area	6,491 square metres
Total site area	2,340 square metres
Total construction area	9,480.69 square metres
Typical apartment area	203 square metres

B. *Evolution of design concepts*

The principal architects, Richard Hassell and Wong Mun Summ, persuaded the client to adopt a smaller footprint and go higher than originally intended. The resulting building has a slender, aesthetically pleasing three-dimensional look that makes it stand out in the competitive real-estate market. Its tallness produces added comfort for its inhabitants, in terms of both light and air (in the urban environment, air is generally cooler the higher up one is from the ground). Orienting the building in north-south direction was part of this decision.

Transforming commercial pressures into environmental devices was a plus point of this design. The (sometimes conflicting) requirements of site, climate, technologies, developer, authorities, end users and consultants were taken into account, and incorporated into a

diagram that was used to develop the design at all levels and scales. The architects looked at stylistic approaches both at home and abroad, but devised their own expression that was guided by this diagram to a considerable degree.

The facade design has four elements – horizontal sunshades, vertical perforated screens, planters and monsoon windows – that are combined in a varied order to give individuality to each apartment. The architects' approach was similar to the way DNA encodes diversity with a few samples of protein. Inspiration also came from Escher paintings and the patterns of the Alhambra mosque. Three elevation types were derived from a mixing and matching of the functional modular elements.

UOL wanted the price–value proposition to be right. There is a great demand among buyers for traditional elements such as bay windows, sunshades and planters. In Singapore, the extra area they take up is exempt from development tax, but still counts as sellable space. Incorporating all these elements in a creative way increased the value of the flats, as did the style quotient of the building, with its slender proportions and distinctive new facade treatment. From the very top of the building a slender (blade) wall rises, dividing the front and the back, or the spaces of south and north.

Landscaping is sensitively executed, with bamboo groves at parking entrances and near the boundary walls. The penthouse roof deck with swimming pool has large palm trees. The landscape design also follows the general order of sliding rectangles that is seen in the facade.

C. *Structure, materials, technology*

This building employs a reinforced concrete structural system. The building form has a slenderness ratio of about 1:12.

Structure:	Reinforced concrete frame
Concrete finish:	Exposed concrete finished with a textured colour coating
Curtain glass exterior:	Tempered glass, aluminium, wood, steel and timber-clad steel
Internal walls:	Lightweight blockwork, plaster and paint
Lift lobby floor:	Composite honed and flamed finish granite tiles
Floors:	White oak parquet flooring with marine-ply underlay (living, dining, bedrooms and gym), white Volex marble and non-slip light grey homogeneous tiles (kitchen and bathrooms)
Bathroom counters:	White Volex marble
Monsoon window:	Perforated aluminium screens, glass, steel and wood
Air-conditioning ledges:	Perforated aluminium screens
Swimming pool:	Biszaza glass mosaic tiles, yellow Balau certified wood decking
Driveway:	Olive green cobblestone
Landscaping:	Black loose pebbles with stepping-stones, bamboo groves, flowering shrubs, water body

Technology conforms to current local practices. The architects insisted on superior quality workmanship.

D. Origins of technology, materials, labour force, professionals

Materials were locally available: some came from Singapore, others from countries such as China and Malaysia. Labour force was local; likewise all professionals came from Singapore. Of the two principal architects, Wong Mun Summ is locally trained, while Richard Hassell trained in Australia, where he is originally from.

V. Construction Schedule and Costs

A. History of the project

In Singapore nowadays, competitions are encouraged for both private and government projects. WOHA won the competition for this project and designed the building between November 1999 and April 2001. Construction commenced in April 2001 and ended in May 2003. Occupancy was in May 2003.

B. Total costs and main sources of financing

Total cost:	USD 9,136,735 (S\$ 14,500,500)
Cost /square metre	USD 1378.91 (S\$ 2,150)
Total construction area	9,480.69 square metres

Funding was provided by the client.

C. Comparative costs

At that time construction costs ranged from USD 1,265/square metre to USD 1,602/square metre for a good-quality private high-rise residential development. At Moulmein Rise costs were higher than average, at c. USD 1,379/square metre. However the design's incorporation of highly marketable elements more than compensated for this additional cost.

D. Maintenance costs

The monthly service charge and sinking fund per apartment is USD 253.20 (S\$ 400), which compares favourably with maintenance costs in similar buildings.

VI. Technical Assessment

A. Functional assessment

The functional organisation of the apartments responds to local spatial requirements. The common facilities set in ground-floor tropical gardens are an added attraction. The architectural vocabulary of planters, bay windows, sunshades and air-conditioning ledges provides a good functional solution as well as an ingenious approach to concealing the air-

conditioning units and dangling clotheslines that so often mar the appearance of high-rise buildings.

Bay windows, air-conditioning ledges and sunshades extend the indoor space as much as possible, adding about 10 per cent to the size of the apartment. Statutory regulations strictly control the size of these various devices. The architects worked within these limitations to create a facade that was complex and rhythmic, and could also accommodate a variety of window treatments.

B. Climatic performance

The provision of natural means of climate control was of the utmost importance to the architects. The building is open on three sides and oriented north-south to optimise its environmental performance. The windows are well shaded to reduce direct heat gain. Deep overhangs on the facades (1 metre on the north and 0.6 metre with vertical sun screens on the south) provide shading from the direct sun and help keep out driving rain.

The monsoon window attached to the bay window is a traditional feature of Malay, Vietnamese and Indonesian vernacular architecture. Monsoon windows were incorporated into a few houses in Singapore in the 1970s and 1980s and also appeared in a hall of residence at the National Technical University in the late 1980s. (An office building designed by Geoffrey Bawa in Colombo had employed this environmental strategy in 1978.)

WOHA had tried out this strategy in two of their previous designs. In the Victoria Park Road houses and later in Maple Avenue House, they used a horizontal steel grille maintenance ledge between the timber louvres and the windows, set flush with the internal floor. Cool air came in when the louvres were shut but the windows open. This was developed into a more sophisticated detail for Moulmein Rise by positioning the grilled opening on the bottom ledge of the projecting bay window.

If the monsoon window is left open when it is raining it keeps the inside cool but stops the rain from coming in. It also helps to air the apartments when residents are away on vacation. With all monsoon windows open on the south side and only one regular window open on the north, there was very good cross-ventilation in the apartments surveyed.

C. Environmental response

In Singapore, air-conditioning is considered a must for comfort, so the architects' attempts to reduce the cooling load are commendable. (In typical Singapore high-rises, windows cannot be left open because of the unpredictability of the rain.) Solar glare was reduced by the use of shades. At midday on the 23rd floor, south windows had some glare problem without the shades. There is cross-ventilation in all rooms. On the 19th floor, interiors were quite breezy as all the regular windows were kept open.

The natural slope of the site was maintained at the ground floor level by designing the swimming pool over three tiers. The bamboo grove was a natural choice for the architects for

the ground-floor landscaping, not only for its aesthetic and space-saving qualities, but also for its high levels of carbon absorption.

D. Choice of materials, level of technology

The choice of materials was determined by issues of economy, durability, availability and aesthetics. The architects state that they studied the materials in relation to their quality, performance, look and compatibility with each other. Exposed concrete is finished with a proprietary textured coating in colours selected not to show dirt or construction tolerances. Two materials, aluminium and wood, have been handled with care in the windows. The use of perforated aluminium screen as a continuous facade element is a clever way to hide air-conditioning units and clotheslines, which has set a new trend in Singapore.

E. Ageing and maintenance problems

The selected materials are durable and also well cared for. The residents are taking good care of their individual units. The common facilities on the ground floor such as the swimming pool and gardens are well cared for. The operable windows open inwards, making it easy to clean their exterior surface. (It is the first instance of such windows in modern high-rises in the country.)

Material on the driveway is small square cobblestone paving, which is very durable and widely used in Singapore.

Some tiles are chipping off from the border of the water body, due to cars hitting the side while turning. A protective column guard could have been applied. Although the turning radius in the driveway was adequate, scratch marks were found in the back wall of the car turnaround at entry. A landscape barrier might have protected the wall.

F. Design features

Having just two apartments per floor allows for greater cross-ventilation and privacy. The plan is simple, with the major spaces of living, dining and master bedroom to one side of the circulation spine and the kitchen, two smaller bedrooms, washroom and utility to the other. The circulation or transitional space is defined by a different floor pattern and a lower ceiling. To accommodate changing user needs, the two smaller bedrooms have the potential to be combined into one. The open living area also allows for adaptability to a variety of functions.

A modular system based on multiples of 300 millimetres regulates all architectural dimensioning, from floor-to-floor heights down to the smallest details. The modular elevation was designed using this system and then randomness was applied to give variety to the individual units. The random ordering contributes to the rhythmic order of the facades, adding to the presence of the building as a designed urban object.

The facades also provide an environmentally responsive curtain wall and additional spaces for the residents. The front (south) facade presents an elegant play of shadow and shifting screens, while the back (north) takes the form of a vast service cage containing air-

conditioning units, drying racks and other utilities such as ironing boards, if required. The division of major and minor spaces in the apartment is dramatically expressed by the tall wall on the roof.

The interior planning gives uninterrupted views of the surroundings, since each apartment is open on three sides. One also senses a continuous flow of the interior space, from the entry right through to the other end of the apartment, a window in the master bedroom.

The penthouses consist of a well-proportioned, double-height living room with a second floor and a balcony. They are day-lit with a vast expanse of curtain wall.

The swimming pool is integrated with the design vocabulary and has a quiet, inviting ambience.

Moulmein Rise has the presence of a coherent urban object that reflects the viability of the plan that it holds. There is an integral relationship between the external form and the internal arrangements. In addition, the building adopts and reinterprets traditional features that contribute to climate control, taking advantage of the incentives offered by Singapore planning regulations. Instead of just applying traditional motifs, forms, ornaments, patterns or materials, it incorporates them in new ways, and so could be termed 'contemporary vernacular'.

G. Impact of the project on the site

Moulmein Rise is a statement that an excellent design adds value to the project and site and improves the quality of the urban life.

H. Durability and long-term viability

The materials are durable and well maintained. They do not need vigorous upkeep. The climate-modifying features contribute to the livability and comfort of the spaces.

I. Interior design and furnishing

There are many innovative features in the apartments. A smart newspaper holder in the apartment lobby also works as a hook for umbrellas. Curtain rods are concealed within the ceiling to give windows a crisp rectangular outline. Sliding doors have custom-designed handles and locks that sit flush with the surface. Flush, unobtrusive door-frames were also specially designed to maintain the planar effect of the doors. Air-conditioning is concealed inside the low ceiling of the circulation spine. The washroom shower tray was specially detailed for the space.

VII. Users

The apartments are owned by urban professionals – mostly single or with small families. Some user profiles and responses are listed below:

1. A couple, both working in the financial sector, 23rd-floor residents: 'We do not spend a lot of time here as we both travel for work, but when we return we really come home. Compared to similar apartments in the region, this is really is comfortable.'
2. A single, professional, 24th-floor resident: 'I keep the monsoon windows open all the time. It is also an energy saver. I like the daylight inside the apartment.'
3. Architect, single, 24th-floor resident: 'I am very happy with the design; it is comfortable with natural ventilation. The view is fantastic, day and night.'
4. Penthouse owner who uses this as a weekend getaway: 'The spaces are lofty and airy and I can display all my collectibles here. The best part is the spiral stair, and seeing the cityscape while getting up gives a good feeling. The swimming pool could have been a little larger.'
5. A couple with a toddler, 19th-floor residents: 'We do not use the air-conditioning due to our child's problem with the cold. Keeping the windows always open brings in adequate breeze, and during rain we keep the monsoon windows open for ventilation, sufficient for our comfort needs. The manual opening device of the monsoon window could have been more efficient.'

VIII. Persons Involved

Client: UOL Development Pte Ltd

Architects: Mr Richard Hassell and Mr Wong Mun Summ, WOHA Architects Pte Ltd

Contractor: Shining Construction Pte Ltd

Mechanical, Electrical, Civil and Structural Engineer: Meinhardt (Singapore) Pte Ltd

Quantity Surveyor: KPF Quantity Surveyors (1995) Singapore Pte Ltd

Fire Consultants: ABL Lim (FPC) Pte Ltd

IX. Bibliography

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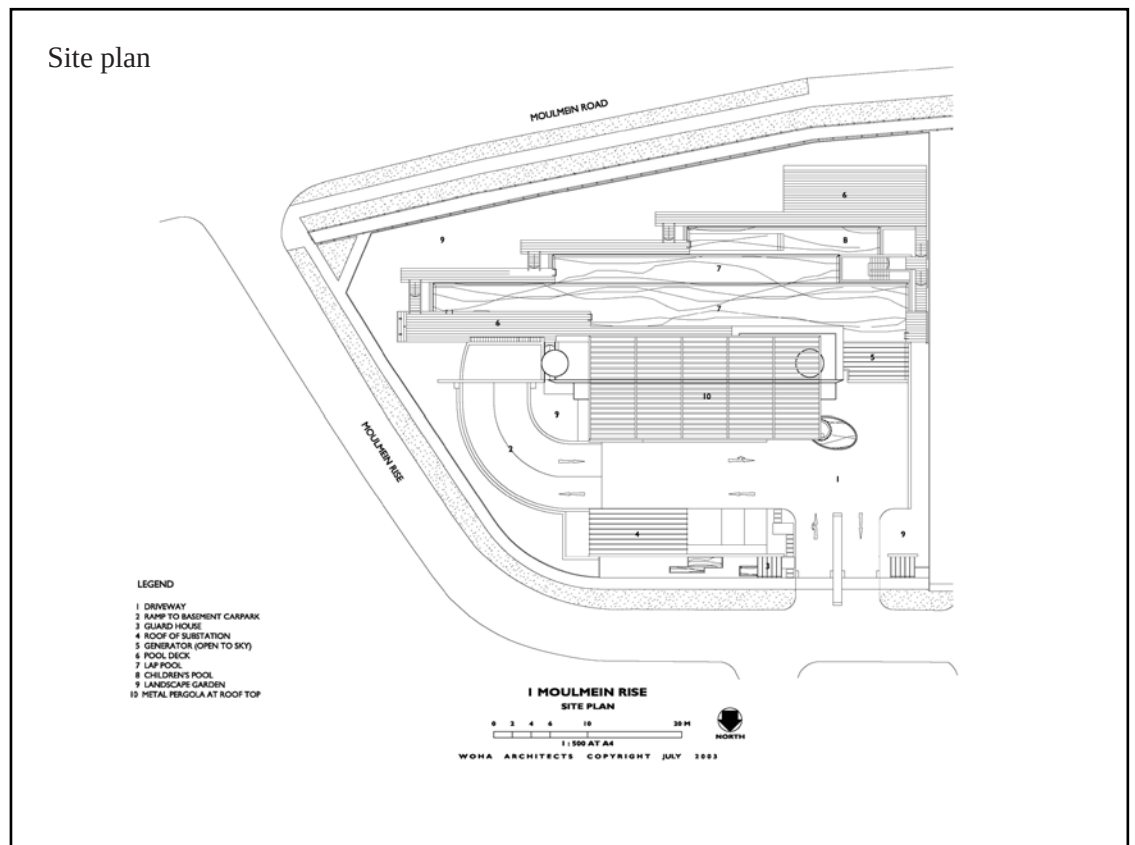
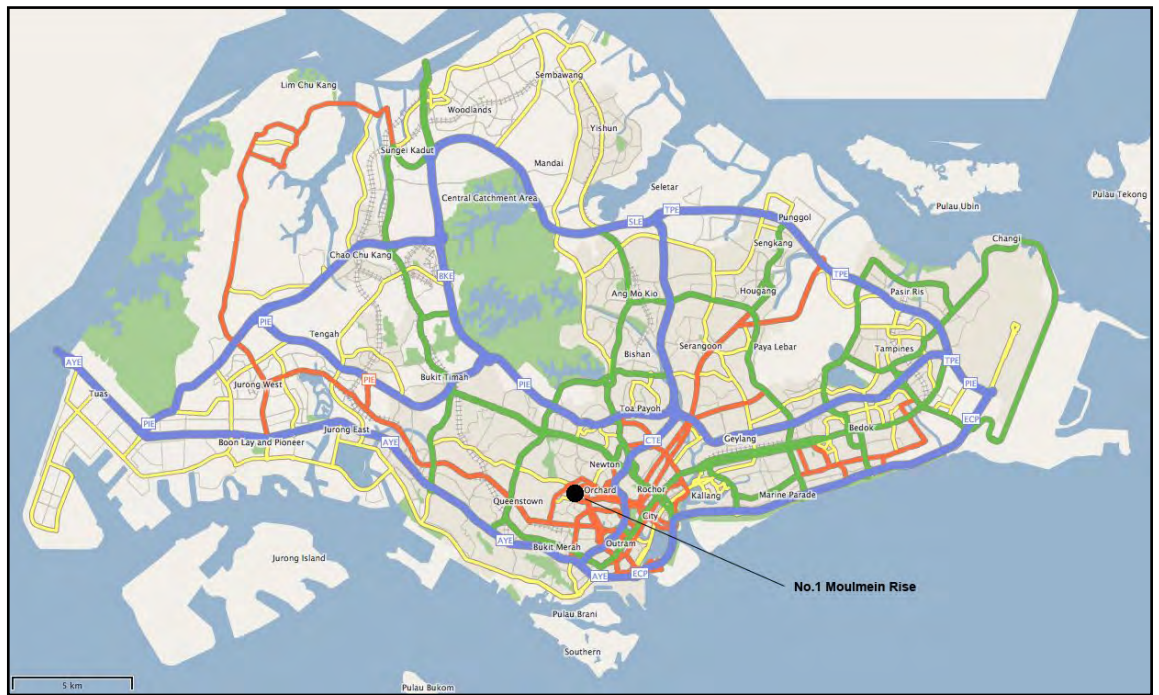
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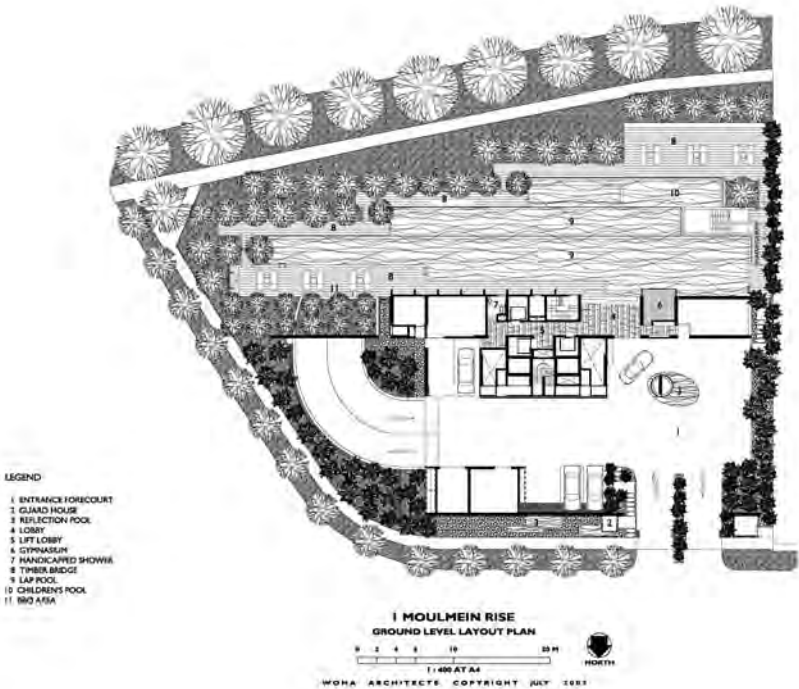
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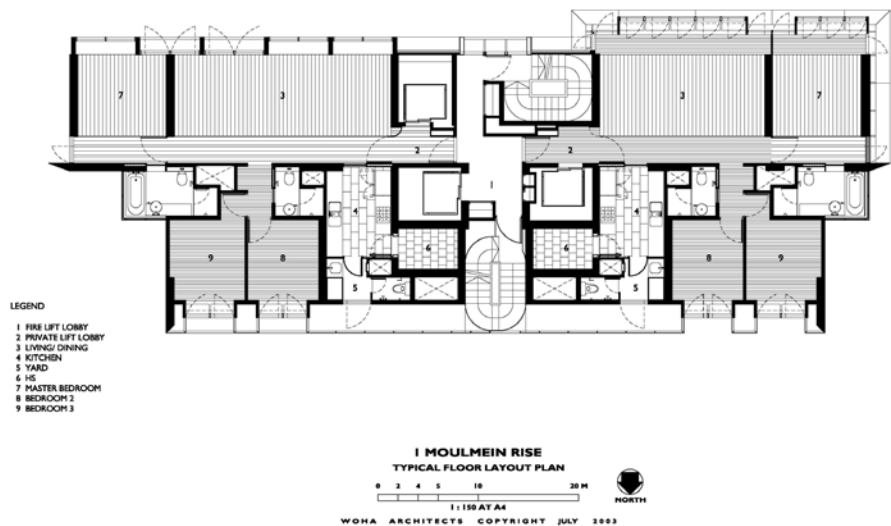
April 2007



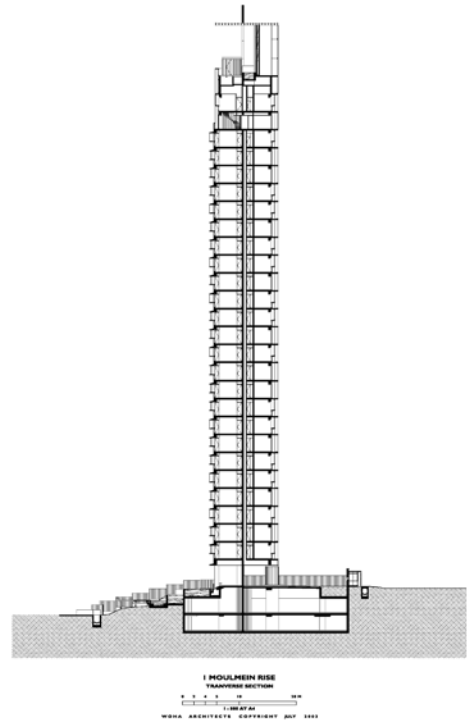
Ground level layout plan



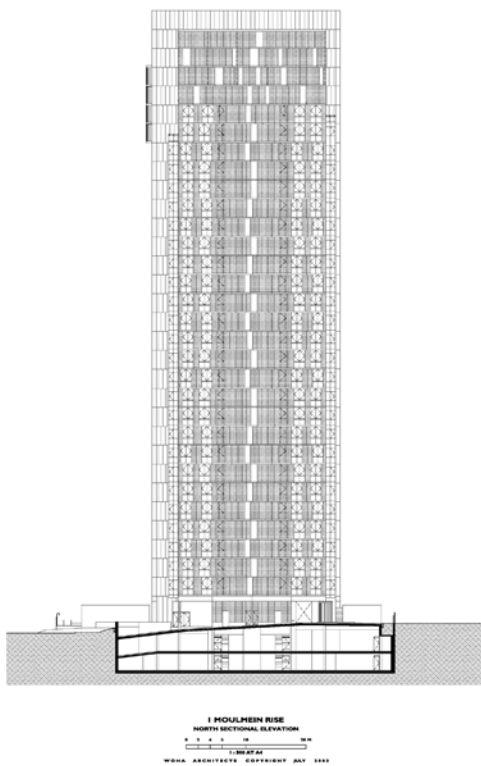
Typical floor layout plan



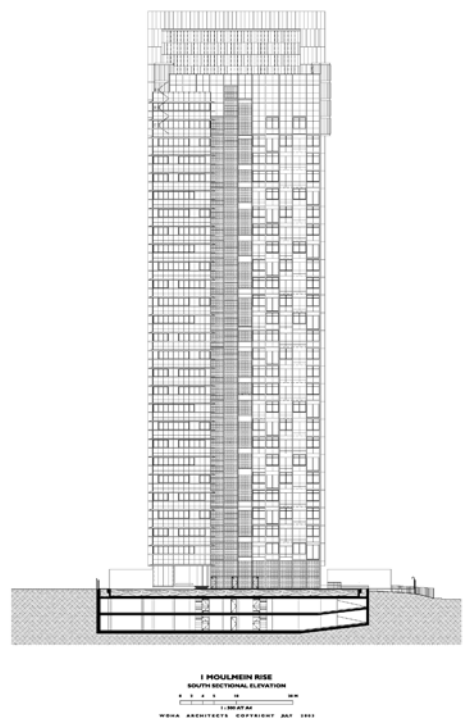
Transverse section



North sectional elevation



South sectional layout





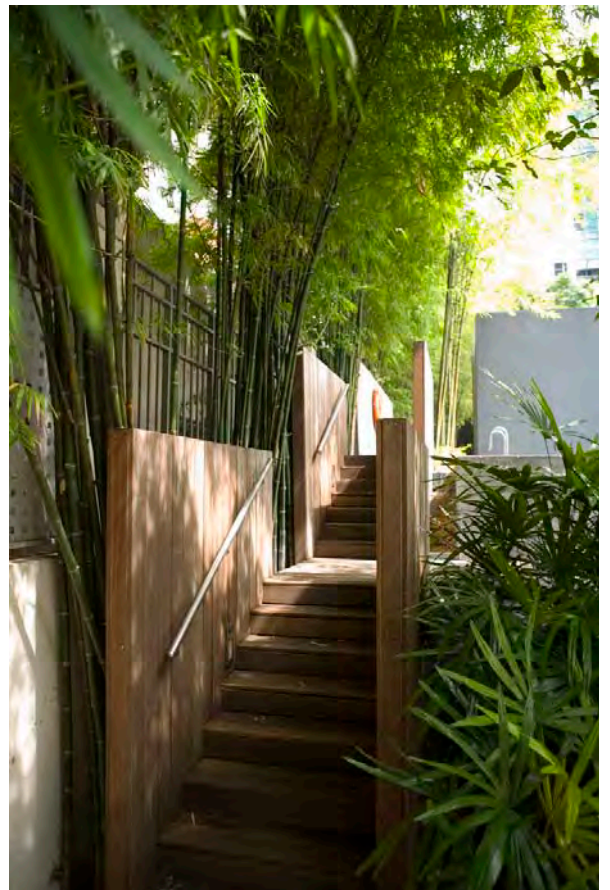
No 1 Moulmein rise looking from the west.



Rhythm of openings in the north façade.



Bay windows, monsoon windows, planters and sunshades in the south façade.



Ground floor landscaping.



Living area at a 19th floor apartment.

Interior view of the 24th floor east side apartment.





Monsoon window detail.



The lofty living room of the penthouse apartment.



Swimming pool on the ground floor.



Keeping windows open allows breeze inside the apartment.



Aga Khan Award for Architecture

ARCHITECT'S RECORD

2007 AWARD CYCLE

I. IDENTIFICATION

Project Title	No 1 Moulmein Rise, Singapore		
Street Address	No 1 Moulmein Rise Singapore 308143		
City	Singapore	Country	Singapore

II. PERSONS RESPONSIBLE

A. Architect / Planner

Name	WOHA Architects Pte Ltd		
Mailing Address	175 Telok Ayer Street		
City	Singapore	Postal Code	068623
Country	Singapore	Telephone	65 6423 4555
Facsimile	65 6423 4666	E-mail	admin@wohadesigns.com
Principal Designer	Wong Mun Summ & Richard Hassell		

B. Client

Name	UOL Development Pte Ltd		
Mailing Address	101 Thomson Road #33-00 United Square		
City	Singapore	Postal Code	307591
Country	Singapore	Telephone	65 6255 0233
Facsimile	65 6252 9822	E-mail	

C. Project Affiliates / Consultants

Please list those in the project and indicate their roles and areas of responsibility (e.g. engineers, contractors, economists, master craftsmen, other architects, clients, etc.). Please cite addresses and telephone numbers separately.

Name	Role
Shining Construction Pte Ltd	Main Contractor
Meinhardt (Singapore) Pte Ltd	Mechanical & Electrical, Civic & Structural Engineers
KPK Quantity Surveyors (1995) Singapore Pte Ltd	Quantity Surveyors
ABL Lim (FPC) Pte Ltd	Fire Consultants
Arzbergh Engineering Group Pte Ltd	Nominated Sub Contractors - Kitchen Appliances
Dai-Dan Co Ltd	Nominated Sub Contractors - Electrical and Security Systems
Fairways Construction & Landscapes Pte Ltd	Nominated Sub Contractors - Softscapes
Hitachi Asia Ltd	Nominated Sub Contractors - Lift
Shin Nippon Air Technologies Co Ltd	Nominated Sub Contractors - ACMV
Sum Cheong Piling Pte Ltd	Nominated Sub Contractors - Piling
Venus Enterprises Pte Ltd	Nominated Sub Contractors - Swimming Pool & Water Features
Focchi Singapore Pte Ltd	Nominated Sub Contractors - Curtain Wall
Acasia Engineering Pte Ltd	Nominated Sub Contractors - Plumbing / Sanitary
Magnificent Seven Corporation Pte Ltd	Nominated Sub Contractors - Minor Sewer

III. TIMETABLE

(please specify year and month)

A Commission	25 November 1999			
B Design	Commencement	25 November 1999	Completion	25 April 2001
C Construction	Commencement	25 April 2001	Completion	28 May 2003
D Occupancy	28 May 2003			

Remarks, if any: _____

IV. AREAS AND SURFACES

(please indicate in square metres)

A Total Site Area	2340.0 m ²	
B Ground Floor Area	230 m ²	
C Total Combined Floor Area	6491.3 m ²	

(including basement(s), ground floor(s) and all upper floors)

Remarks, if any: _____

V. ECONOMICS

(please specify the amounts in local currencies and provide the equivalents in US dollars. Specify the dates and the rates of exchange in US dollars at the time.)

	Amount in Local Currency	Amount in US Dollars	Exchange Rate	Date
A Total Initial Budget	SGD\$14,500,000	USD\$ 9,136,735	USD\$1=SGD1.587	
B Cost of Land	Confidential			
C Analysis of Actual Costs				
1. Infrastructure				
2. Labour				
3. Materials				
4. Landscaping				
5. Professional Fees	Confidential			
6. Other				
D. Total Actual Costs (without land)				
E Actual Cost (per sq. meter)				

Remarks, if any, on costs: _____

VI. PROJECT DESCRIPTION

It is a new 28-storey high-rise Residential tower undertaken by UOL Development in the year 2001, comprising 48 typical apartments, 2 penthouses with roof top pools and terraces, a common 50m lap swimming pool cascading over three levels, landscaped tropical gardens, an underground car park for 52 cars and a small gym.

VII. MATERIALS, STRUCTURE, AND CONSTRUCTION

The building is built from a concrete frame, with curtain walling exterior, comprising a mix of bay windows, planters with casement windows, and sliding doors with balustrades and sun shading and screening elements. Concrete surfaces are finished in a proprietary textured coating in colours selected so as to not show dirt or construction tolerances. The internal walls are lightweight block work, Internal materials were kept to a simple mix of white oak, Volex marble, together with stainless steel, homogenous tiles, plaster and paint.

VIII. PROJECT SIGNIFICANCE AND IMPACT

An Environmentally Sensitive Tropical Highrise:

In the tropics the climate is gentler high above the ground. However, typical designs do not take advantage of this, providing comfort through airconditioning. This apartment building takes low-energy strategies from traditional housing and applies them in a contemporary manner.

Vernacular houses used several climatic strategies— orientation, internal planning, overhangs, cross ventilation, shading and perforation. All these strategies were re-used here:

This apartment is oriented north-south, with narrow walls facing east-west. Two apartments per floor allows each apartment to have cross ventilation with full privacy. Projecting ledges and perforated metal cladding provide shading and conceals airconditioning equipment and drying areas.

Singaporean high-rise dwellers enjoy fresh air, but don't open their windows due to unpredictable rain. A practical façade design allowing breeze without rain would result in less airconditioning use, especially during the cool monsoon. This concept developed into the monsoon window. The monsoon window is based on a traditional device used in the longhouses of Indonesia; a horizontal opening allowing breeze without rain. We developed a bay window incorporating a sliding aluminium shelf operated by a winder. A perforated metal shelf prevents objects from falling through; this can be opened for maintenance. The device is well used, many inhabitants sleep without airconditioning.

An Expression of Diversity

Repetitive housing treats inhabitants as identical consumers. This project sought to express individuality through recombining simple elements, much as DNA encodes diversity with a few simple proteins. A complex façade was created through non-regular arrangement of standard elements. This principle of building up visual complexity was based on artist M.C. Escher's tessellations, themselves inspired by the Islamic tiling of the Alhambra.

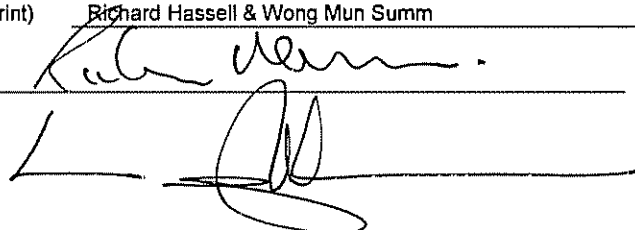
3 different arrangements of planters, overhangs, screens and monsoon windows were developed for the typical plan, stacked up in random order. Three floorplate variations were easy to administer, yet give strong variety to the façade. The variation also allows different interior treatments to add to the richness rather than spoil the facade. The façade is both high-technology and human, contemporary and domestic.

This project is important because developer-driven, speculative housing is the largest sector of development in the Asian, tropical region yet has the least innovation. No 1 Moulmein Rise shows history and tradition still contain valuable lessons for contemporary architecture.

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Name (please print) Richard Hassell & Wong Mun Summ

Signature



Date

27 September 2006

Name	Address	Telephone Number
Shining Construction Pte Ltd	107A Jalan Kembangan Singapore 419146	6543 3113
Meinhardt (Singapore) Pte Ltd	168 Jalan Bukit Merah #09-01 Surbana One Singapore 150168	6273 5255
KPK Quantity Surveyors (1995) Singapore Pte Ltd	No. 1 Magazine Road #03-01/06 Central Mall Office Tower Singapore 059567	6536 3303
ABL Lim (FPC) Pte Ltd	780 Upper Serangoon Road #02-03 Choon Kim House Singapore 534649	6323 0136
Arzbergh Engineering Group Pte Ltd		
Dai-Dan Co Ltd	315 Outram Road #15-09 Tan Boon Liat Building Singapore 169074	6221 8488
Fairways Construction & Landscapes Pte Ltd	30 Pasir Ris Coast Industrial Park 3 Singapore 518455	6581 4111 /4333
Hitachi Asia Ltd	10 Toh Guan Road East Hitachi Elevator Building Singapore 608597	6416 1711/ 6416 1801
Shin Nippon Air Technologies Co Ltd		
Sum Cheong Piling Pte Ltd	45 Gul Road Jurong Singapore 629350	6861 1033
Venus Enterprises Pte Ltd	6 & 8 Chang Charn Road Singapore 159635	6472 0020
Focchi Singapore Pte Ltd	51, Goldhill Plaza #12-06 Singapore 308900	6323 3240
Acasia Engineering Pte Ltd		
Magnificent Seven Corporation Pte Ltd		

No 1 Moulmein Rise

No 1 Moulmein Rise
Singapore, Singapore

Architects	WOHA Architects / Wong Mun Summ, Richad Hassel Singapore, Singapore
Clients	UOL Development Pte Ltd Singapore, Singapore
Commission	1999
Design	1999 - 2001
Construction	2001 - 2003
Occupancy	2003
Site	2'340 m²
Ground Floor	230 m²
Total Floor	6'491 m²
Costs	US\$ 9'136'735

Programme Most high-rises in the tropics do not exploit the fact that the climate is gentler higher up. This 28-storey apartment block does, redeploying several climatic strategies used in vernacular construction. Cross-ventilation is achieved by the plan, with two apartments per floor. Projecting ledges and perforated metal cladding provide shade and conceal air-conditioning. A ‘monsoon window’ - a bay window incorporating a sliding aluminium shelf - allows breezes in without rain. The building provides 48 apartments, 2 penthouses, a lap-swimming pool and parking. Its diverse curtain wall mixes planters, bay and casement windows, screens and sliding doors.



An Environmentally Sensitive Tropical High-rise:

In the tropics the climate is gentler high above the ground. However, typical designs do not take advantage of this, providing comfort through air-conditioning. This apartment building takes low-energy strategies from traditional housing and applies them in a contemporary manner.

Vernacular houses used several climatic strategies– orientation, internal planning, overhangs, cross ventilation, shading and perforation. All these strategies were re-used here:



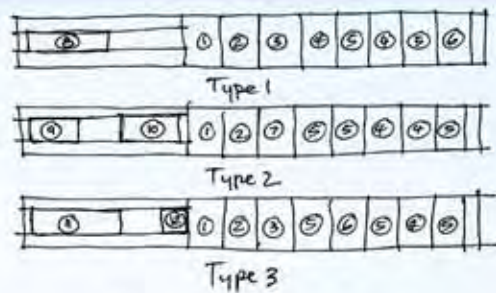
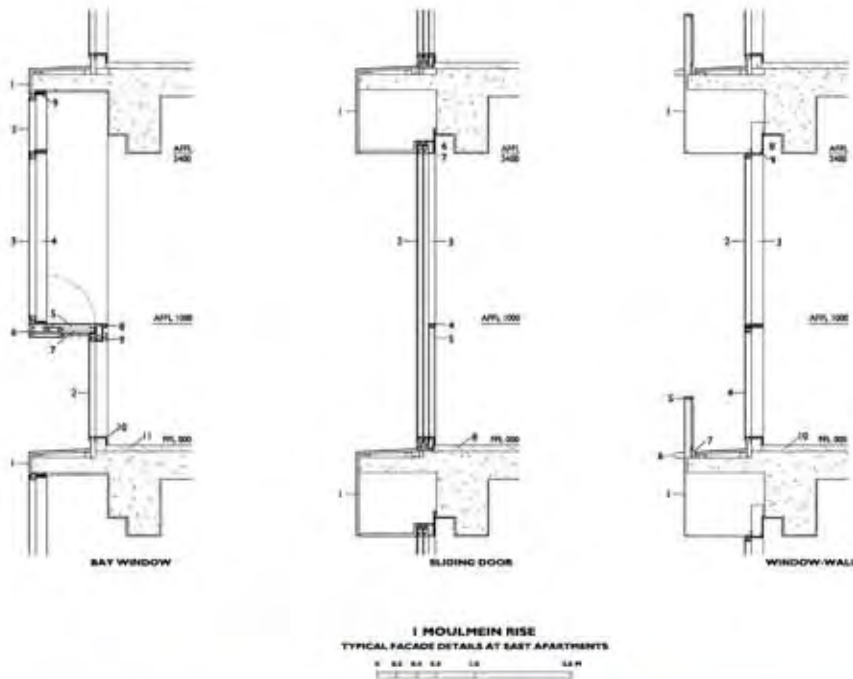
This apartment is oriented north-south, with narrow walls facing east-west. Two apartments per floor allow each apartment to have cross ventilation with full privacy. Projecting ledges and perforated metal cladding provide shading and conceals air-conditioning equipment and drying areas.

Singaporean high-rise dwellers enjoy fresh air, but don't open their windows due to unpredictable rain. A practical façade design, allowing breeze without rain would result in less air-conditioning use, especially during the cool monsoon. This concept developed into the monsoon window..



Monsoon Windows

The monsoon window is based on a traditional device used in the longhouses of Indonesia; a horizontal opening allowing breeze without rain. We developed a bay window incorporating a sliding aluminium shelf operated by a winder. A perforated metal shelf prevents objects from falling through; this can be opened for maintenance. The device is well used, many inhabitants sleep without air-conditioning.



South Facade Types
Variations using repetitive Elements.



An Expression of Diversity

3291.SIN

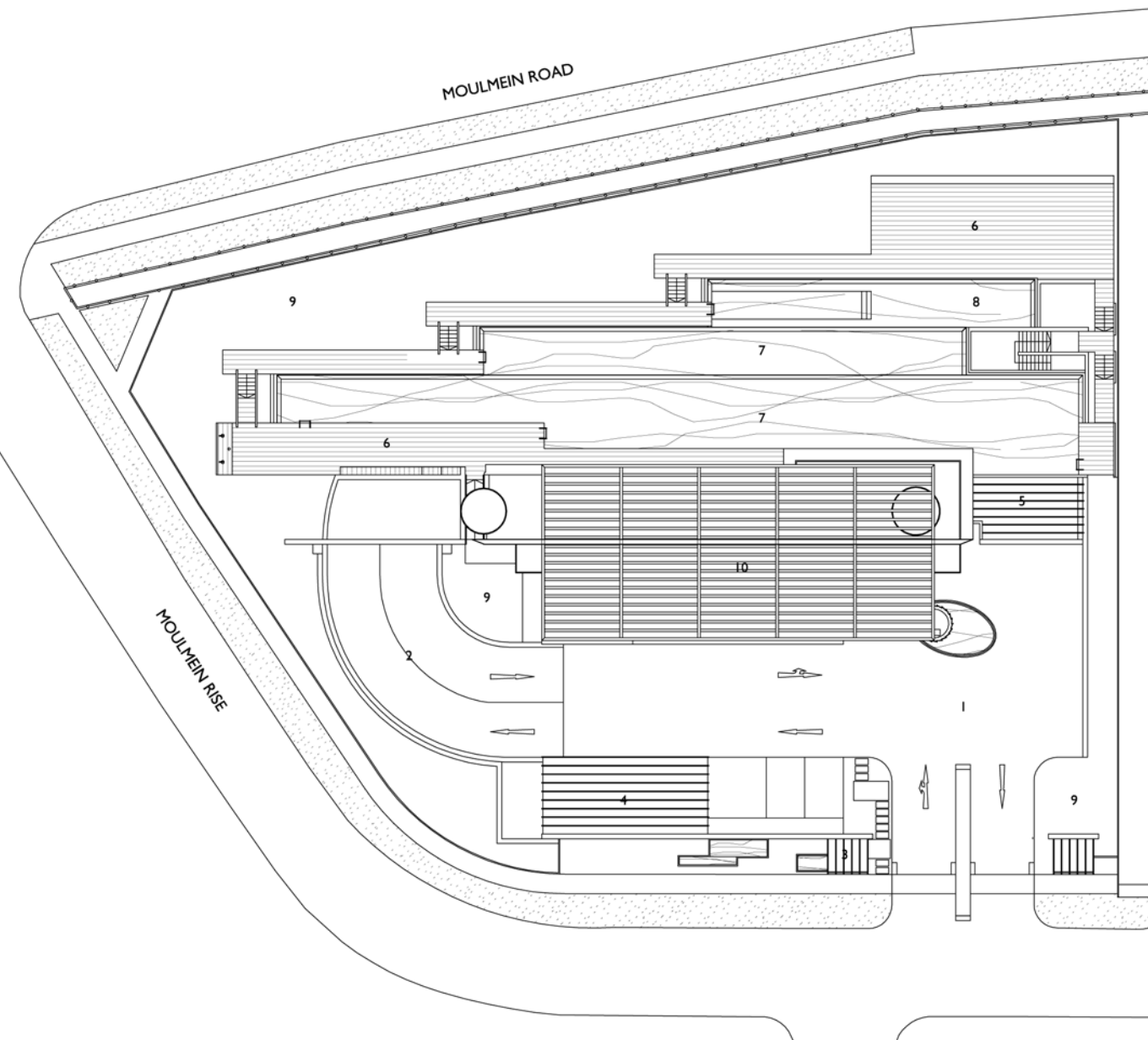
Repetitive housing treats inhabitants as identical consumers. This project sought to express individuality through recombining simple elements, much as DNA encodes diversity with a few simple proteins. A complex façade was created through non-regular arrangement of standard elements. This principle of building up visual complexity was based on artist M.C. Escher's tessellations, themselves inspired by the Islamic tiling of the Alhambra.

3 different arrangements of planters, overhangs, screens and monsoon windows were developed for the typical plan, stacked up in random order. Three floor plate variations were easy to administer, yet give strong variety to the façade. The variation also allows different interior treatments to add to the richness rather than spoil the facade. The façade is both high-technology and human, contemporary and domestic.

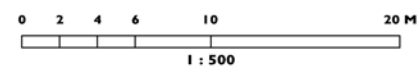
This project is important because developer-driven, speculative housing is the largest sector of development in the Asian, tropical region yet has the least innovation. No. 1 Moulmein Rise shows history and tradition still contain valuable lessons for contemporary architecture.



- LEGEND
- 1 DRIVEWAY
 - 2 RAMP TO BASEMENT CARPARK
 - 3 GUARD HOUSE
 - 4 ROOF OF SUBSTATION
 - 5 GENERATOR (OPEN TO SKY)
 - 6 POOL DECK
 - 7 LAP POOL
 - 8 CHILDREN'S POOL
 - 9 LANDSCAPE GARDEN
 - 10 METAL PERGOLA AT ROOF TOP



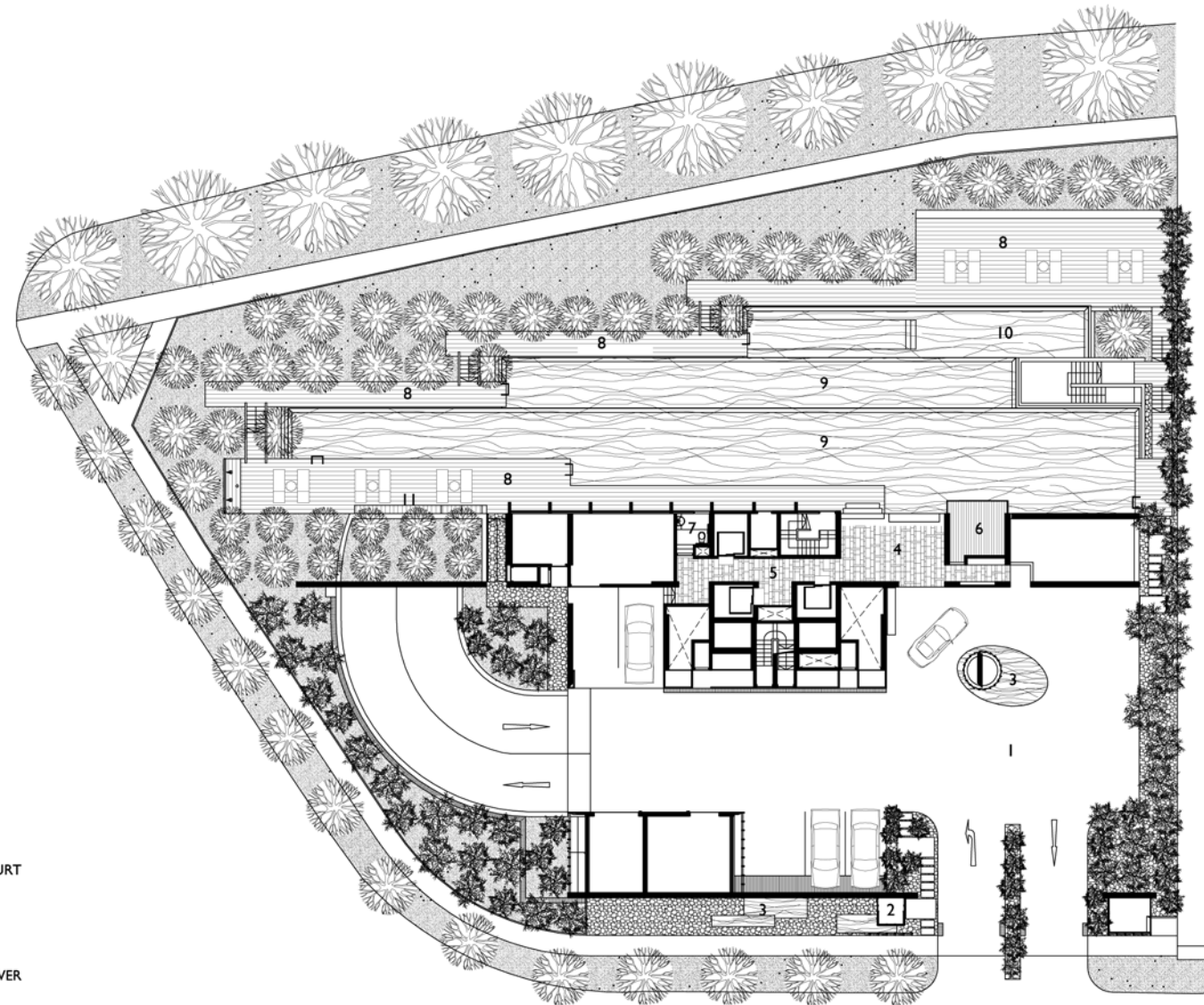
I MOULMEIN RISE
SITE PLAN



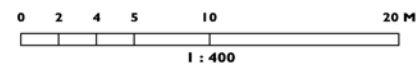
WOHA ARCHITECTS COPYRIGHT JULY 2003

LEGEND

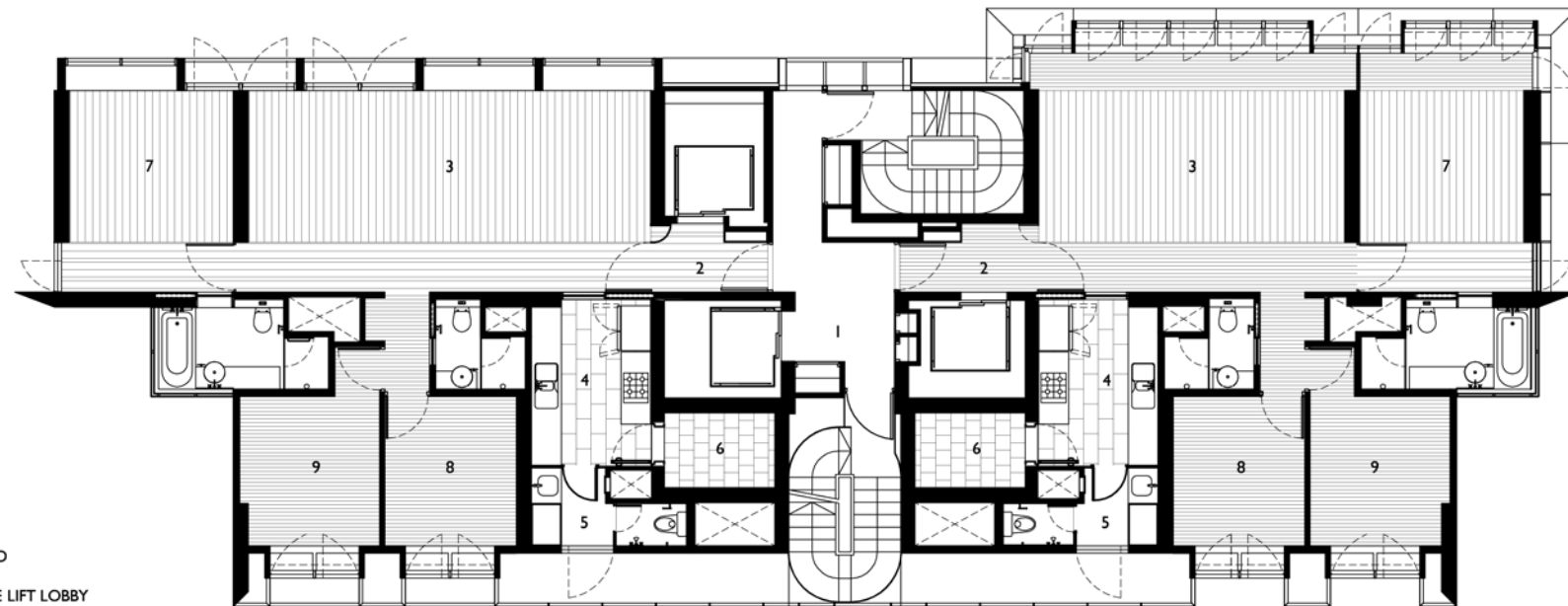
- 1 ENTRANCE FORECOURT
- 2 GUARD HOUSE
- 3 REFLECTION POOL
- 4 LOBBY
- 5 LIFT LOBBY
- 6 GYMNASIUM
- 7 HANDICAPPED SHOWER
- 8 TIMBER BRIDGE
- 9 LAP POOL
- 10 CHILDREN'S POOL
- 11 BBQ AREA



I MOULMEIN RISE
GROUND LEVEL LAYOUT PLAN



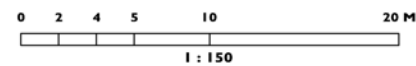
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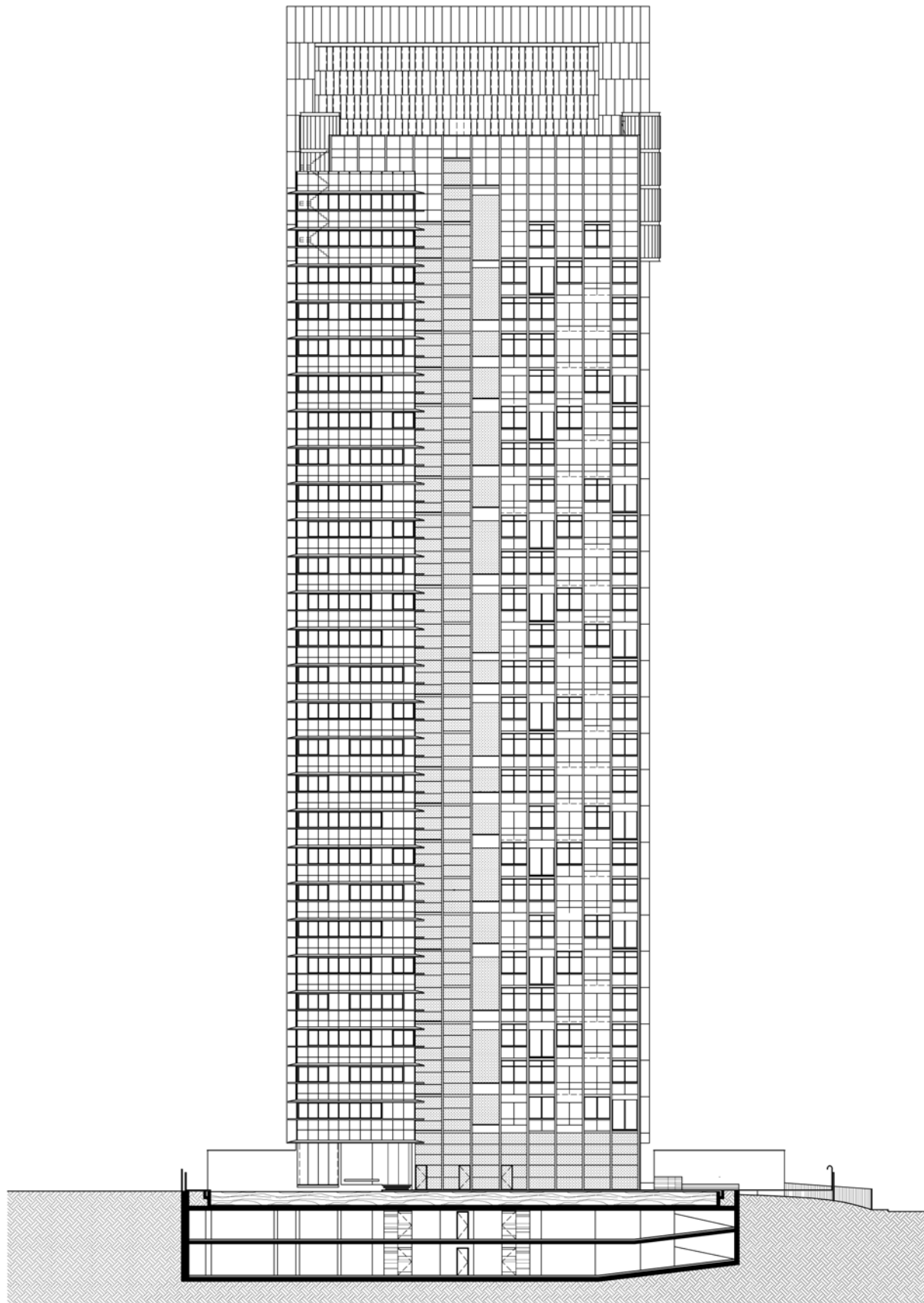
LEGEND

- 1 FIRE LIFT LOBBY
- 2 PRIVATE LIFT LOBBY
- 3 LIVING/ DINING
- 4 KITCHEN
- 5 YARD
- 6 HS/ MAID'S
- 7 MASTER BEDROOM
- 8 BEDROOM 2
- 9 BEDROOM 3

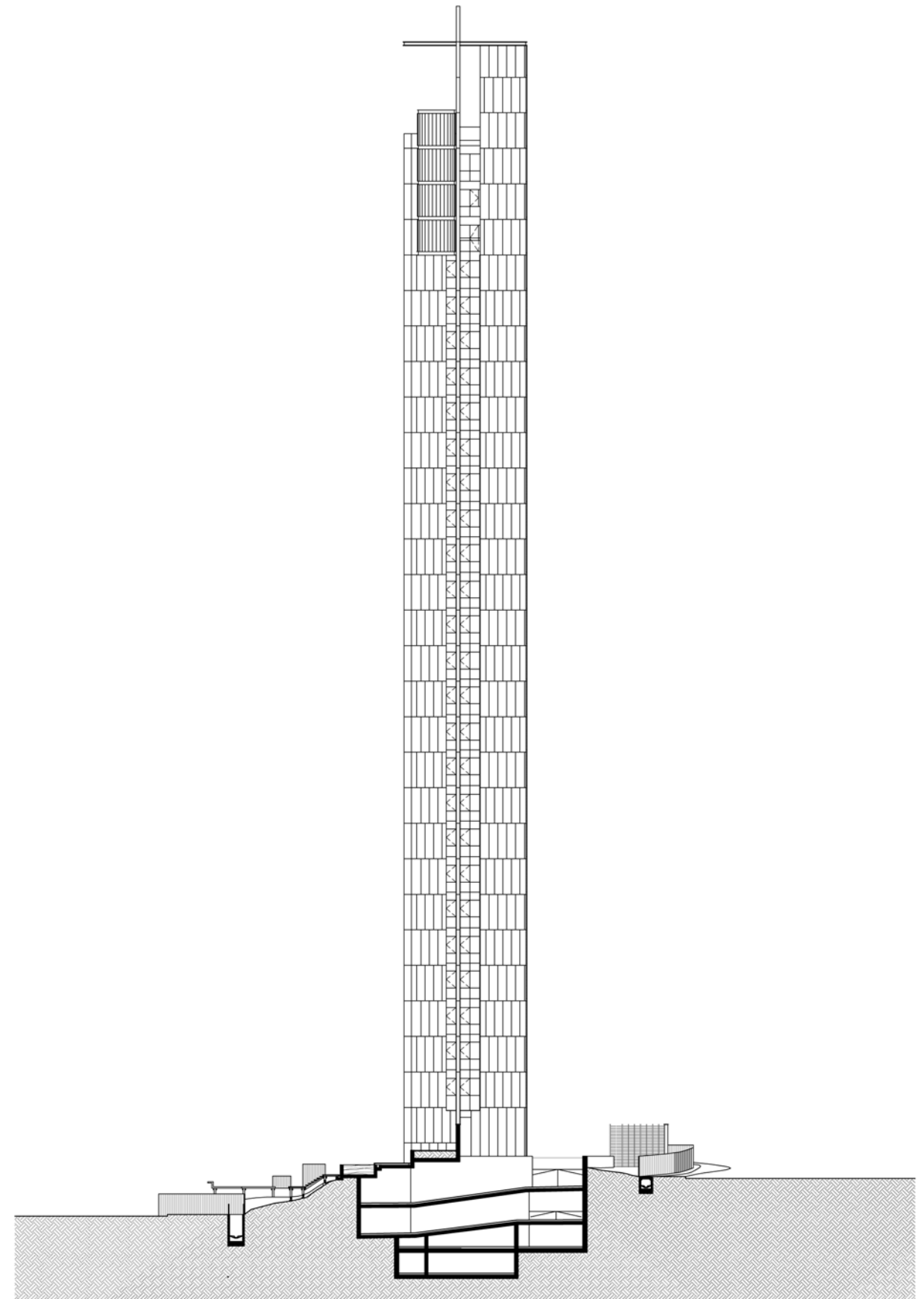
I MOULMEIN RISE TYPICAL FLOOR LAYOUT PLAN



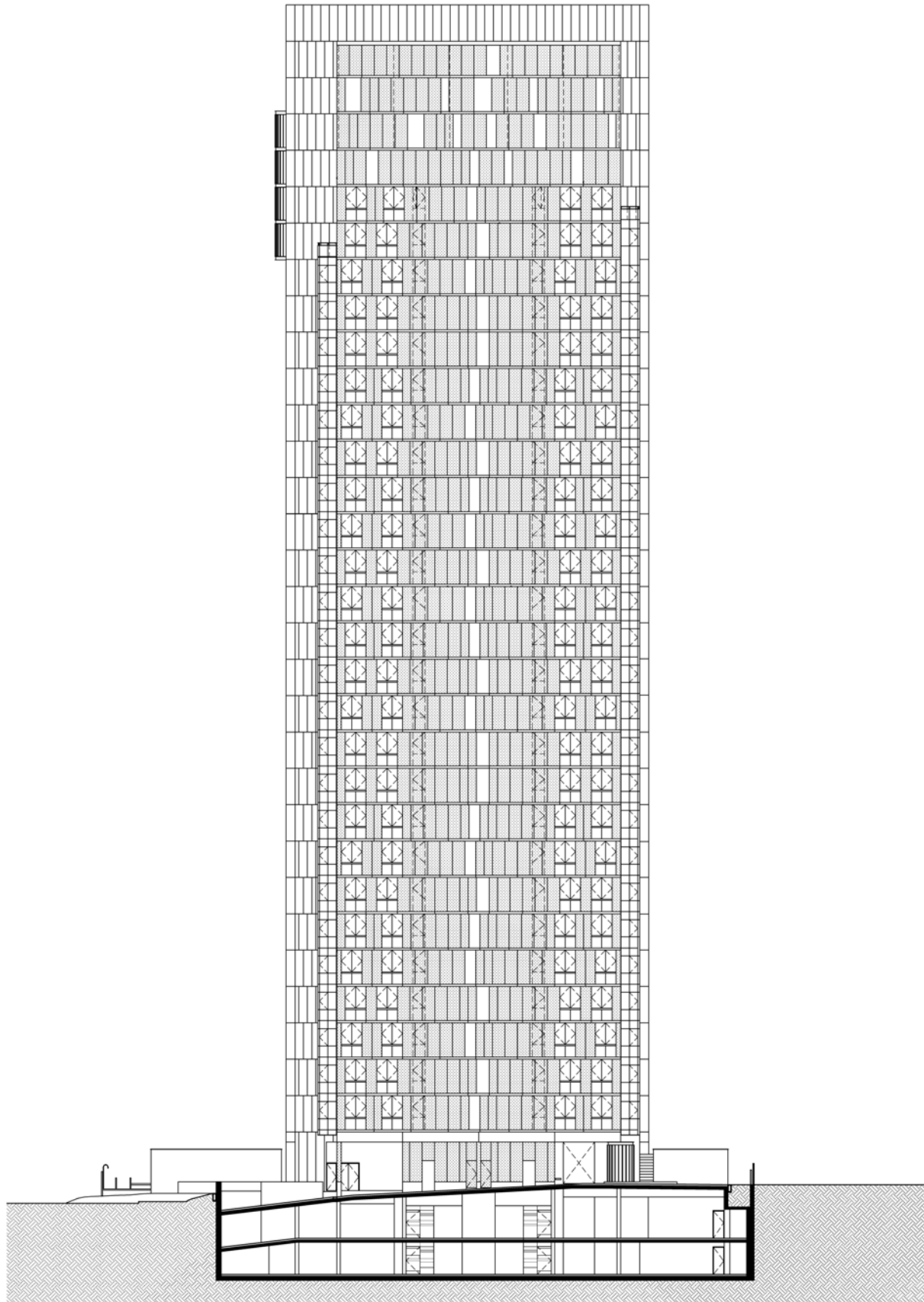
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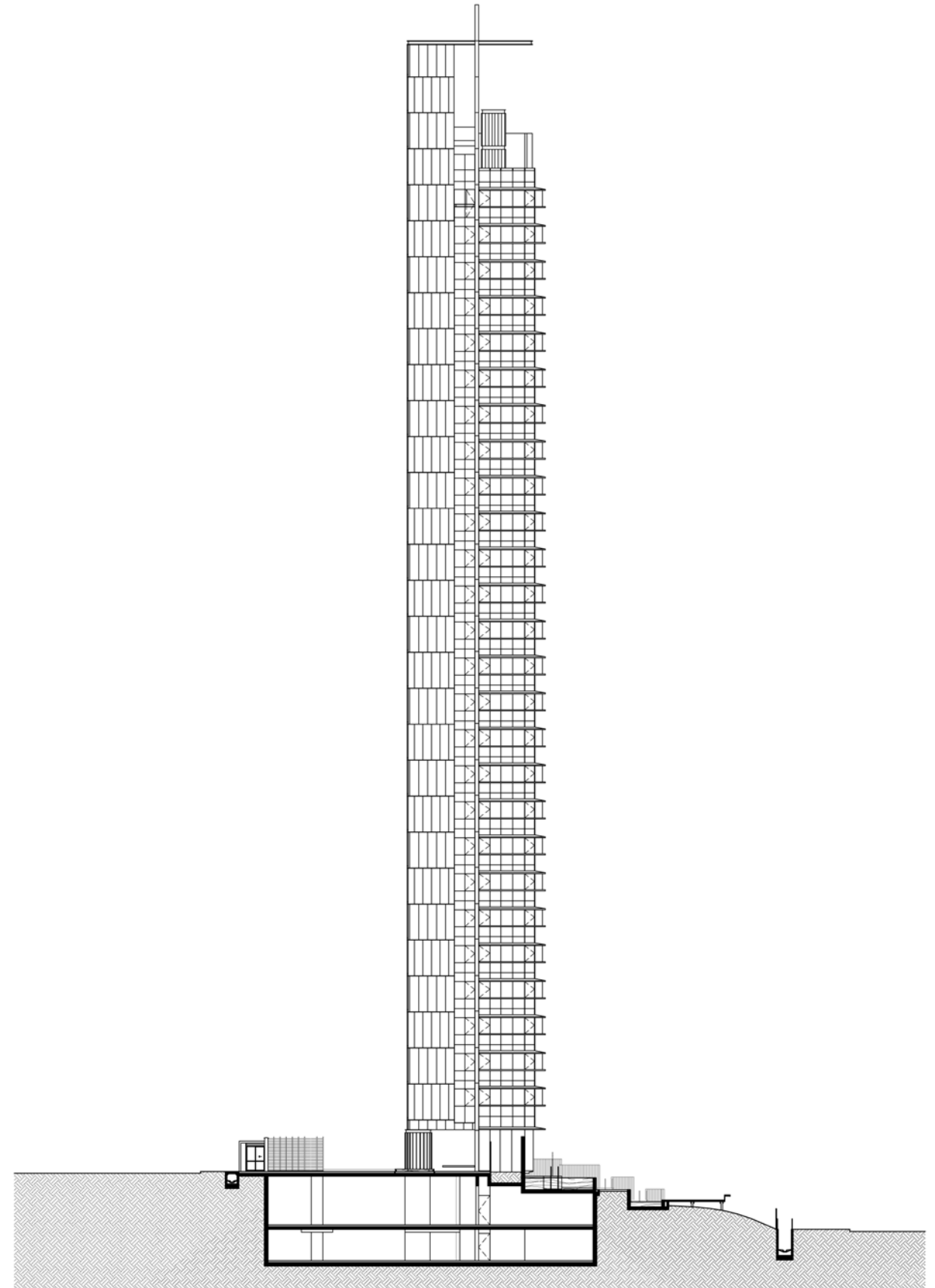
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SOUTH SECTIONAL ELEVATION
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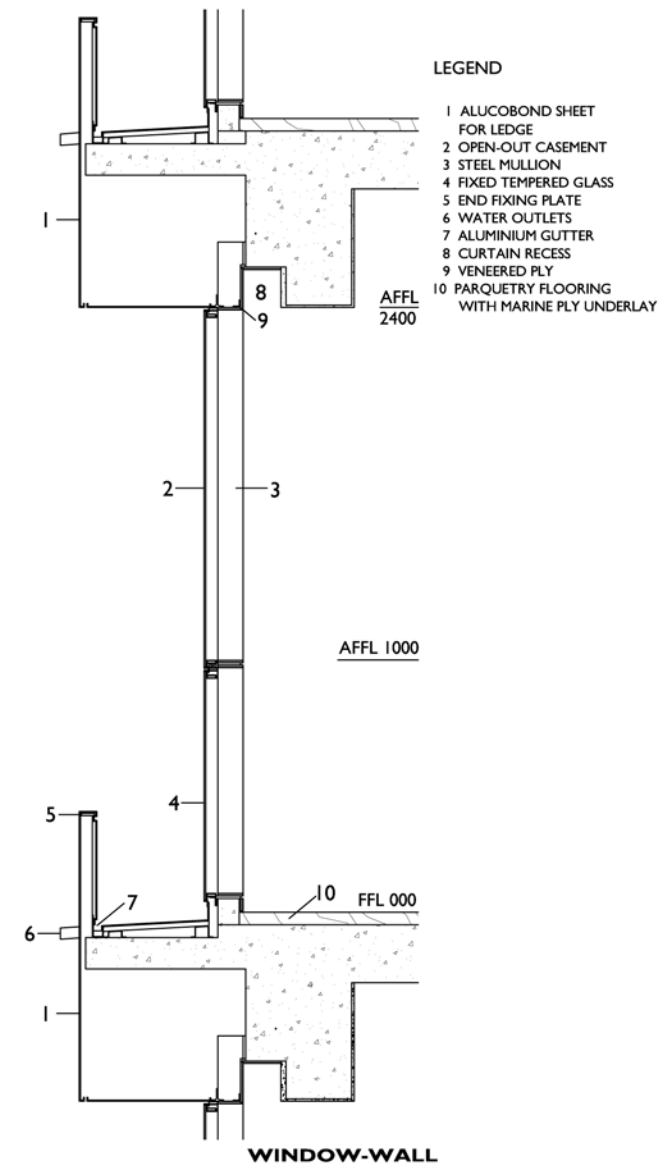
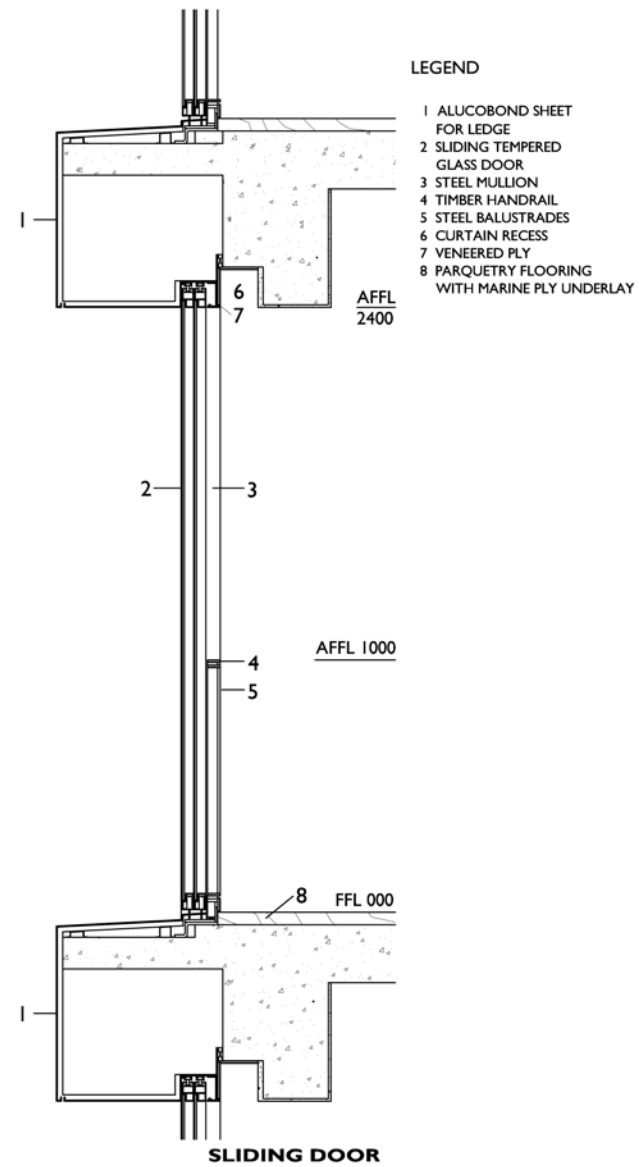
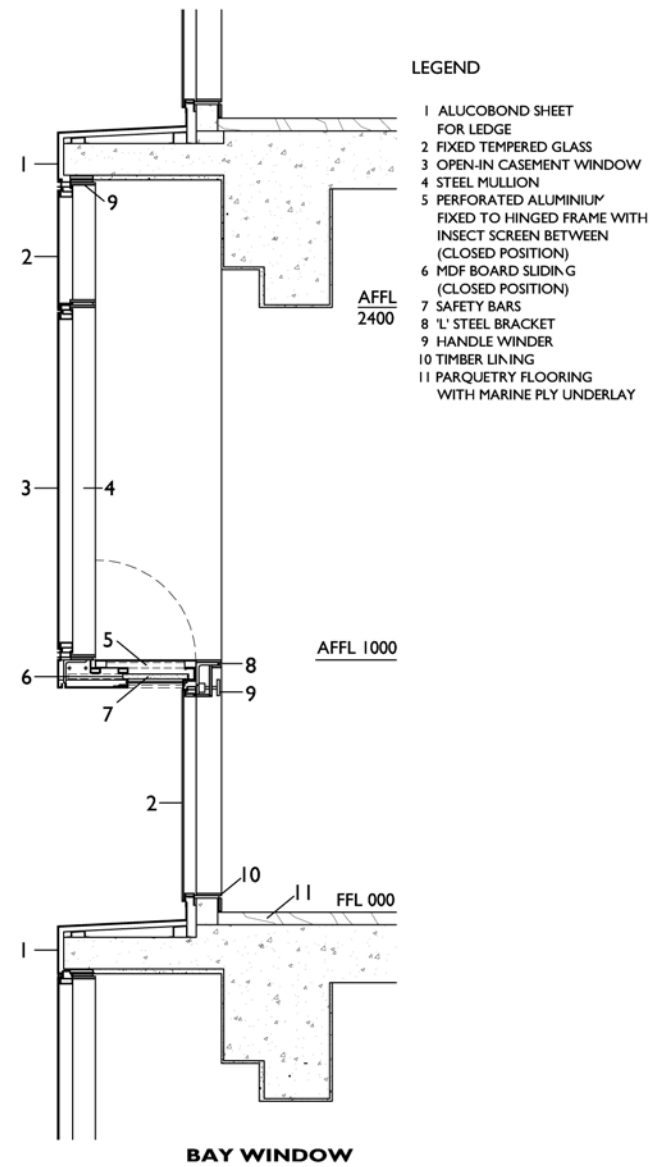
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EAST SECTIONAL ELEVATION
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 WOHA ARCHITECTS COPYRIGHT JULY 2003



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NORTH SECTIONAL ELEVATION
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 1:500
 WOHA ARCHITECTS COPYRIGHT JULY 2003

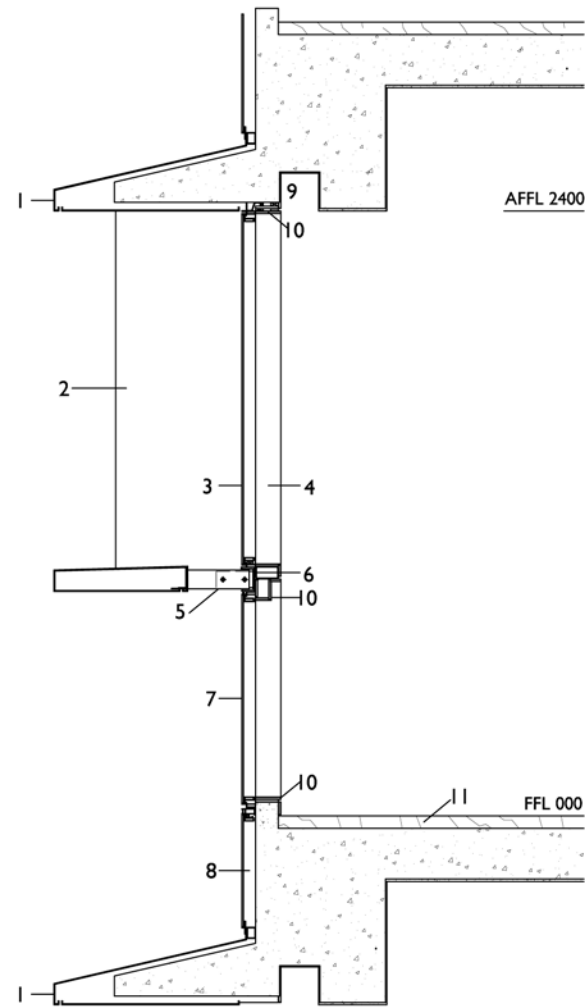


I MOULMEIN RISE
WEST SECTIONAL ELEVATION
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I MOULMEIN RISE
TYPICAL FACADE DETAILS AT EAST APARTMENTS

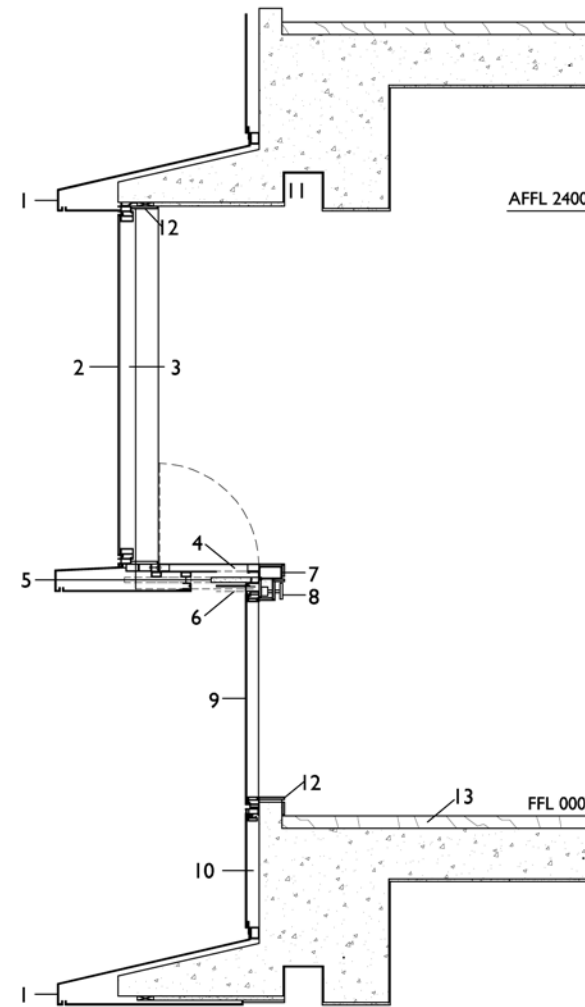
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WINDOW-WALL

LEGEND

- 1 ALLUCOBOND SHEET FOR HOOD
- 2 ALLUCOBOND LINING
- 3 OPEN-OUT CASEMENT SASH FOR VENTILATION AND CLEANING
- 4 STEEL MULLION
- 5 ALUMINIUM OUTRIGGER PLATES AT MULLION CENTRES
- 6 RHS BRACKET
- 7 FIXED TEMPERED GLASS
- 8 VENTILATED CAVITY
- 9 CURTAIN RECESS
- 10 TIMBER LINING
- 11 PARQUETRY FLOORING WITH MARINE PLY UNDERLAY

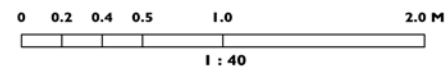


BAY WINDOW

LEGEND

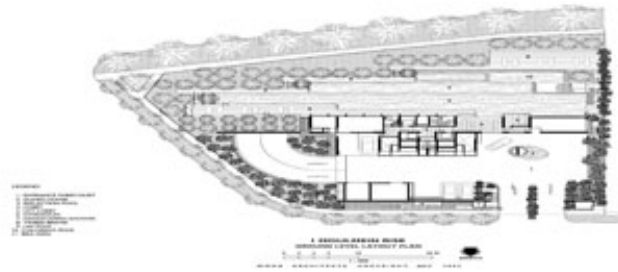
- 1 ALLUCOBOND SHEET FOR HOOD
- 2 OPEN-OUT CASEMENT SASH FOR VENTILATION AND CLEANING
- 3 STEEL MULLION
- 4 PERFORATED ALUMINIUM FIXED TO HINGED FRAME WITH INSECT SCREEN BETWEEN (CLOSED POSITION)
- 5 MDF BOARD SLIDING (CLOSED POSITION)
- 6 SAFETY BARS
- 7 RHS BRACKET
- 8 HANDLE WINDER
- 9 FIXED TEMPERED GLASS
- 10 VENTILATED CAVITY
- 11 CURTAIN RECESS
- 12 ASH VENEER PLY WITH EDGE VENEER
- 13 PARQUETRY FLOORING WITH MARINE PLY UNDERLAY

I MOULMEIN RISE
TYPICAL FACADE DETAILS AT WEST APARTMENTS



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3291_Dr



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S327821



S327822



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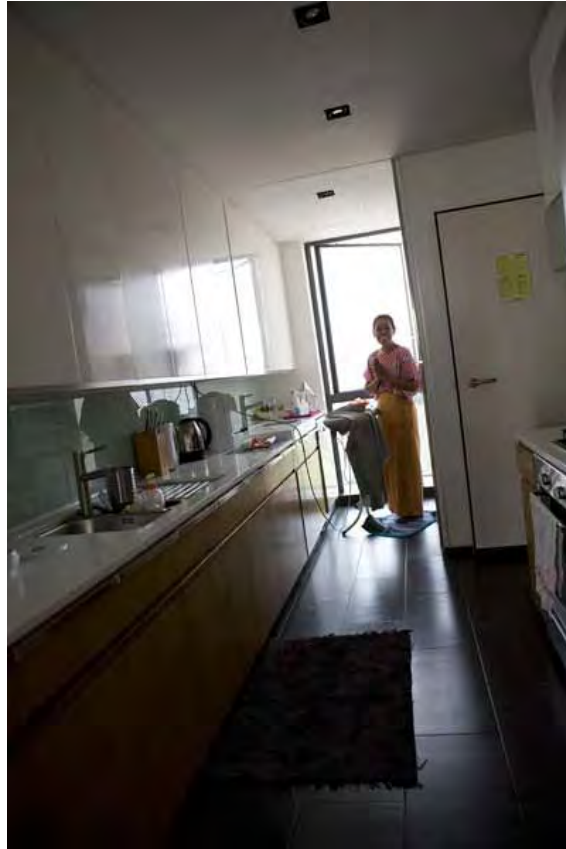
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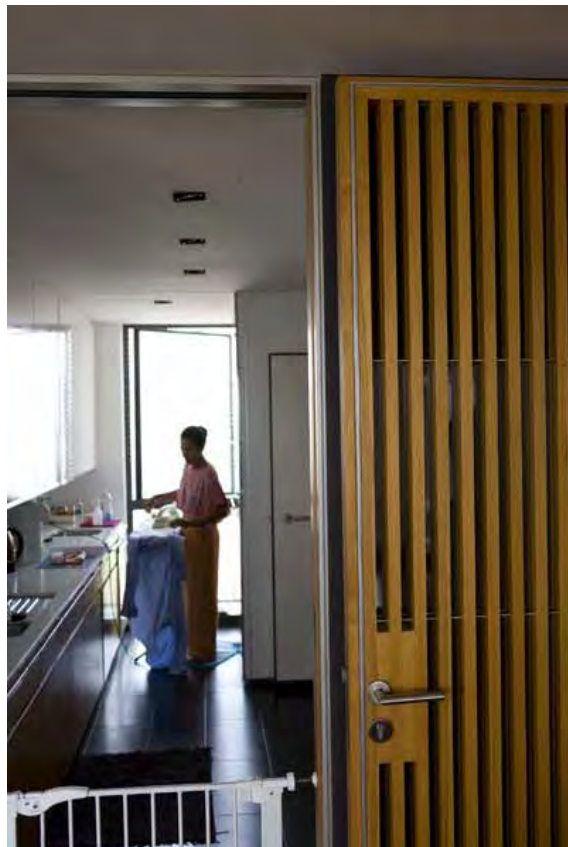
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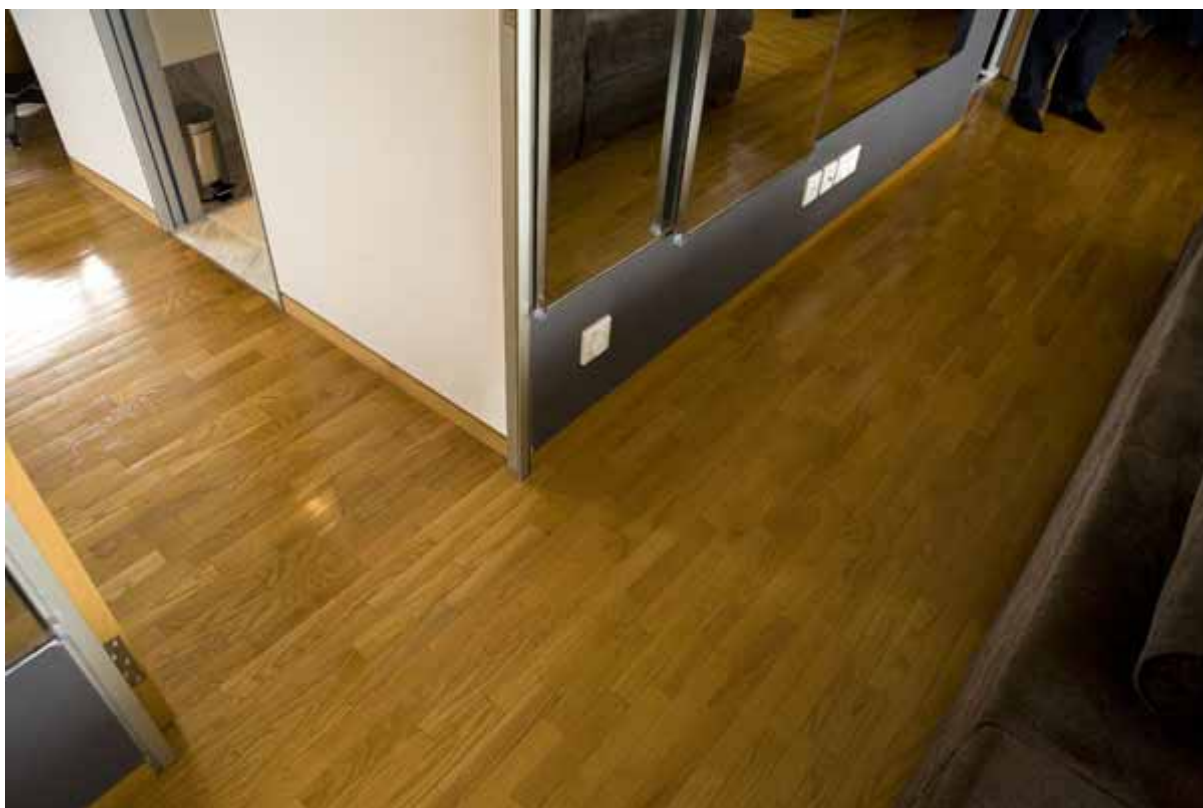
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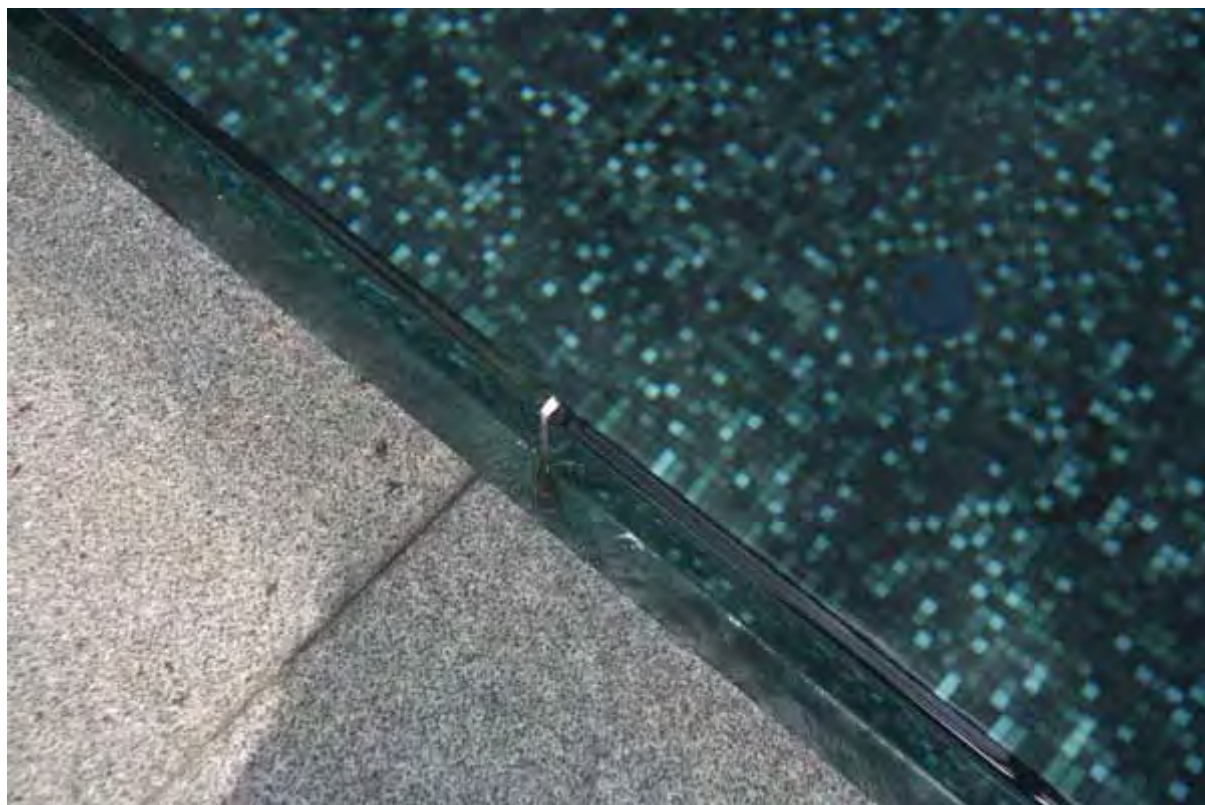
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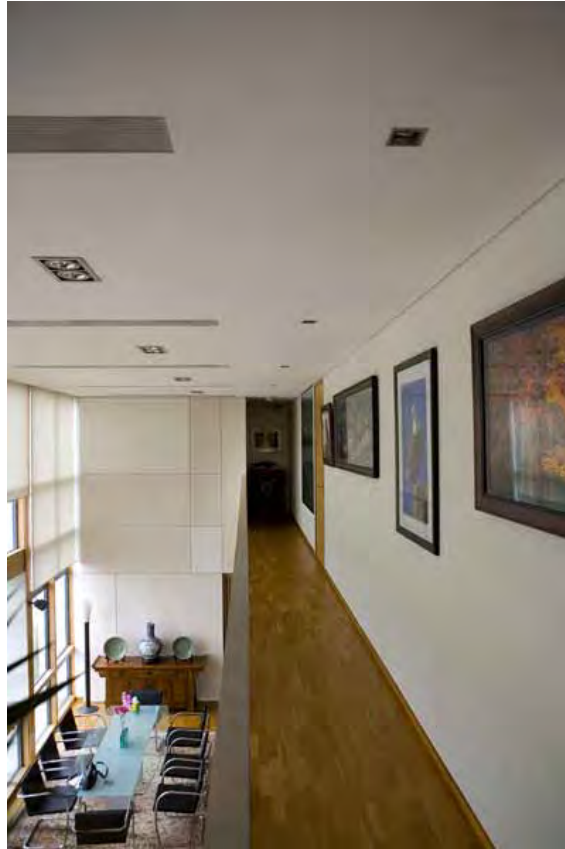
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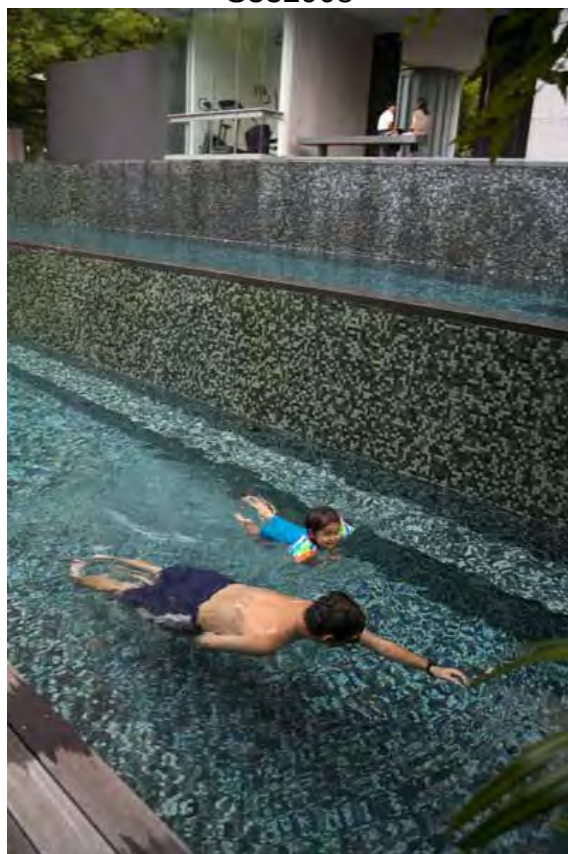
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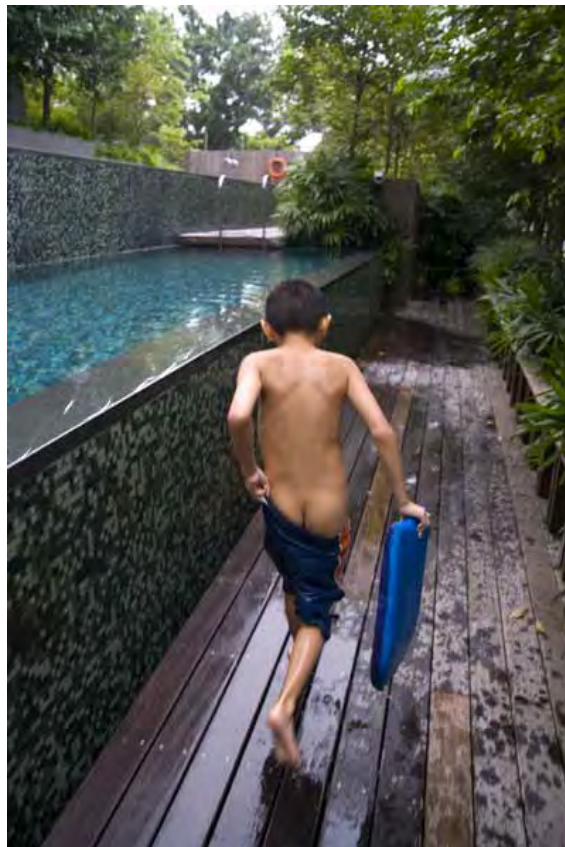
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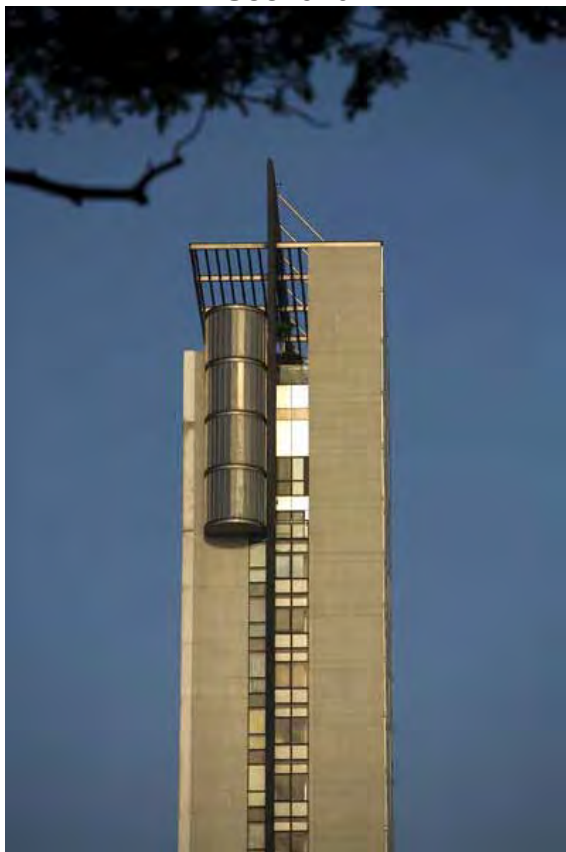
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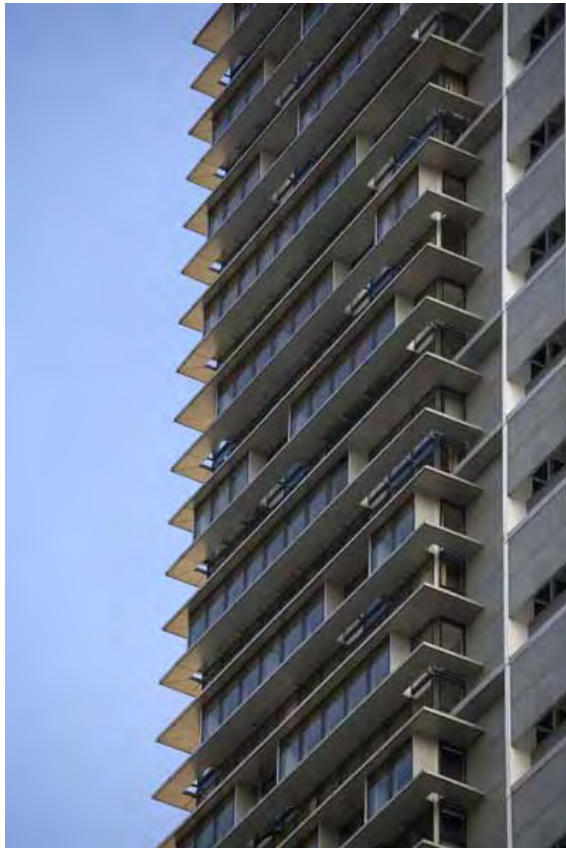
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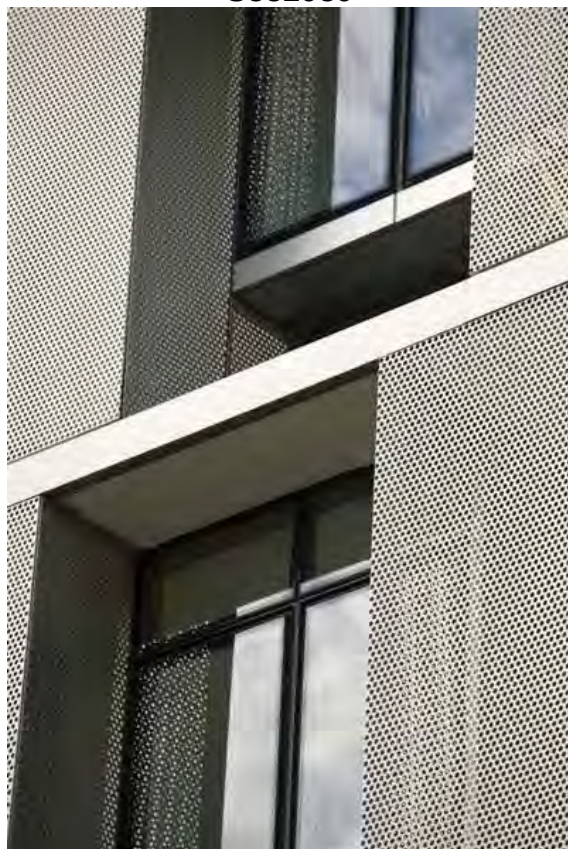
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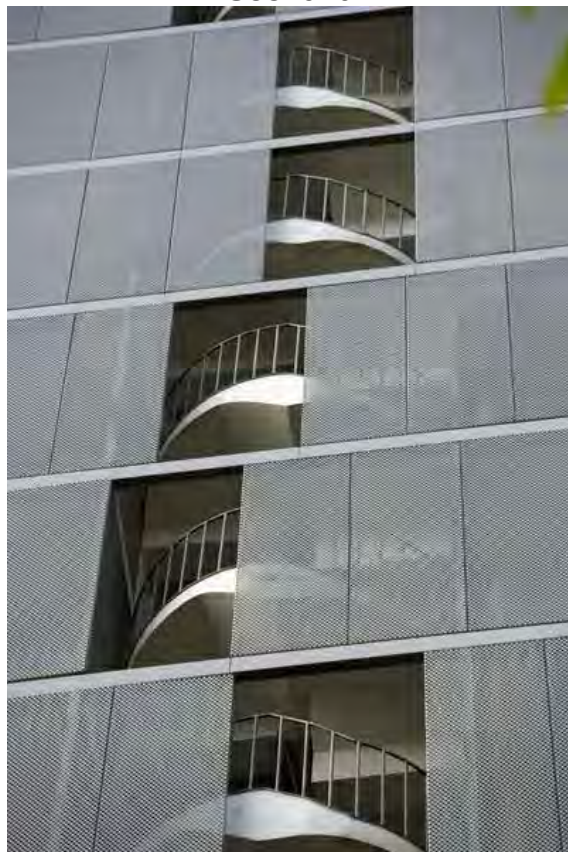
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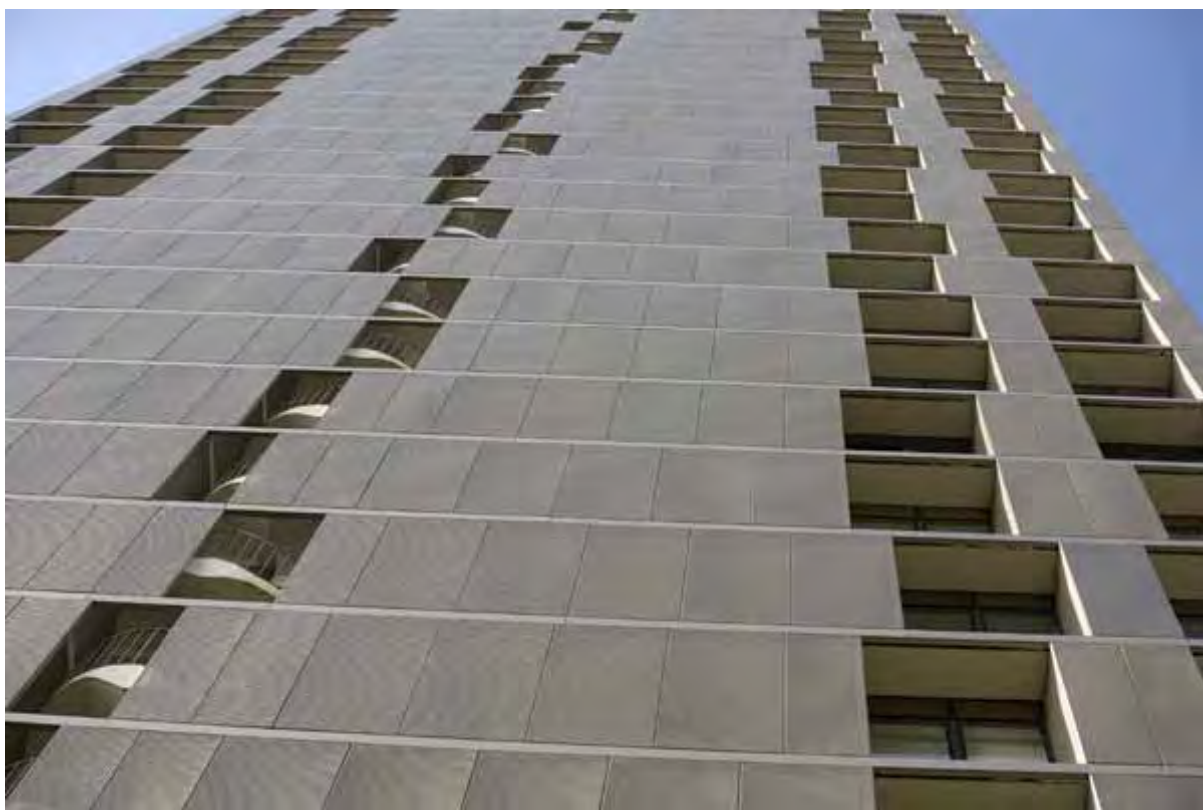
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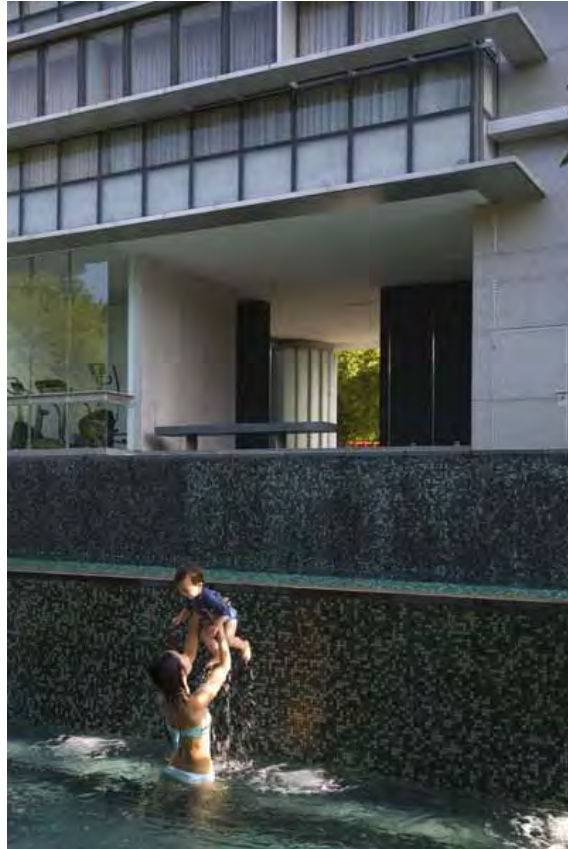
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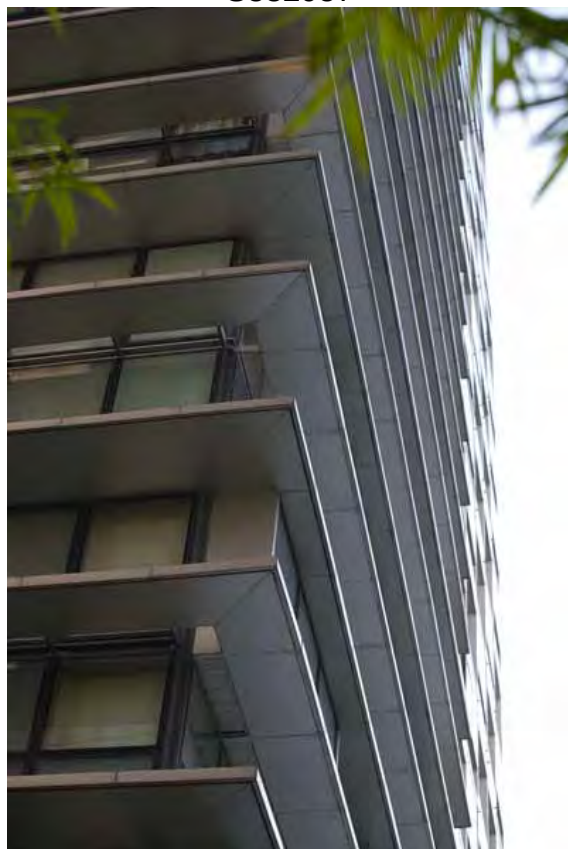
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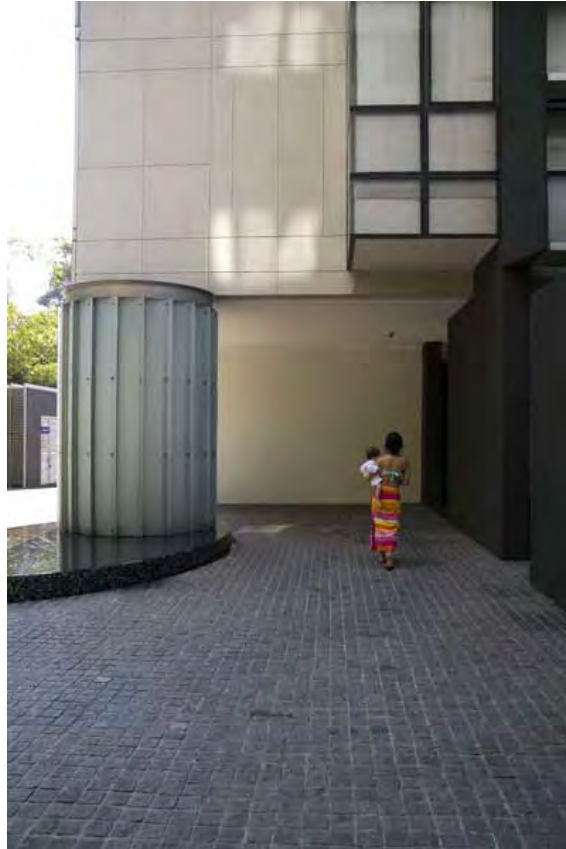
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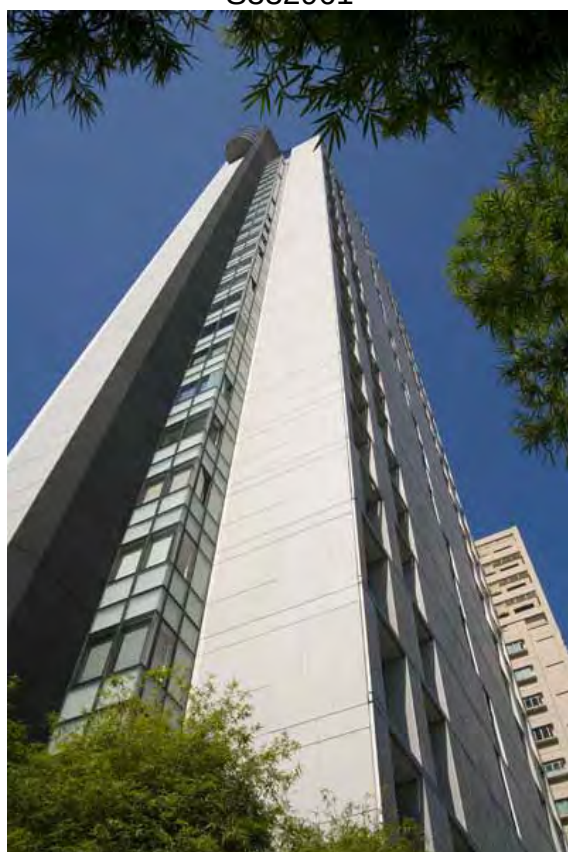
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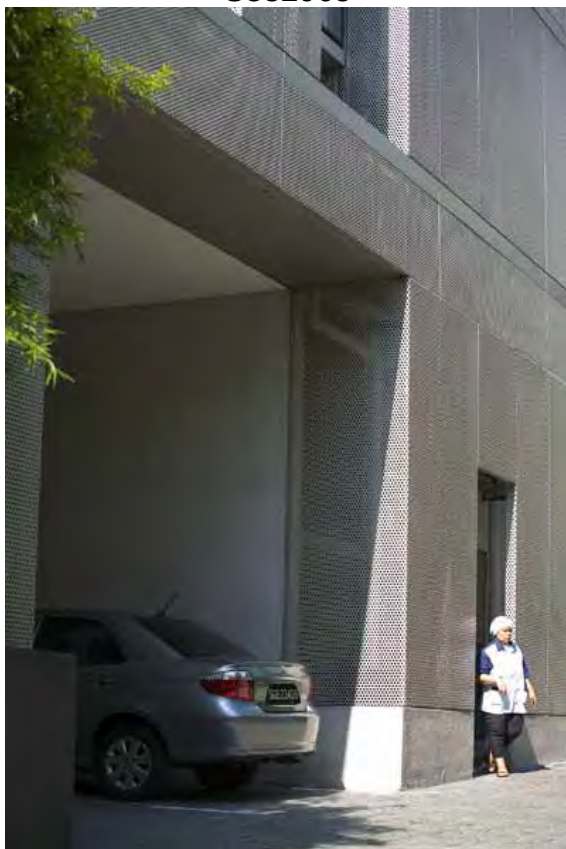
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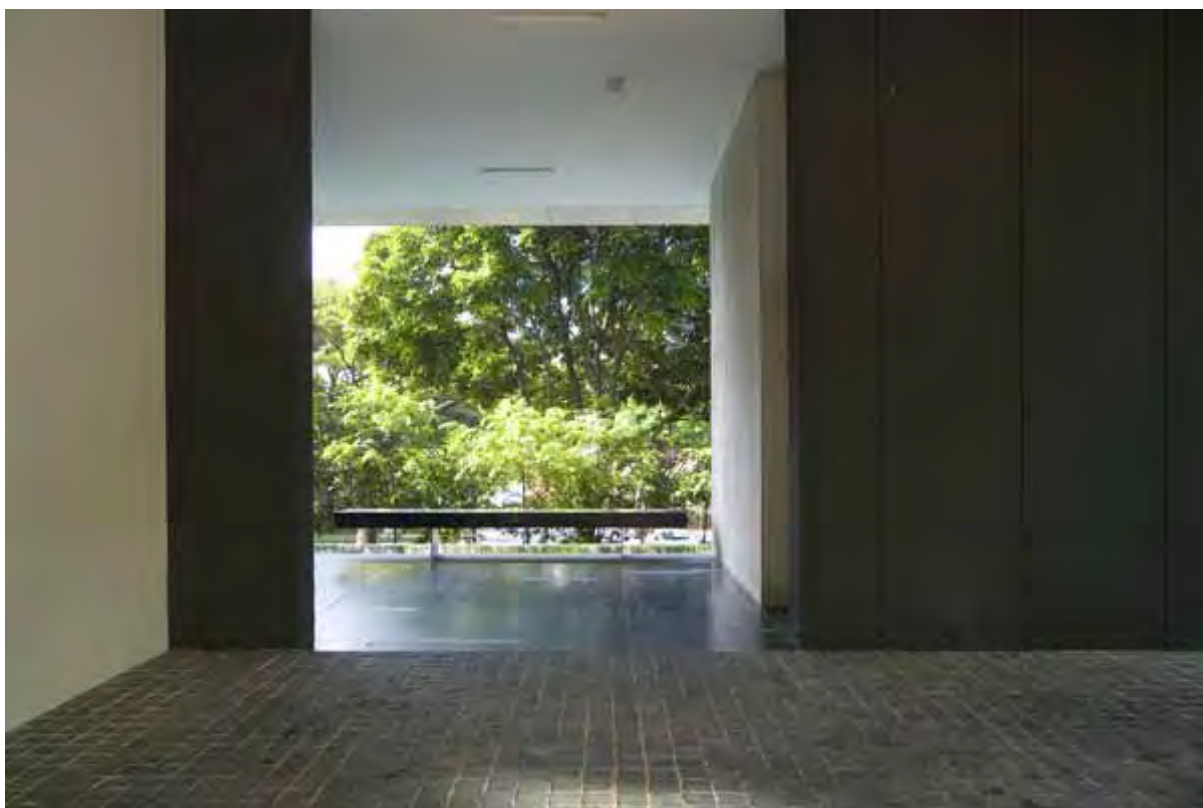
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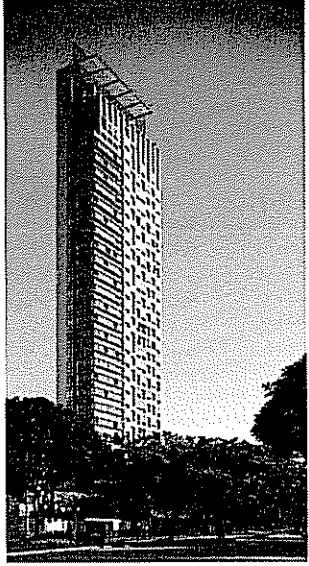
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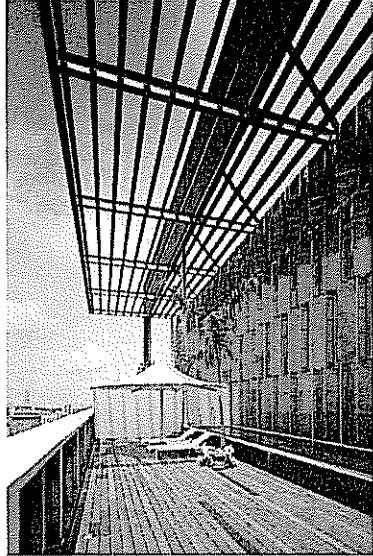
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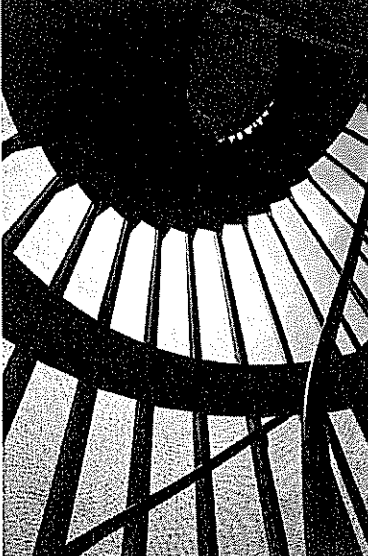
Provide a full list of all material being submitted

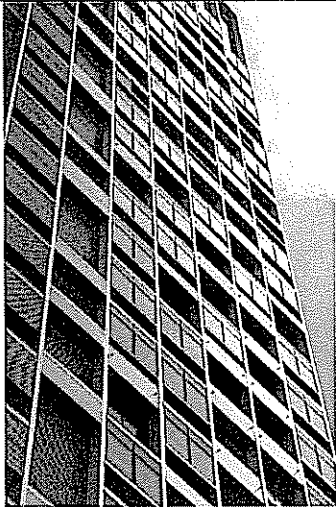
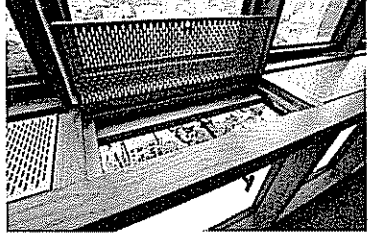
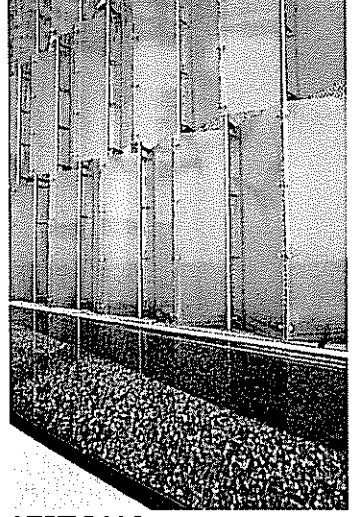
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2	Architect's Record	5 X A4
3	Image Caption	5 X A4
4	DVD (15 X Digital Images, 7 X Drawings, 2 X A3 Panels, 1 X Image Caption)	1 X DVD
5	Office Brochure	1 copy
6	Aedes Exhibition Brochure	1 copy
7		
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Selected tiffs.	Photographer	Date	Captions:
 075AL020	Albert Lim	19 January 2004	Short Caption: View from South West Long Caption: View from South West. The building is exactly oriented to the cardinal points, exposing only a slim elevation to the east and west.
 075AL039	Albert Lim	27 April 2004	Short Caption: View of Typical Apartment Interior Long Caption: The typical apartment has a long south-facing living and dining room, with a fully glazed façade incorporating the monsoon windows.
 075TG001	Tim Griffith	15 October 2003	Short Caption: View from North East Long Caption: The North elevation is fully shaded by a perforated aluminum screen, which also serves to conceal the air conditioners and washing areas.

 075TG002	Tim Griffith	15 October 2003	Short Caption: Building in context Long Caption: The tower is located at the edge of a high-rise zone, looking over a height-controlled area.
 075TG005	Tim Griffith	23 October 2003	Short Caption: North Façade detail Long Caption: The North elevation is fully shaded by a perforated aluminum screen, which also serves to conceal the air conditioners and washing areas
 075TG006	Tim Griffith	12 December 2003	Short Caption: Apartment Interior Long Caption: The full height glazing allows the excellent views to the south to be appreciated. The façade incorporates monsoon windows to allow the building to be naturally ventilated in all weather conditions.

 075TG009	Tim Griffith	23 October 2003	Short Caption: Detail of Facade Long Caption: The full height glazing incorporates a monsoon window, in the ledge, which allows the windows to be opened in all weather conditions.
 075TG010	Tim Griffith	23 October 2003	Short Caption: Swimming Pool Long Caption: The swimming pool is designed as three tiers of water, the longest of which is a 50m-lap pool.
 075TG011	Tim Griffith	23 October 2003	Short Caption: Penthouse Terrace Long Caption: The penthouse has a roof terrace and a lap pool. The polycarbonate screen conceals services, and is backlit at night.

 075TG12	Tim Griffith	23 October 2003	Short Caption: Penthouse Spiral Stair Long Caption: The spiral stair of the penthouse cantilevers out from the façade.
 075TG013	Tim Griffith	23 October 2003	Short Caption: Penthouse Spiral Stair Long Caption: The spiral stair of the penthouse cantilevers out from the façade.
 075TG015	Tim Griffith	23 October 2003	Short Caption: South Façade Detail Long Caption: The south façade incorporates monsoon windows in the bay window ledges. 3 different façade variations produce an interesting random effect.

 075TG018	Tim Griffith	23 October 2003	Short Caption: South Façade Detail Long Caption: The south façade incorporates monsoon windows in the bay window ledges. 3 different façade variations produce an interesting random effect.
 075TG020	Tim Griffith	23 October 2003	Short Caption: Monsoon Window Detail Long Caption: The Monsoon Window is an adaptation of a vernacular detail. A horizontal panel is slid back by operating a winder. The perforated panel prevents objects falling through, and can be lifted for maintenance and cleaning the glass below.
 075TG022	Tim Griffith	23 October 2003	Short Caption: Penthouse Terrace Detail Long Caption: The penthouse has a roof terrace and a lap pool. The polycarbonate screen conceals services, and is backlit at night. The swimming pool has a glass overflow edge.