

**ARCHITECTURE DEPARTMENT**

**CHINESE UNIVERSITY OF HONG KONG**

MASTER OF ARCHITECTURE PROGRAMME 1996-97

DESIGN REPORT



## **A FUTURE WORKPLACE**

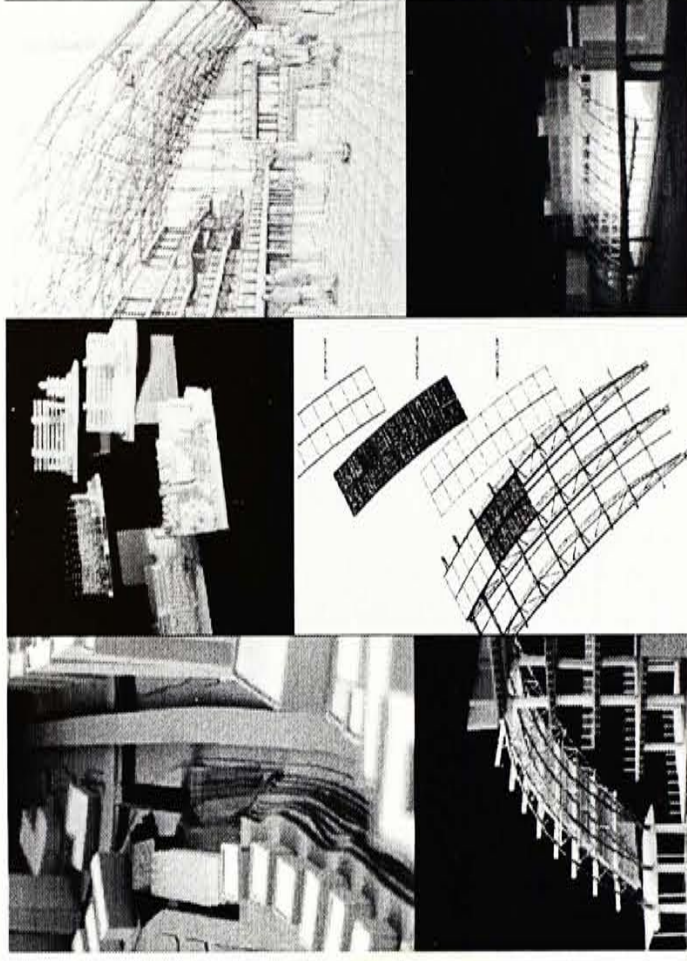
FUNG Chi Ho Michael

April 1997



# A FUTURE WORKPLACE

HEADQUARTERS OF CHINA LIGHT AND POWER



DESIGN REPORT (Thesis Project 1997)  
DEPARTMENT OF ARCHITECTURE  
THE CHINESE UNIVERSITY OF HONG KONG

FUNG CHI HO, MICHAEL

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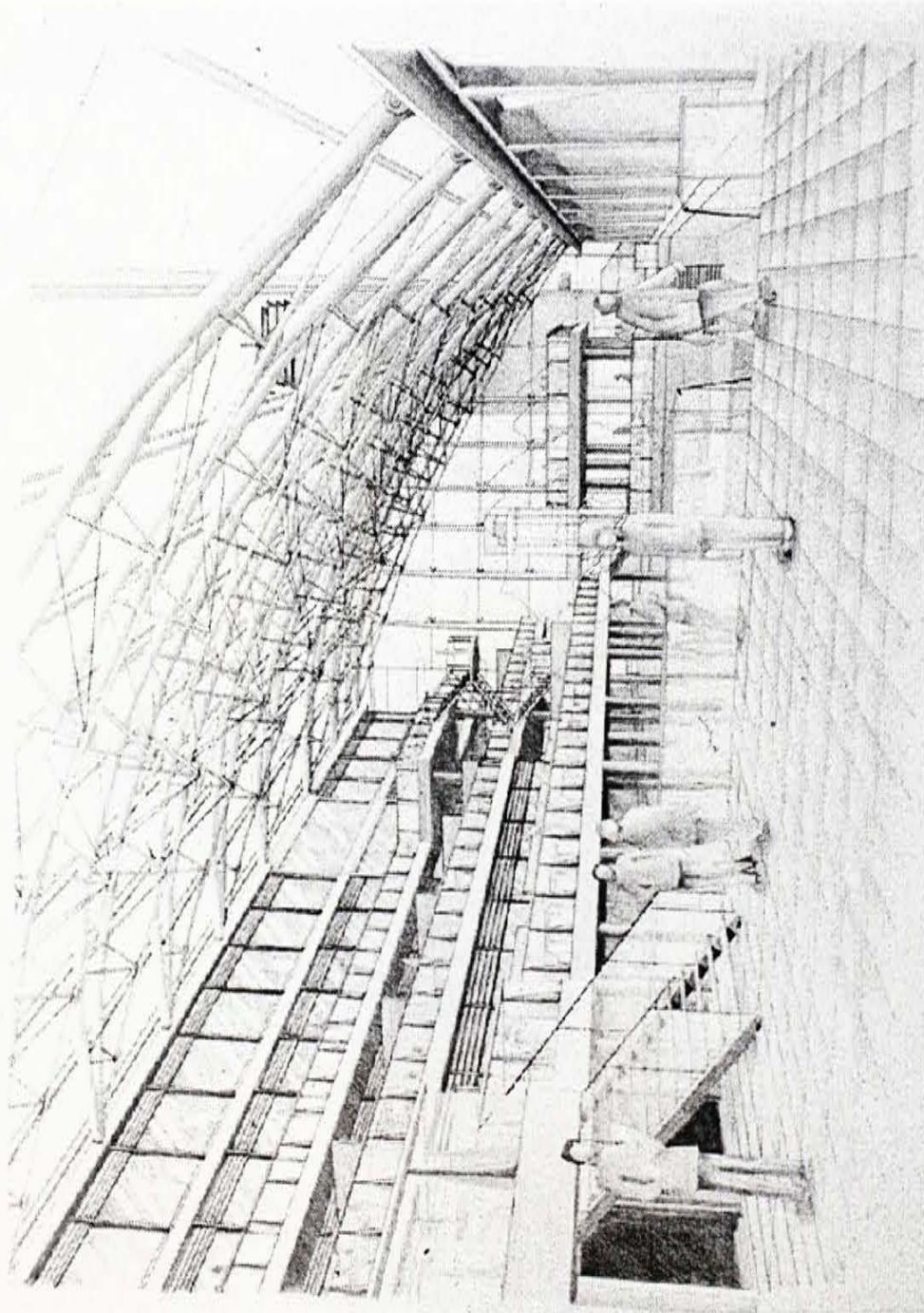
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**Bibliography**

- David Button and Brain Pye, "Glass in building: A guide to modern Architectural Glass Performance" Pilkington with Butterworth Architecture, 1993.
- Timothy E. Johnson, "Low-E Glazing Design Guide" Department of Architecture Massachusetts Institute of Technology, Butterworth Architecture, 1991.
- Dean Hawkes, "The Environmental Tradition: Studies in the architecture of environment", E & FN Spon, 1996
- William M.C. Lam, "Sunlighting As Formgiver for Architecture", Van Nostrand Reinhold Company, 1986
- Verlag GerdHatje "Design Center Linz Thomas Herzog", Germany, 1994
- Andrea Compagno, "Intelligent Glass Facade", Material Practice Design, Birkhauser 1995
- CIBSE Code for interior lighting, The Chartered Institution of Building Services Engineers London, Yale Press Ltd.

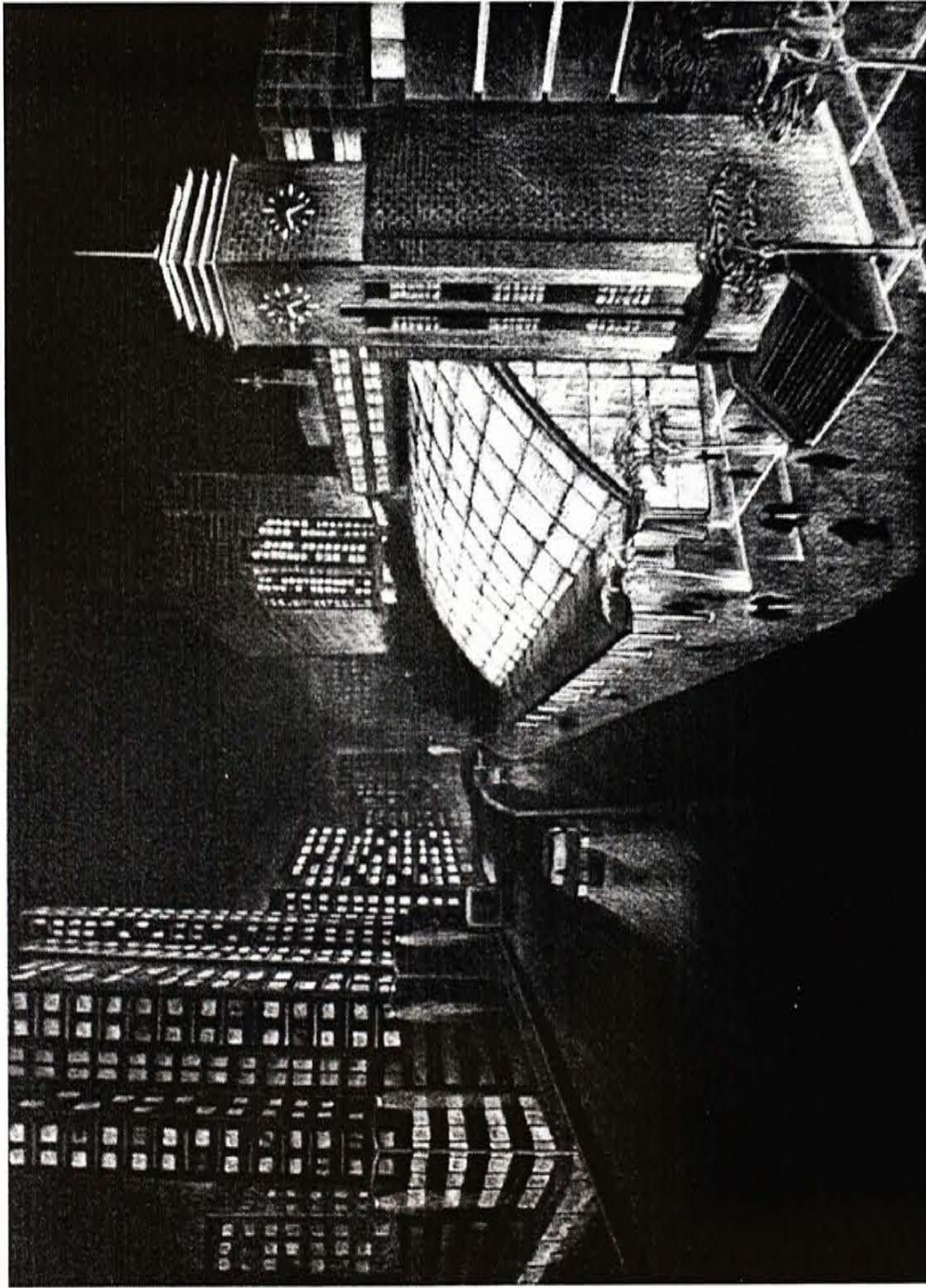
## INTRODUCTION



China Light and Power Co. Ltd. is a major public utilities company in Hong Kong. Suffering from inadequate provision of office space, there are plans to redevelop their existing Headquarters building. To cope with the company's rapid development, the building will be more than a traditional mixed-use office building. The new Headquarters should certainly reflect the image of China Light and Power from its past, present to future. It should also serve as a bridge for communicating with the public with an image for increasing transparency of the company.

With the diffusion of information and changes in life style of office workers, the office in the cities will gradually change in form heading toward the 21 st Century. The office can be dispensed in theory and can be sited at any place. It is now possible to perform a major bulk of work in a hotel room, at home, or even inside a car. However even with the advance of technology, face to face contact is still most important in human communication. Offices as a container for an organization need not always be an office building as their hardware. When an office as a physical place is no longer needed, the concept for office building may require rethinking.

As living standard rises, the building users require a more sensitive living condition and air-conditioning become essential in office building design. The energy crisis and environmental pollution may not be stopped, the concept of environmental friendly and energy efficient workplace should be considered more seriously. To enhance the architectural solution, carefully planning and service integration should be the most important design issue.



### 1.1 Design Mission

To create an ideal concentrate workplace for our society and to cope with the rapid social revolution.

### 1.2 Design Objectives

- To create an environment which can provide suitable stimulation to the occupants which they can work more creative and effective, improve and enhance social interaction
- To enhance the transparency of the image of China Light and Power.
- To design a workplace which is energy efficiency.

### 1.3 Client/users

China Light and Power Company Limited was incorporated in Hong Kong in 1901 to supply electricity to Canton and Kowloon. After almost a century, it becomes one of the biggest public utilities company in Asia. and Hong Kong's largest public companies listed on the Stock Exchange of Hong Kong. It provides electricity to Kowloon and New Territories, including Lantau, Cheung Chau and a number of other outlying islands.

There are approximately 6000 employees in China Light, and 300 employees are working in its headquarters in Argyle Street currently. Since the lack of office space in existing headquarters, only part of the staffs of Managing, Administration, Development and Public Affair Division is works in the headquarters, the rest is scattered in the regional offices located in different areas.

The new Headquarters is going to accommodate 800 staffs, which will include most of the Managing, Administration, Development and Public Affair Division of the company. Apart from this, the communal and recreational facilities located in the new building will be opened to the whole company. The new Headquarters will be a multi-functional office building and will also become a social centre for the whole company.

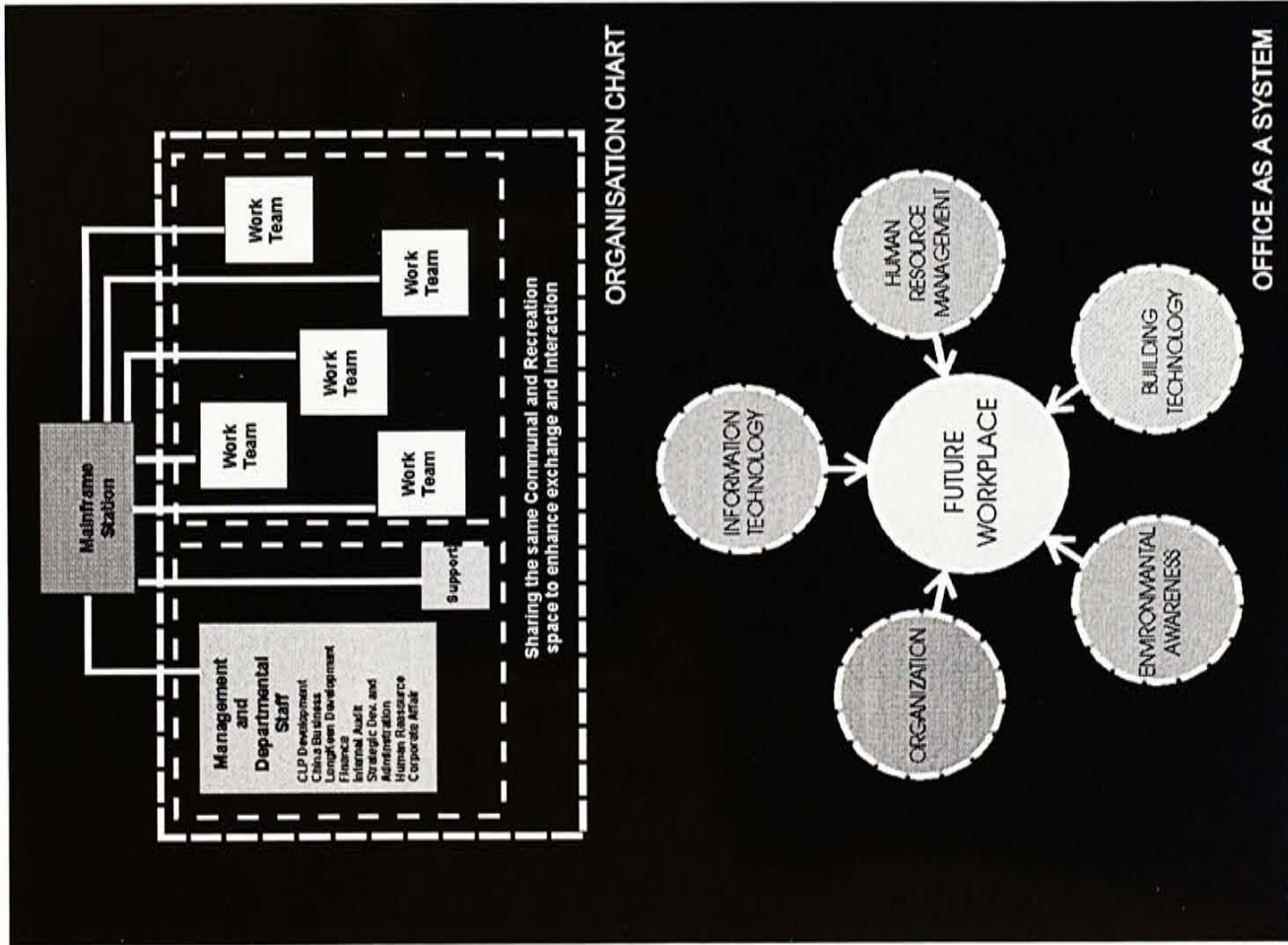
1.4 Need

The new Headquarters is going to accommodate 800 staffs from the Managing, Administration, Development and Public Affair Division of the company and to integrated the company's recreation, customer service and exhibition area

China Light is keen to increase communication with the community in term of their operation in order to enhance the public's understanding of the company. The new headquarters can serve as a bridge for the public communication. and increase the transparency of the image of China Light and Power. By the way, the new headquarters would also set up a new standard for their future concentrated workplace's environment and energy efficiency building design for their future development.

Client Requirement

- To integrate most of the office space which is scattering around all over Hong Kong, into the new building.
- To develop an healthy working space in term of environmental as well as operational.
- To develop a working space which can encounter the future change of the organization.
- To develop an energy efficient office building which represent the environmental concern of the Company
- To integrate the exhibition space in Western Kowloon and part of exhibition space in Castle Peak
- To develop well-designed customer service centre



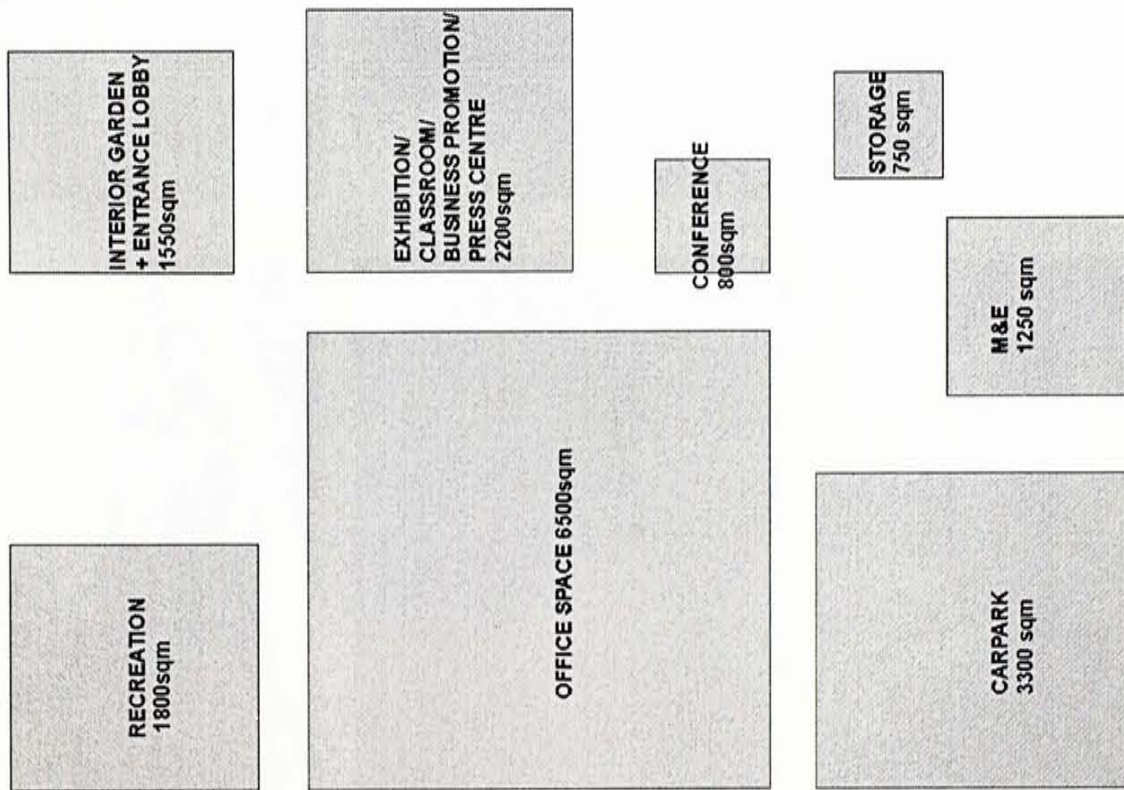


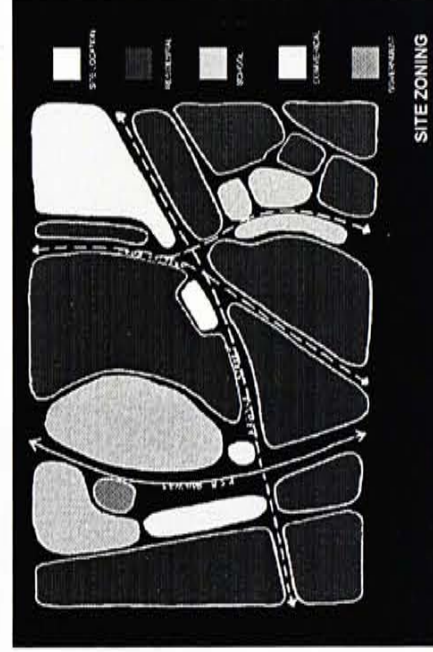
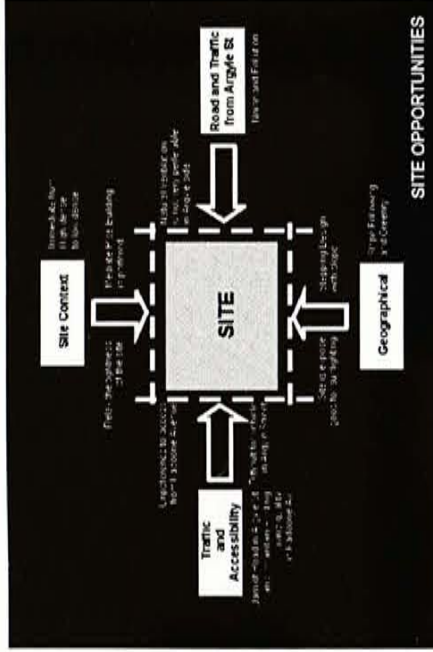
1.5 Brief

**Client:** China Light and Power Co. Ltd.  
**Location:** 137-148 Argyle Street, Ho Man Tin, Kowloon, Hong Kong  
**Site Area:** 6600 sqm (approximately)  
**Proposed GFA:** 18000 sqm (approx.)  
**Occupant:** 800 staff  
**Purposed:** Co-operation Office (Single Use)  
**Number of Storey:** 9

Schedule of Accommodation

	Area in sqm
Office space	6500
Carpark area	3300
Recreation	1800
Interior garden	
Entrance Lobby	1550
Press centre	
Business Promotion centre	
Exhibition + Classroom	2200
Customer service	300
Conference	1200
M/E	750
Storage Computer facilities	750





### 1.6 Site Issues

In 1940s, the headquarters first built in the location 147 Argyle Street, there is only the eastern portion of the site has been built. Later, two more blocks is added on the western side. Finally, the three bays are connected together and become a whole complex.

It is a historical site to the development of the company and the clock tower become the landmark of the area.

It is located at the intersection of **Argyle Street and Waterloo Road**. On the north of the street is **Kadoorie Avenue**, which is under the Family name of chairman of the company.

### 1.7 Planning(Statutory)Constraints

According to Outline Zoning Plan produced by Building and Lands Department (May 1995)

- It is classified as **Residential B**.
- It is forbidden to develop commercial use. When we going to develop this site as **Utilities Office** use, an Planning Report may have to submit to Town Planning Board.
- Development in these area are subject to a maximum **plot ratio** of 5.0.

According Building (planning) Regulation

The site is abutting two street, which classified as Class B site.

The permitted plot ratio: 15

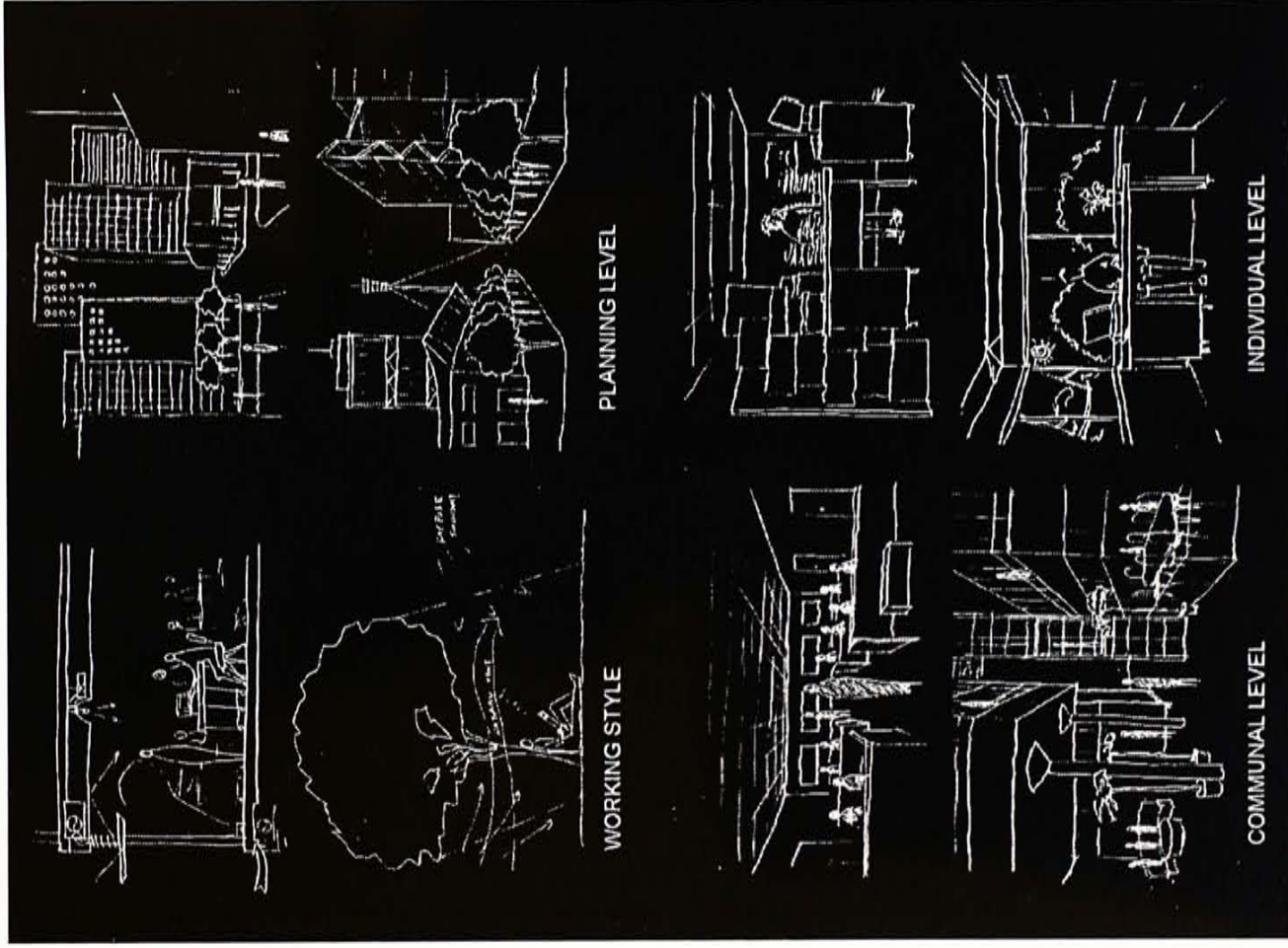
The permitted Site Coverage: 62.5%

However, it is subjected to Town Planning Board comment and Building and Lands Department control.

#### Lease Control

The site is composed of five lots. Five Lots are restricted for 3 storey European House development, but all the lots have obtained approval of **modification** to use as **office**. Among the five lots, there is similar lease control which does not affect the development of the site at all.

## DESIGN/PLANNING/ZONING STRATEGY



## 2.1 Design Concept

**Working style**

- With the advance of information technology, we can work anywhere.
- Imagine, in a park, there is still shading protection, natural ventilation and require sunlight, which can already support you work.
- The need of an group workplace should be more than working space.

**Planning level**

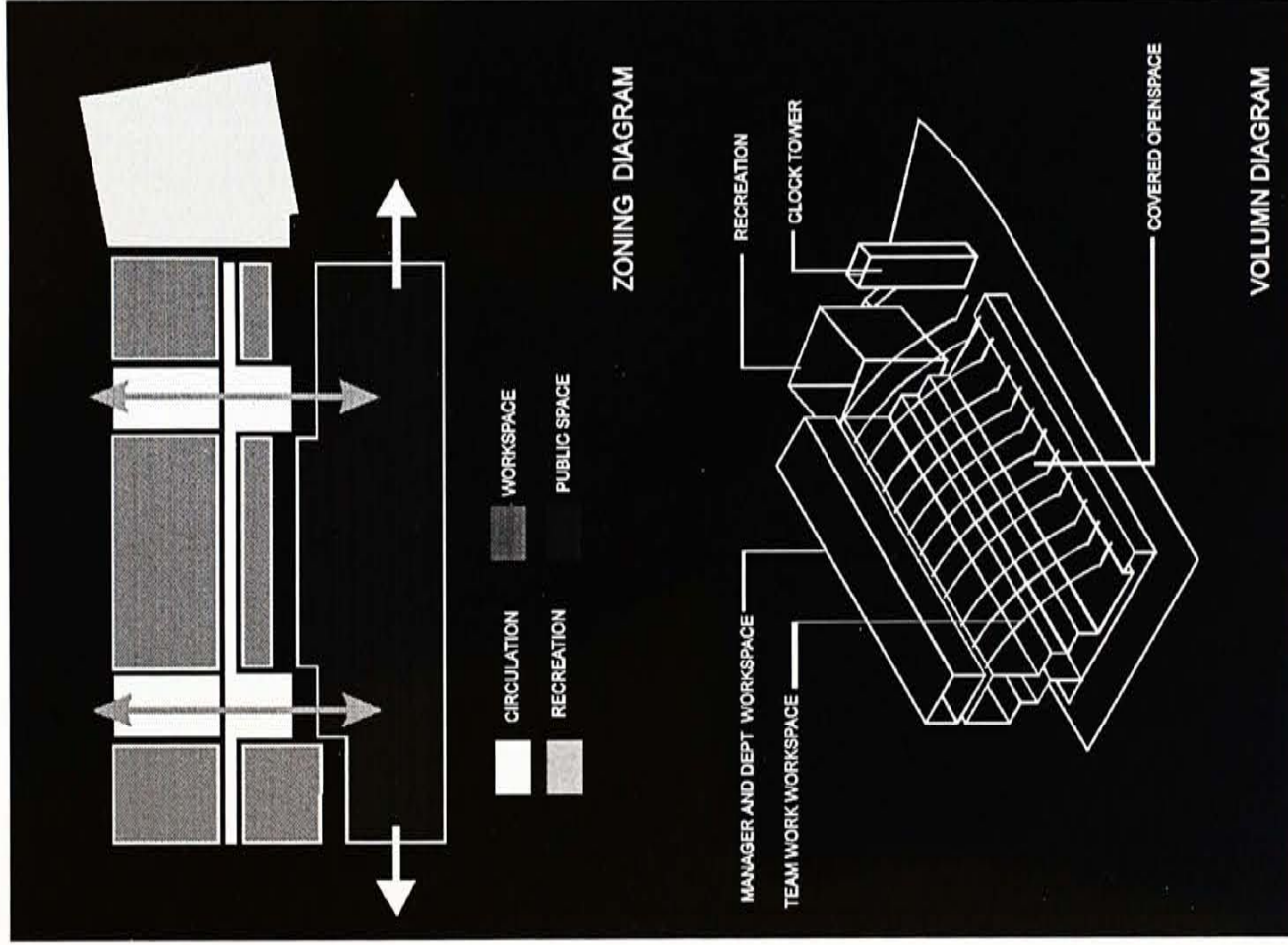
- In a office region in Hong Kong, more of the office is located inside an almost identical tower.
- There is almost no personnel touch, human scale and openness in the space at all.
- In future, we are going to habit in an more unique and humane working environment.

**Communal Level**

- The communal space in the most of the modern office is the corridor in between the partition workstation
- The space is so undefined and boring. It never enhance discussion and communal activities which may even arouse distribute to surrounding staff in work.
- In future, there should be a more interactive relation between working space, lounge, conference space and circulation

**Individual Level**

- One of the headache in modern workplace is the lack of space and well-organized document storage
- The work unit is so boring and pre-controlled, there is also lack of personal taste
- The future workplace should be of more human control, well organized by the advantage of data management system



## 2.2 Zoning Strategy

For the main area

- There is three bays divided by servicing and circulation zone in the main complex.
- The servicing bay in-between is working as a servicing core and circulation core which linked all floors together.
- The front part is the open atrium space which is a semi-public space for social interaction.

In term of massing, the building can be divided into five parts

1. Manager room and departmental workplace located in the top block above the glazing volume. It is the most private portion which business with confidential is running there.
2. The workplace behind the glazing roof: semi-private space which provide visual linkage between public and the company.
3. The atrium space under the glazing: semi-public space which enhances the interaction with public communication within the building
4. Recreation: an individual block linked to the atrium.
5. Clock tower: historical corner, mark the entrance of the building.



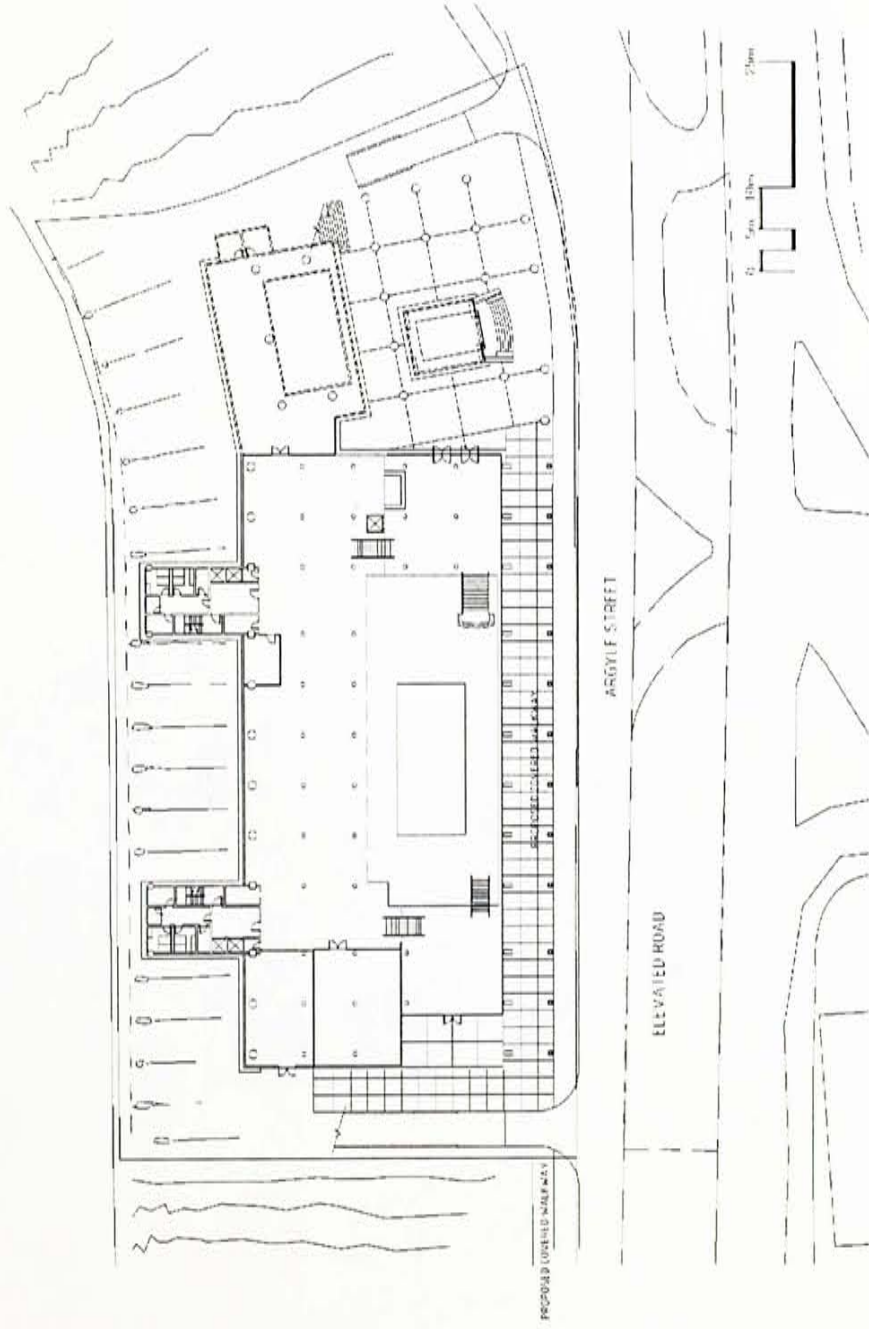
### 2.3 Transport: Pedestrian/Vehicular Access

#### For public access,

- Most of the pedestrian access of the site by the Argyle Street side.
- There is quite a numerous of buses running in Argyle Street and Waterloo Road which can reach the site fairly easy.
- Most of the public transport is located at the east side of the site. MTR, KCR, mini-bus all of them within 10 minutes walking distance

#### For vehicular access,

- The carpark entrance of the site is located at the east side of the Argyle Street and the exit in the west side.
- Since the traffic is so busy in the Argyle Street, a loading bay is designed on the Kadoorie Avenue. The Company car can drop the staff on that side before they entered the carpark.
- The open space next to the clock tower can serve as a drop off point for special event.

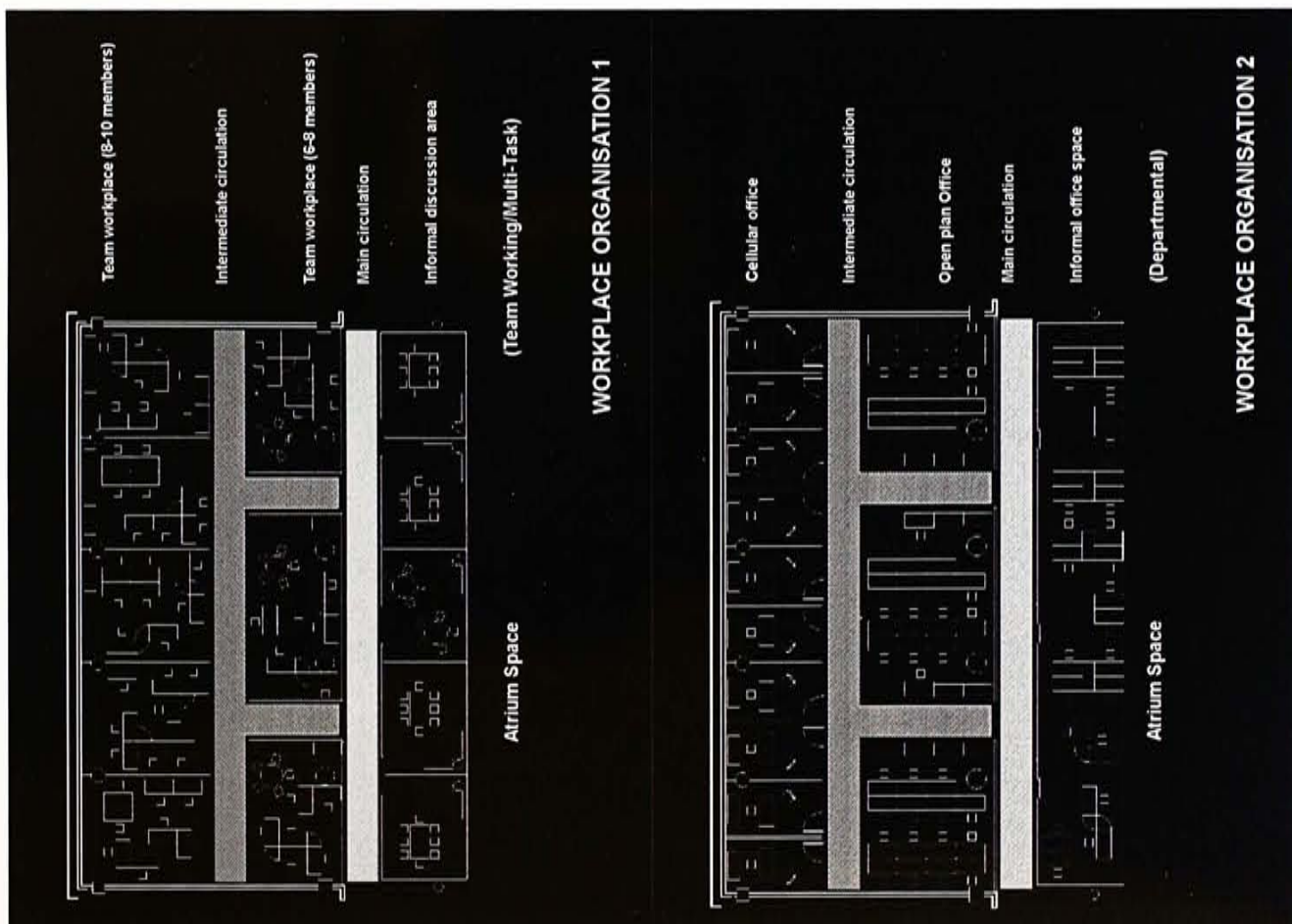


**For the Argyle Street,**

- Approaching the building from east of the site, public have to go through the covered walkway.
- There is a staff entrance on the east side of the building for convenience.
- Before entering the building, people will arrive the plaza of the clock tower.

**For the Kadoorie Avenue,**

- The top of the recreation block is the staff and business entrance lobby.
- There is a loading bay for the company and staff's vehicle drop off.
- As to keep the privacy of the Kadoorie hill, there is only limited parking facilities there.



### 2.4 Office Space Organization

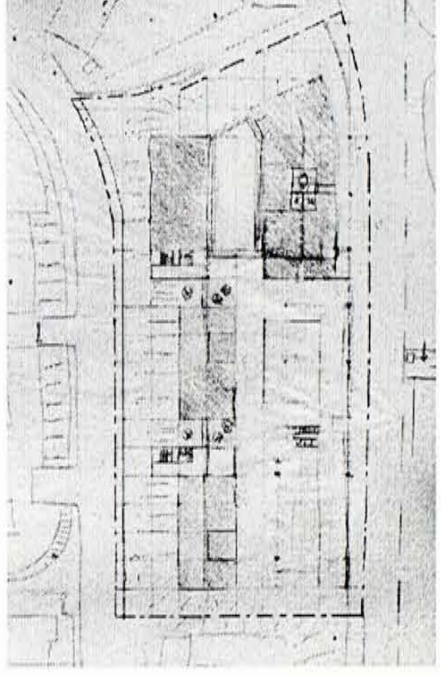
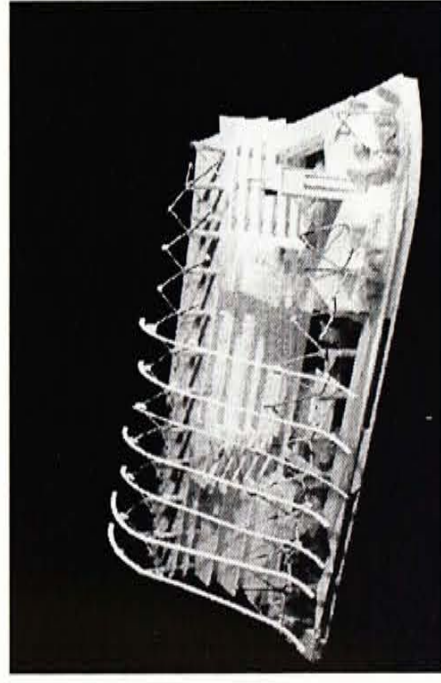
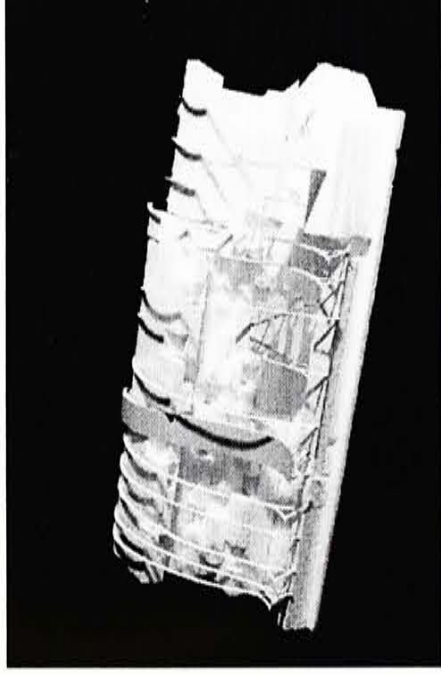
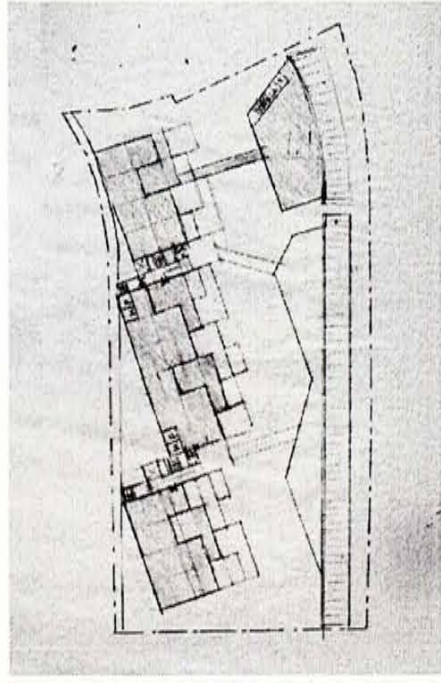
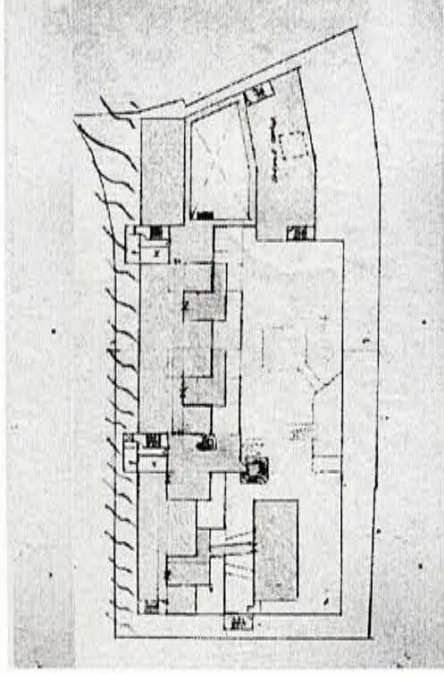
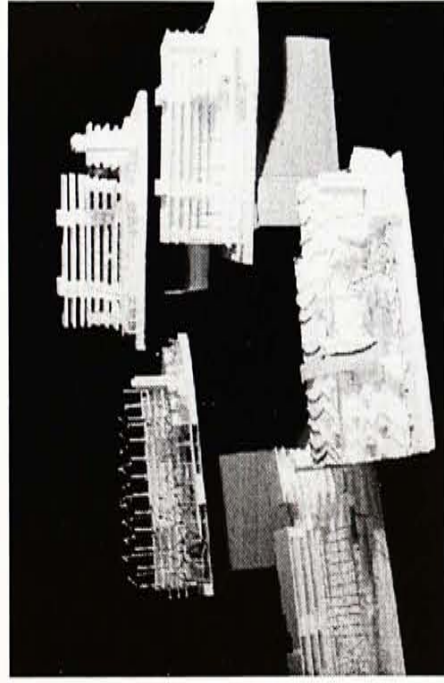
There will be two major layout for the office space.

#### Team Working/Multi-task

- To create team spirit inside a team structure. Each team will occupy a territory.
- There is an Informal Discussion area on the other side of the corridor which allow some informal discussion.
- Divide the space for each team will be 2.5m height partition wall.

#### Departmental

- Cellular Office is located in the deeper side of the plan.
- An open plan office is located immediate next to the cellular office.
- It could provide more flexibility for the traditional office structure.



## 2.5 Design Development

### Planning Approaches,

For the site context, the building is preferable to develop as a middle rise development.

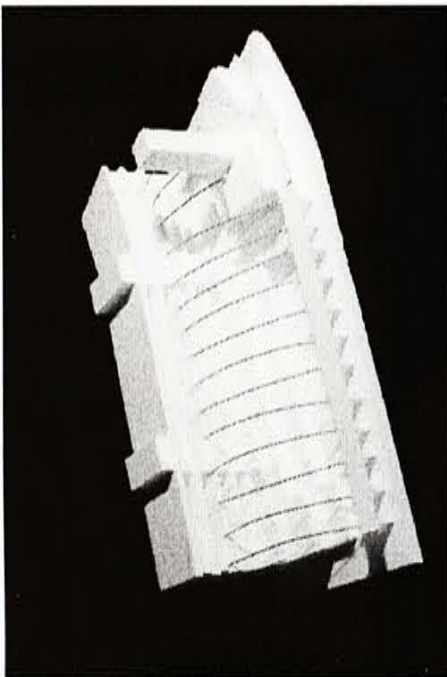
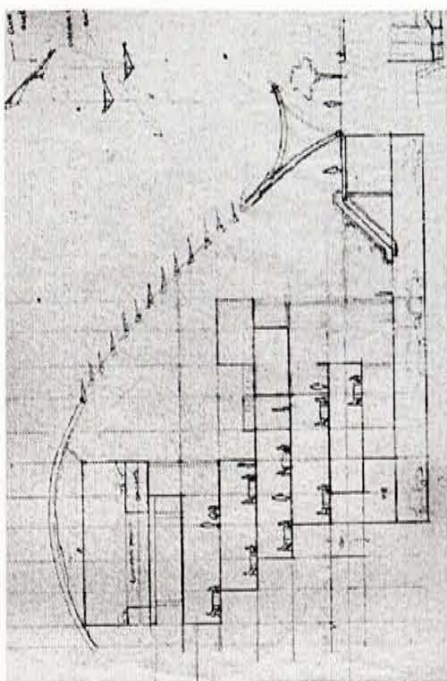
Most of the building mass has been set back to increase the buffer space near the elevated road.

The entrance of the building has a dilemma with the convenience and location of the clock tower.

The orientation and alignment of the building is driven by the traffic and site shape.

Subdividing the mass and turning grid will reduce the efficiency of the building too much, so these options are eliminated at early stage.



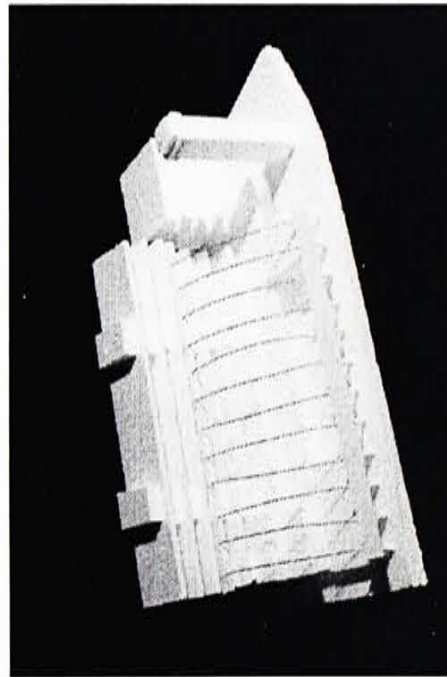
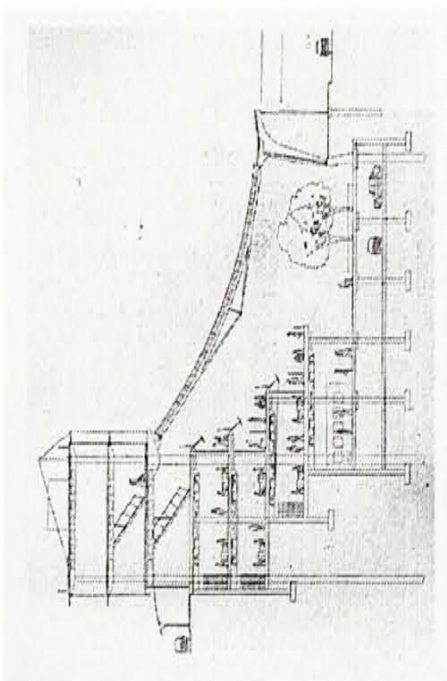
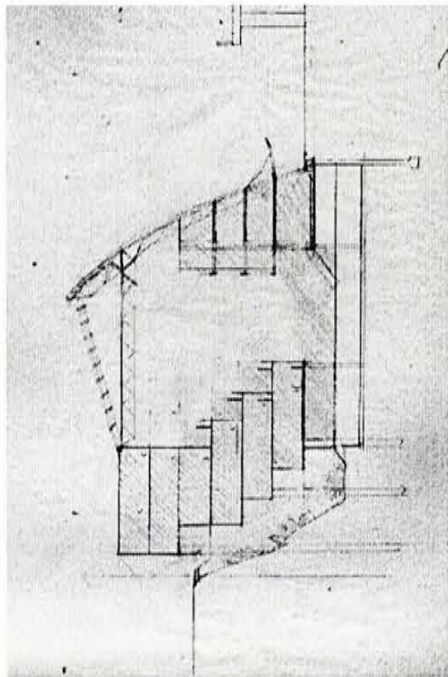
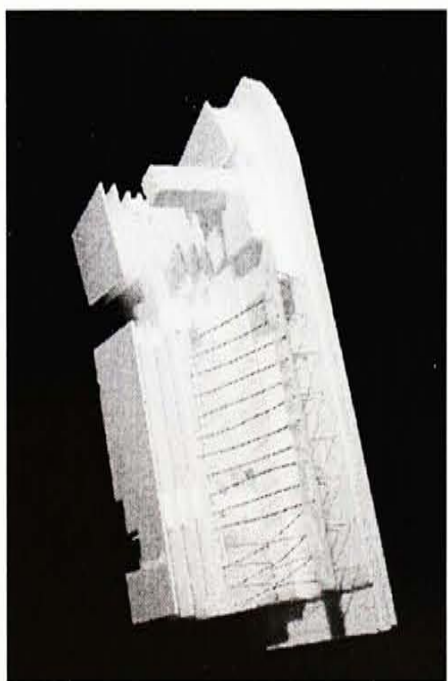


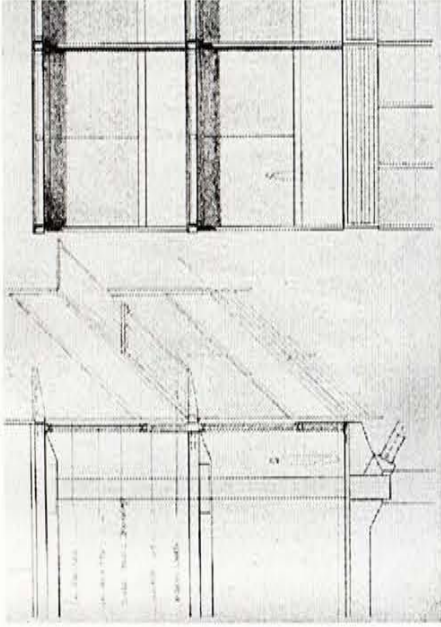
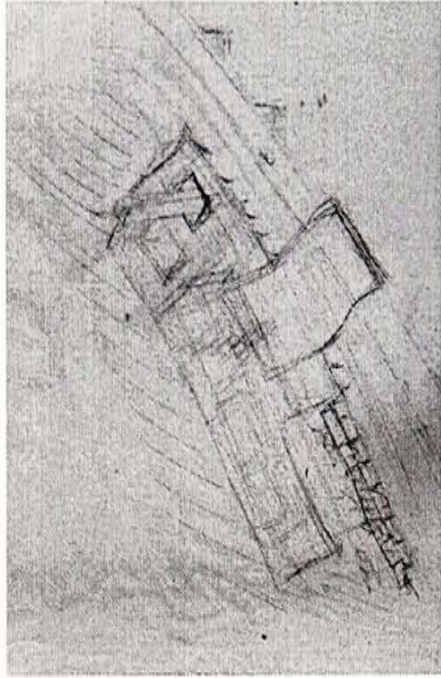
**Form of atrium,**

The roof shape is directly related to the structural system and environmental concern approach

The size of atrium has being reduce during the design stage in order to proportionize with the size of working space.

The shape of the atrium roof has been develop to be a concave shape with suspension structure. Since the movement created by the suspension system will damage the glazing system on top, it was final rejected.

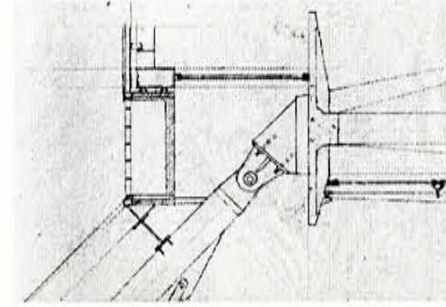
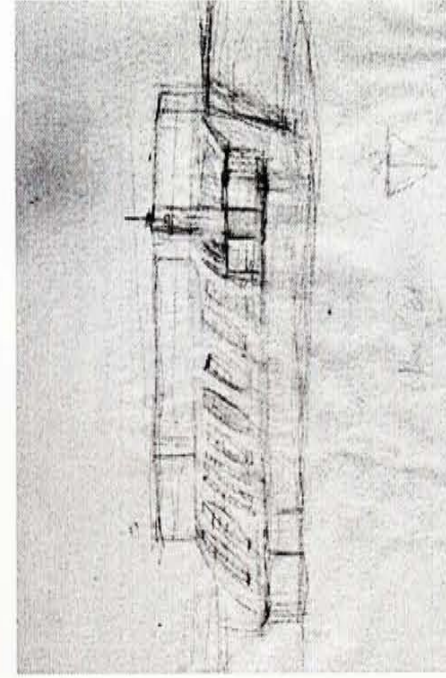




**Images,**

Extending the building to enclose part of the elevated road , it will create interesting relationship of the public and company . Although, it may create a lot of technical problem.

The relationship between the new development and the clock tower is ambiguous before. Later, the new development is totally set back to leave the clock tower to be stand out.

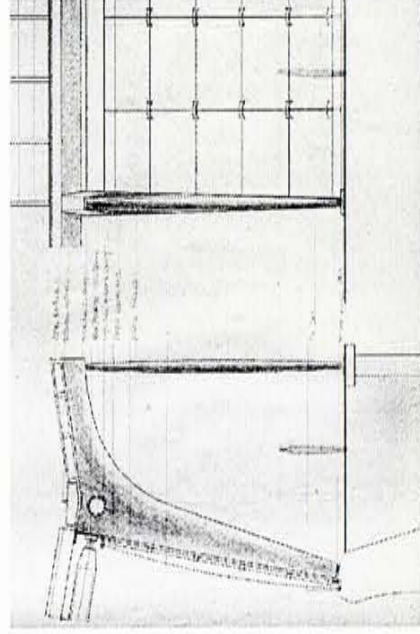
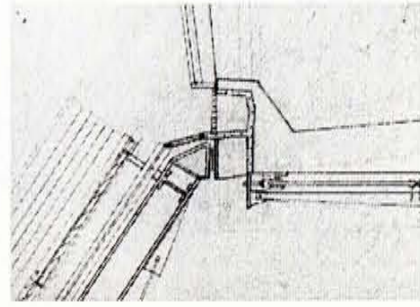


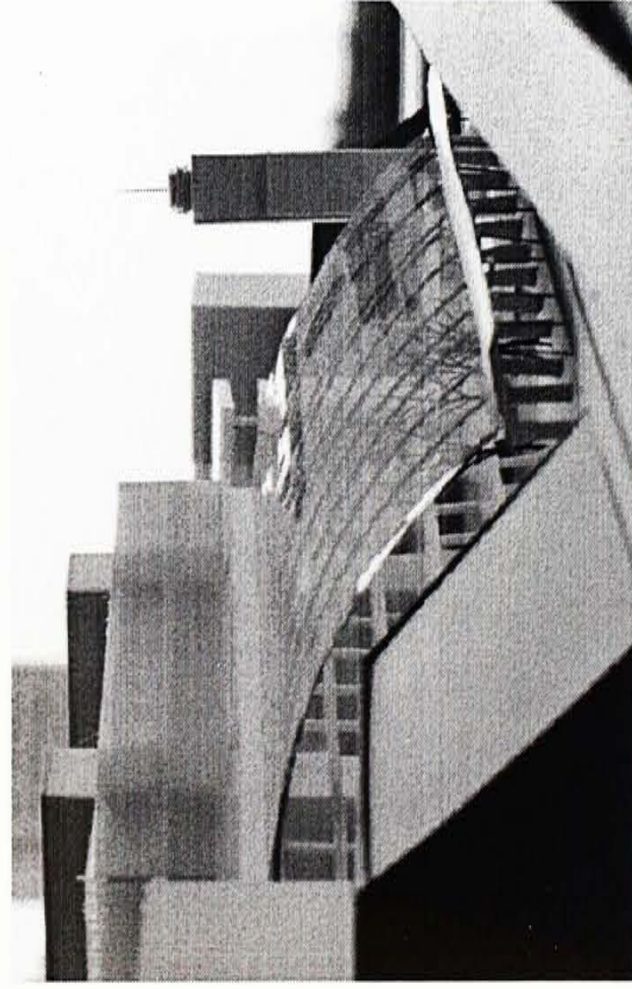
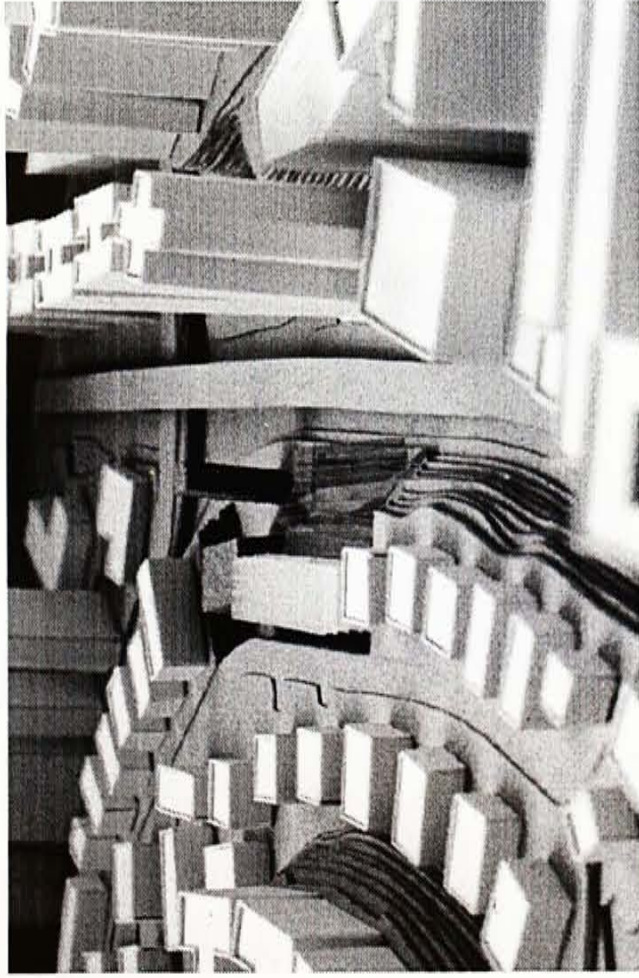
**Detail Development,**

The facade design above glazing atrium has adapted various shading device and glazing system. To integrate the both would be an important design issues.

The joint of the roof structural system to the concrete arcade has to allow thermal expansion.

The design of the joint has been change dramatically when the structural system change.



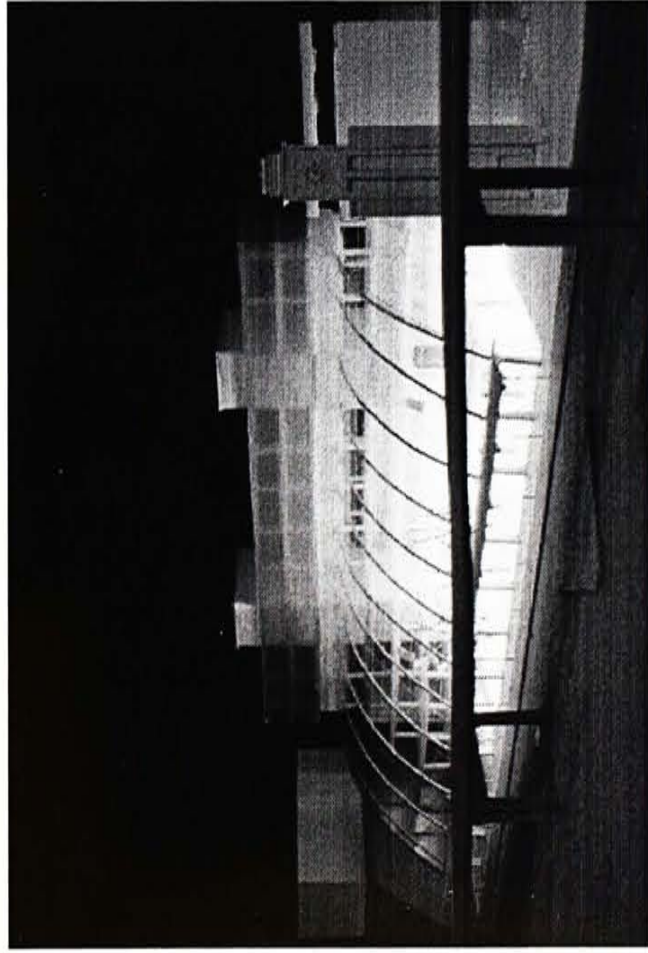
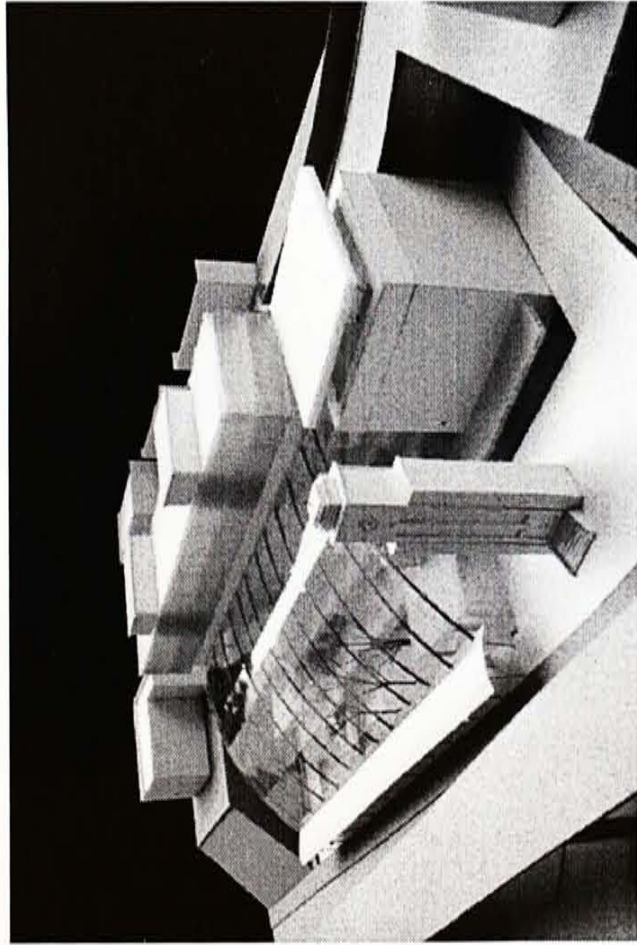


## 2.6 Final Design Solution

The first concern of the building form design is to suit in the context of the region and work as a bridge for communication between company and public.

The mass above the glazing atrium is designed to be in appropriate high with buildings along Kadoorie Avenue.

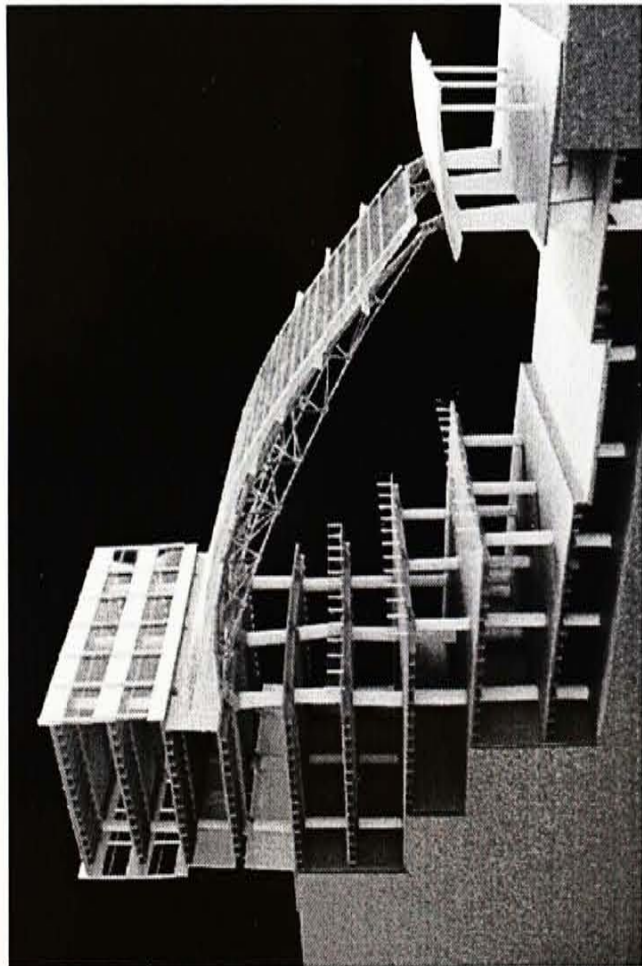
The clock tower represents the historical development of the company and is a landmark of the region. It is designed to be remain stand out as the most eye catching object running along Arygle street.



The recreation block working as a background of the open space of the clock tower.

In daytime, the building will be an object with pure form and clean enclosure.

In night time, the building will become a negative space with invisible boundary connecting to the region.



The section can be divided into: 3 parts Arcade, Atrium Space and working space.above glazing.

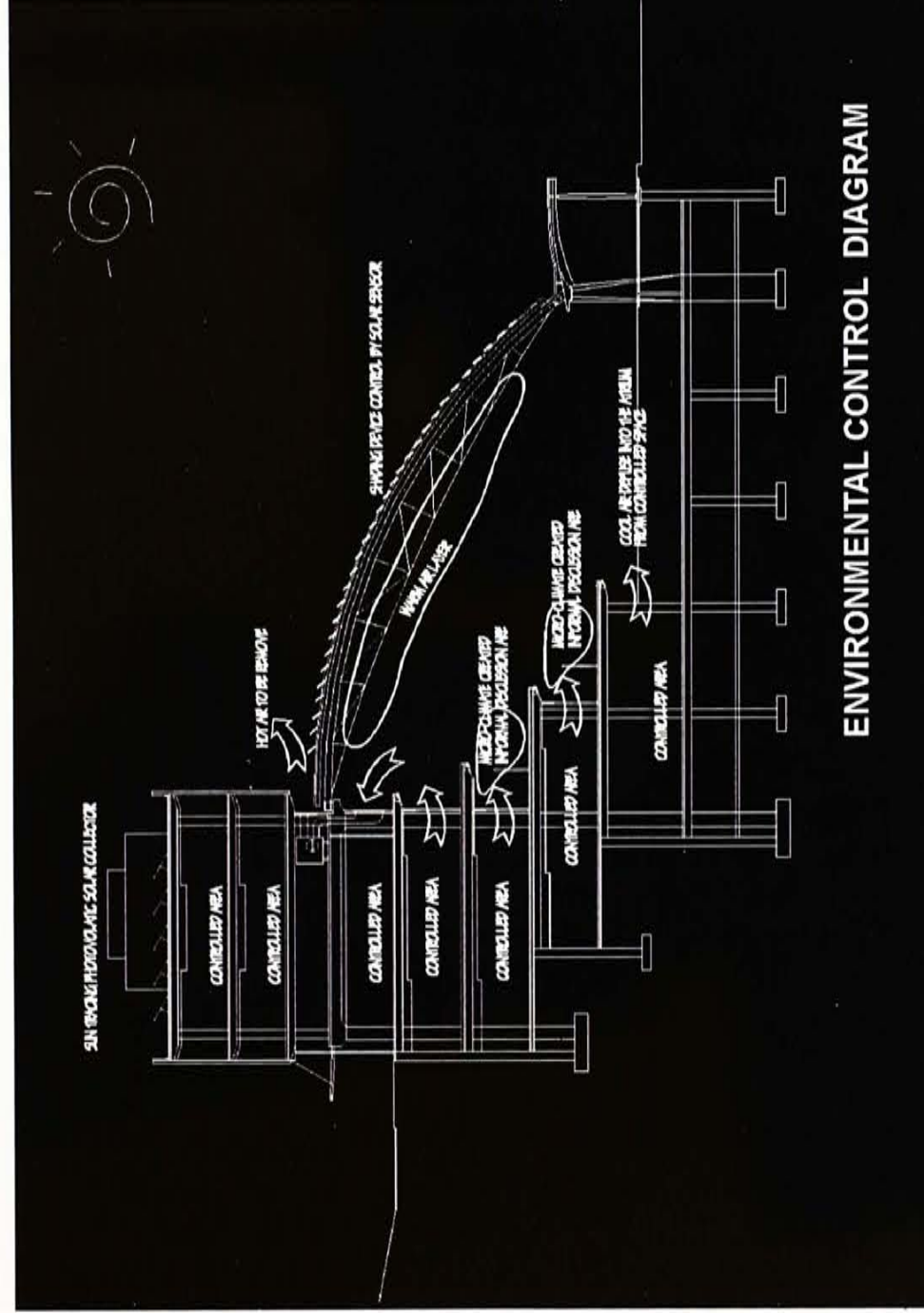
Structural system of the atrium roof is approaching to be as light as possible.

The glazing system has to ensure the space is well controlled in term of natural lighting and thermal insulation.

The roof of the arcadeis working as a drainage channel to fall the storm water away.

The front arcade is working as a additional zoning to screen off the busy traffic to the interior space.

**ENVIRONMENTAL CONCERN**



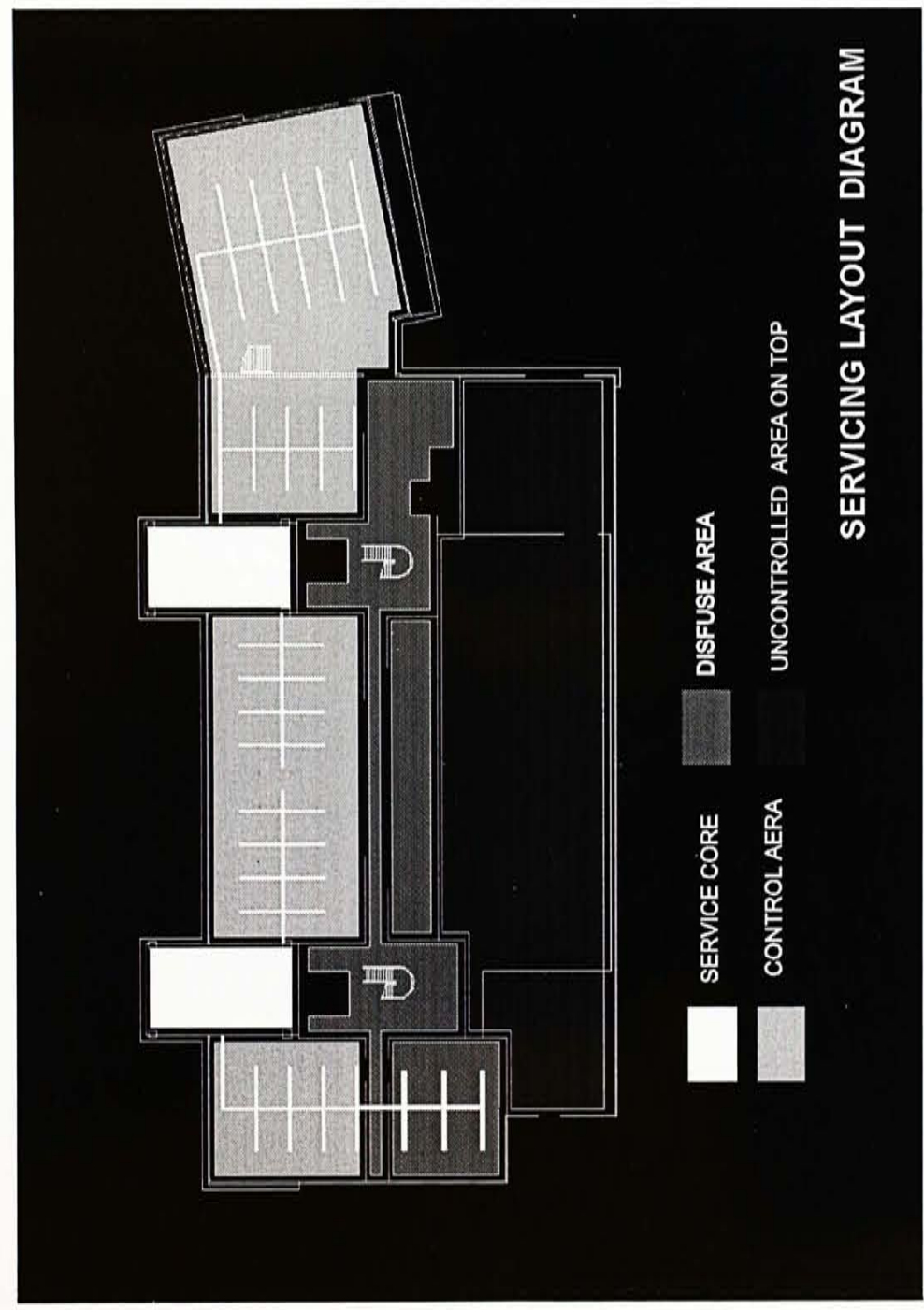
**3.1 Microclimate Concept**

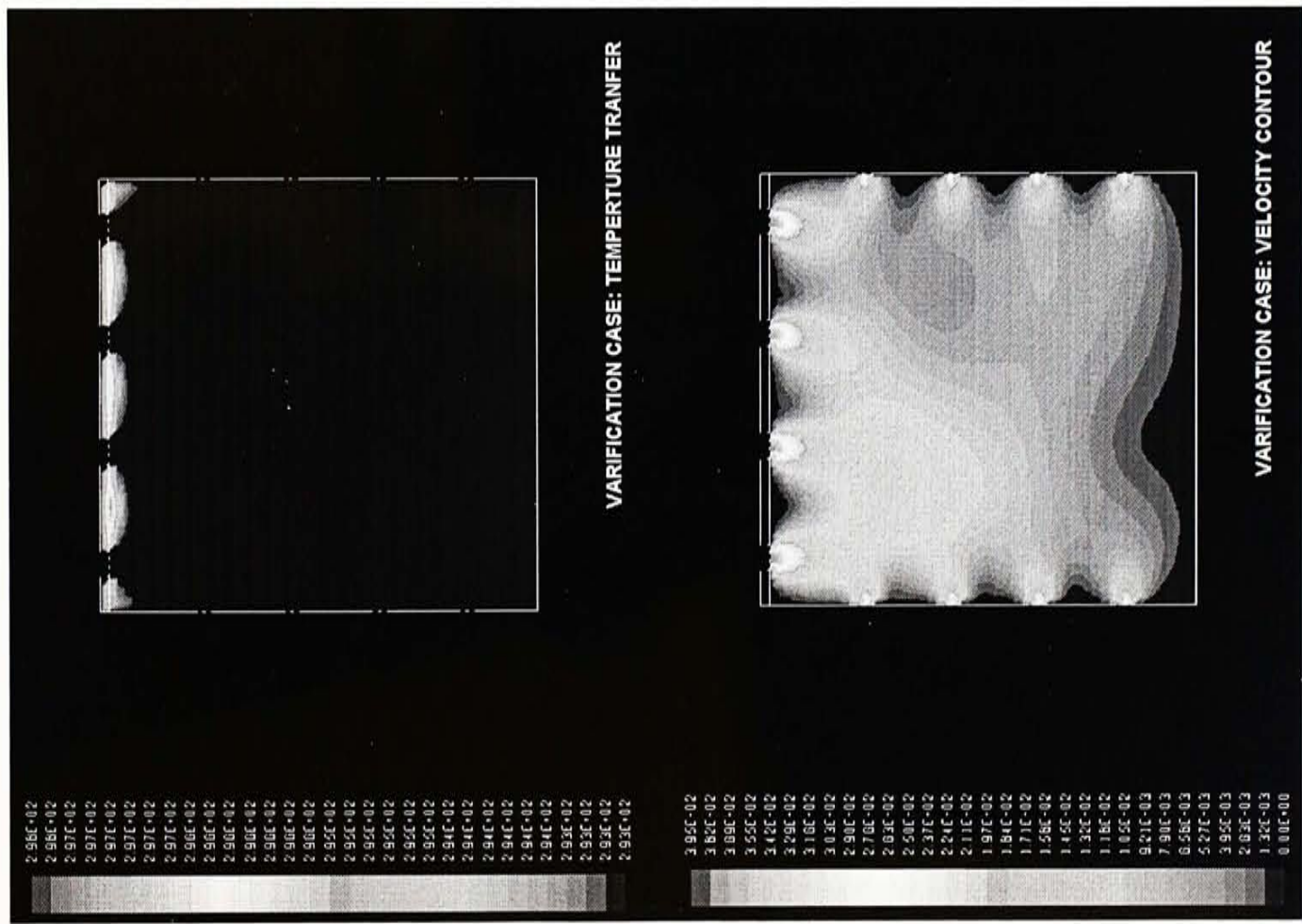
(acoustics, ventilation, lighting, energy strategy)

- All the workspace will be air-conditioned to screen off the exterior pollution.
- In the atrium space, only the lower part will have fresh air supply
- The top of the atrium will work as a buffer zone and hot air will be extracted by mechanical fan on the high level.
- A microclimate will be created in the informal discussion area to provide the comfort level for the occupants.
- The circulation area and the atrium space is depended on the diffuse air form the workspace
- The sun tracking photovoltaic cell in the top of the building to collect the solar energy for environmental control system
- The atrium roof glazing system will act as a thermal and lighting control device for the atrium space, it control the solar radiation penetrate into the space.
- The movable louver interlayer is controlled by light sensor system which vary the angle of the louver to control the density of daylight entering the space.

### 3.2 Servicing Layout

- The AC plant room located on the mechanical floor will distribute the thermal energy top and bottom through the servicing core.
  - The AHU inside the service core prepare the cool air will distribute horizontally as shown .
  - The control level is divided into layers from the most inner controlled workplace the diffused circulation/informal discussing area
1. uncontrolled atrium space.
  - 2.
  - 3.





### 3.3 Computation Analysis (CFD)

The Purpose:

To understand and design the environmental condition inside the atrium space of the main area

- Thermal condition
- Air flow
- Pressure difference

Device

"SUN" SPARC Station 10  
Environmental Lab in the Chinese University of Hong Kong

Programme:

Fluent 4.3 (Computational Fluid Dynamics Software)

Step and Procedure:

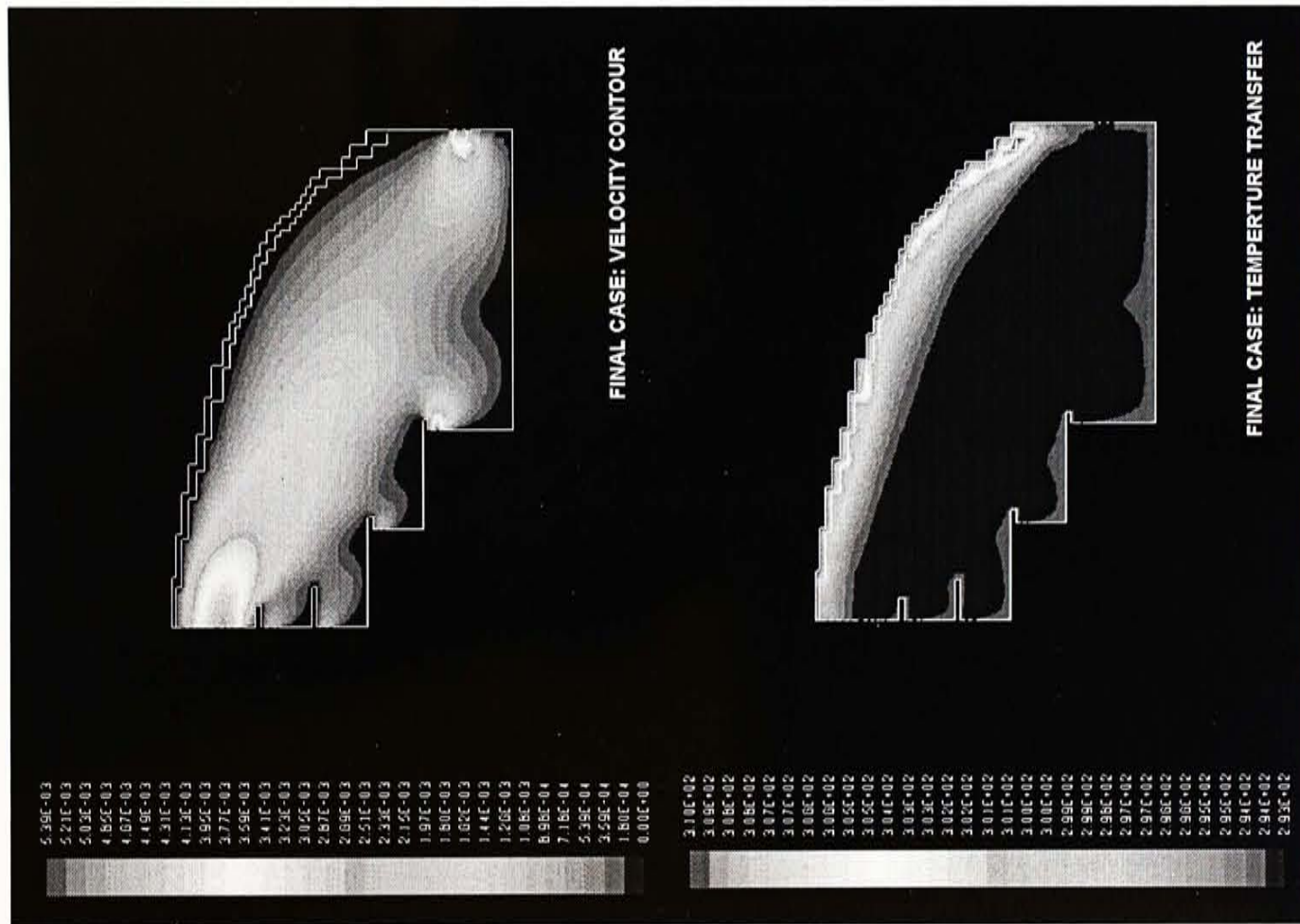
- 1 Allocation Memory
- 2 Define the Domain
- 3 Generate the Grid
- 4 Define the Model
- 5 Define the Boundary Condition
- 6 Computation
- 7 Plot and Evaluate

The most difficult step is the grid generating and defining the model and boundary condition. During that step, we have to highly depend on the expertise in the environmental lab who have deep understanding of aerodynamic theory.

Model used:

Heat Transfer  
Gas Law applied  
Initial condition 297k(temperature)



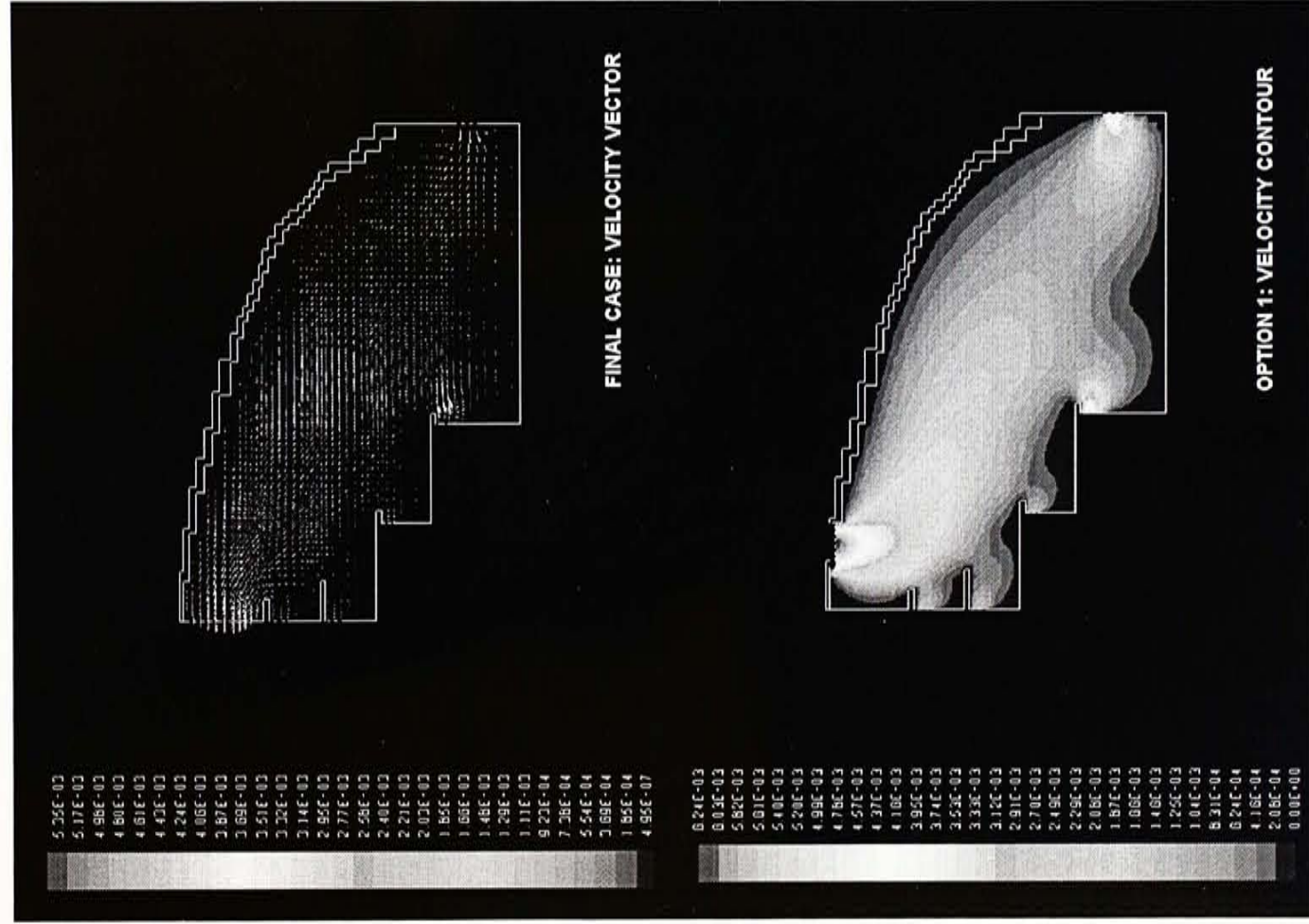


Verification case

- Firstly, I make a simple case to study the nature of interface and limitation of the software. The case picked is a built atrium building design by ARUP. Then I make a very simple verification of the option and initial condition I have made.
- We have to make sure the verification is in good condition so that the test case can use the same physical condition for further testing.
- The result have to come to a convergence results in the residual plot graph with all plot come below 10e-3. Otherwise the result cannot reflect the situation at all.

The Result:

- The result outcome is very interesting, There is quite a low velocity of air movement inside the space and the fastest air movement inside the space may be the area in the informal discussion area and the outlet area.
- There is a number of thermal layer in the high level atrium space which need not to be controlled. All of the hot air will be extracted out in the outlet in high level.
- There is a layer of hot air around 40°C in the roof level. The proportion of the inlet and outlet will change the speed of the air movement a lot. If the air moving fast enough, the extra accumulated heat on the roof level is easy move away.
- There is a microclimate condition in the informal discussion area.
- The air speed, the proportion and location of air diffuser is very important factors to affect the condition inside the space.
- The design and material choice for the glazing facade would be another important factor



Option studies:

Option 1

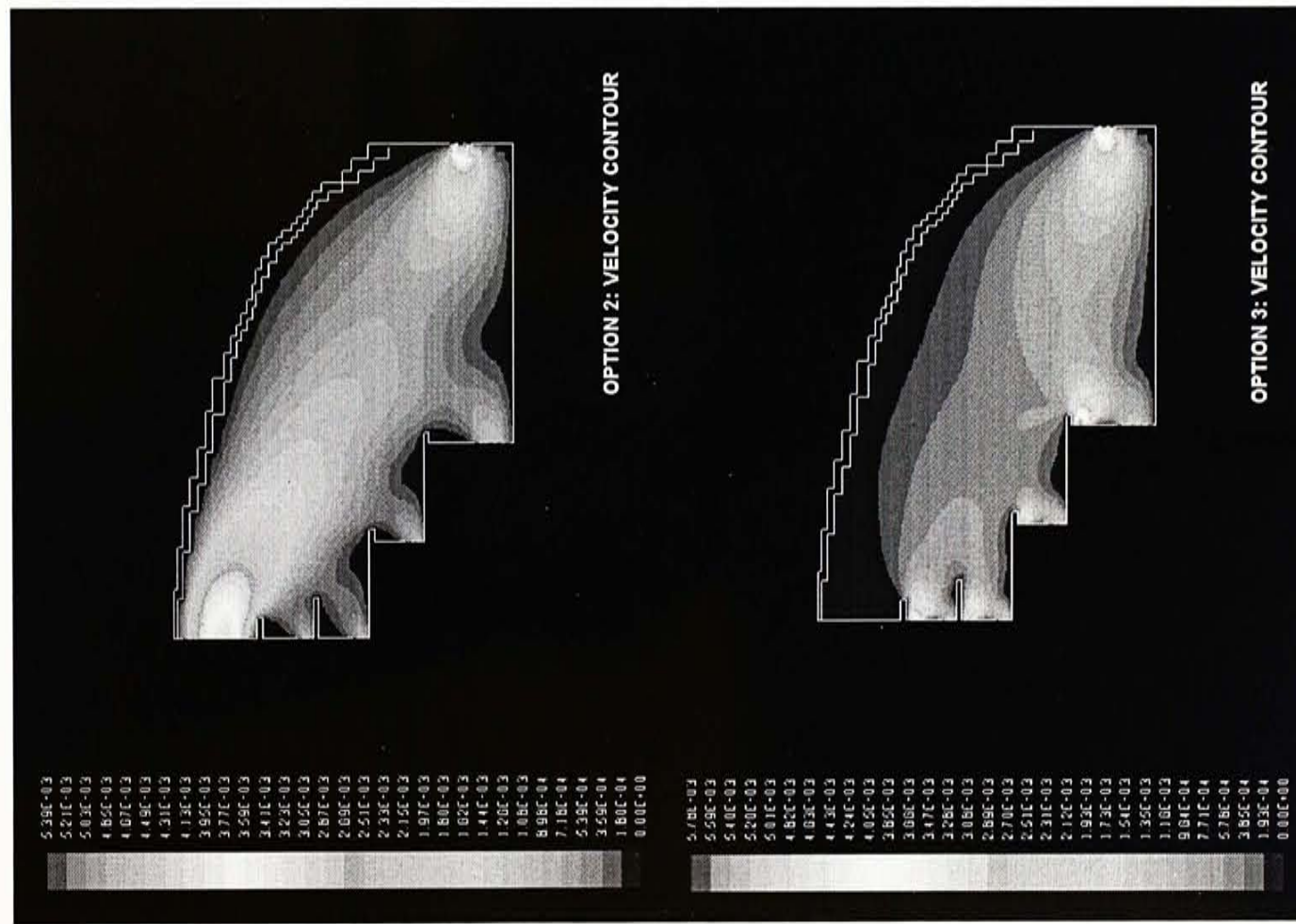
- When the outlet of the atrium change to the top of the atrium, the hot air move out of the space more easily.
- The temperature of the hot air layer can be reduced

Option 2

- When the inlet of the diffuser change to low level of the , the air moving in the informal discussion area moving up fast.
- There may not enough fresh air supply and air movement in the informal area.

Option 3

- When the outlet located on the low level of the same surface of the inlet, short circuit may happen.
- There may not be enough air moving in the atrium space and the temperature on the top of atrium get 5 k higher.



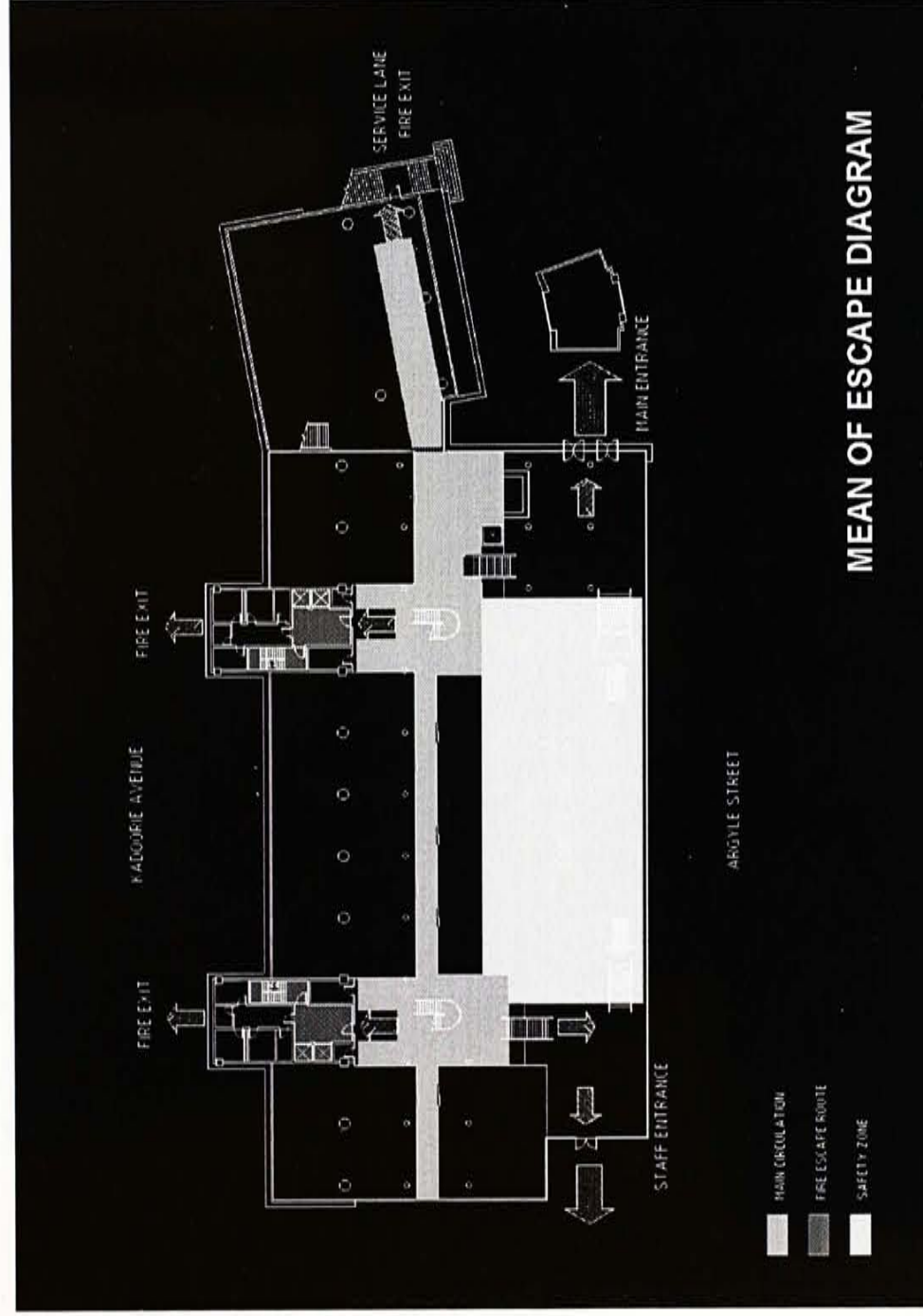
Comment:

I find that CFD is a very power tool for architectural design during the design development. It is a very good demonstration for the air flow and energy transfer problem in turn of easily understandable visual result.

However, there should be run by someone who have deep understanding with aerodynamic theory. Otherwise the result can never represent the real situation in any sense.

Since the energy issue is a very important topic today. The global heat and energy crisis seem to be still an very big problem in our world. Building design with servicing engineering interagation should be one of the most important design aspect for architect considerate.

**LIFE SAFETY**



**4.1 Means of Escape**

- The two circulation core at a distance 36 m work as a fire exit which connected to the Kadoorie Avenue.
- There 4 fireman lifts are located inside the circulation core which is within 50 m from any space in the building.
- The atrium space works as a safety zone for emergency exit buffer.
- From the atrium buffer, people can exit the building from the both entrance.
- The service lane in the eastern side of the building is serviced as a fire escape route connect to the recreation block.

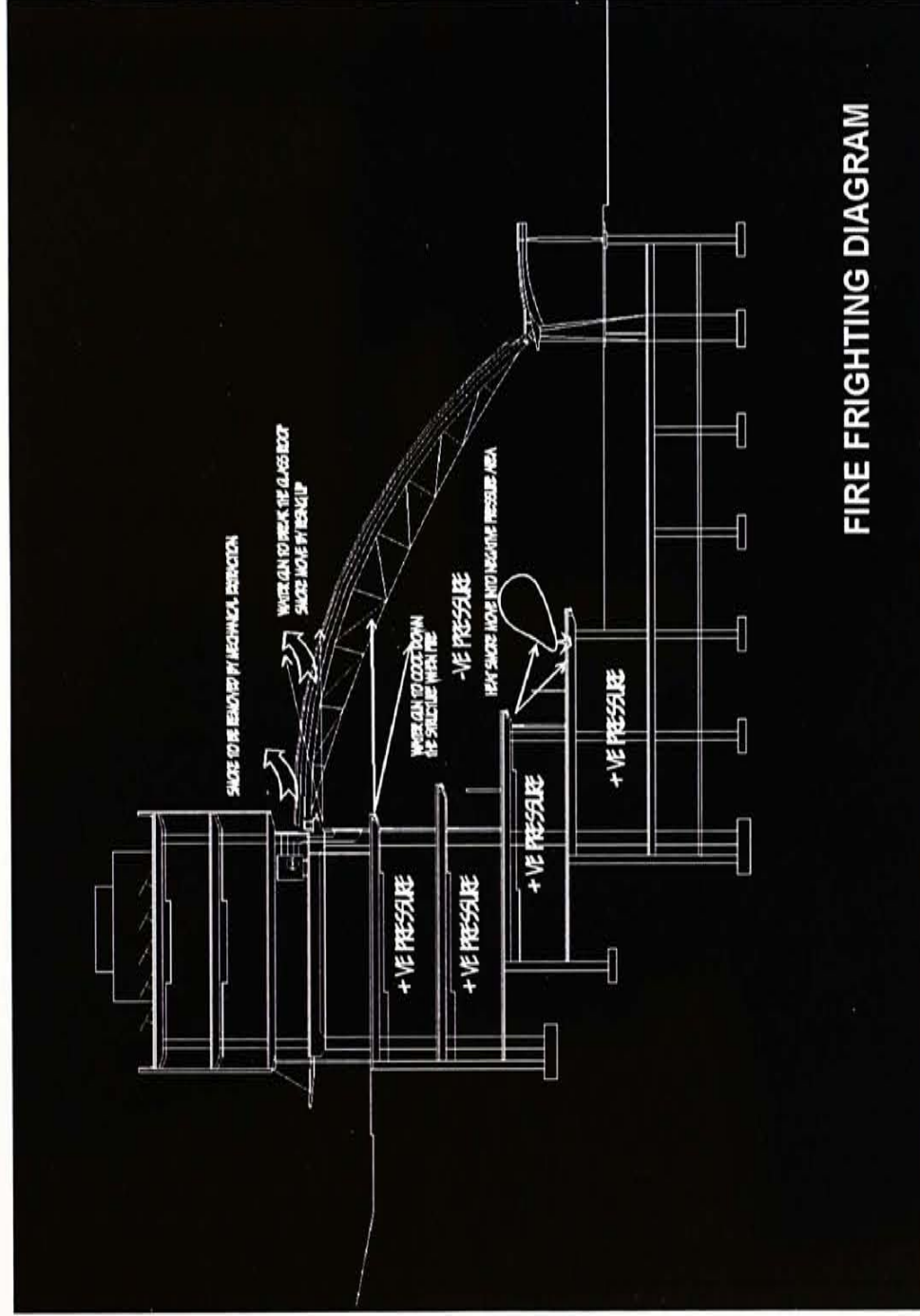
## 4.2 Fire Fighting Strategy

In term of section, the space is divided into two zones:

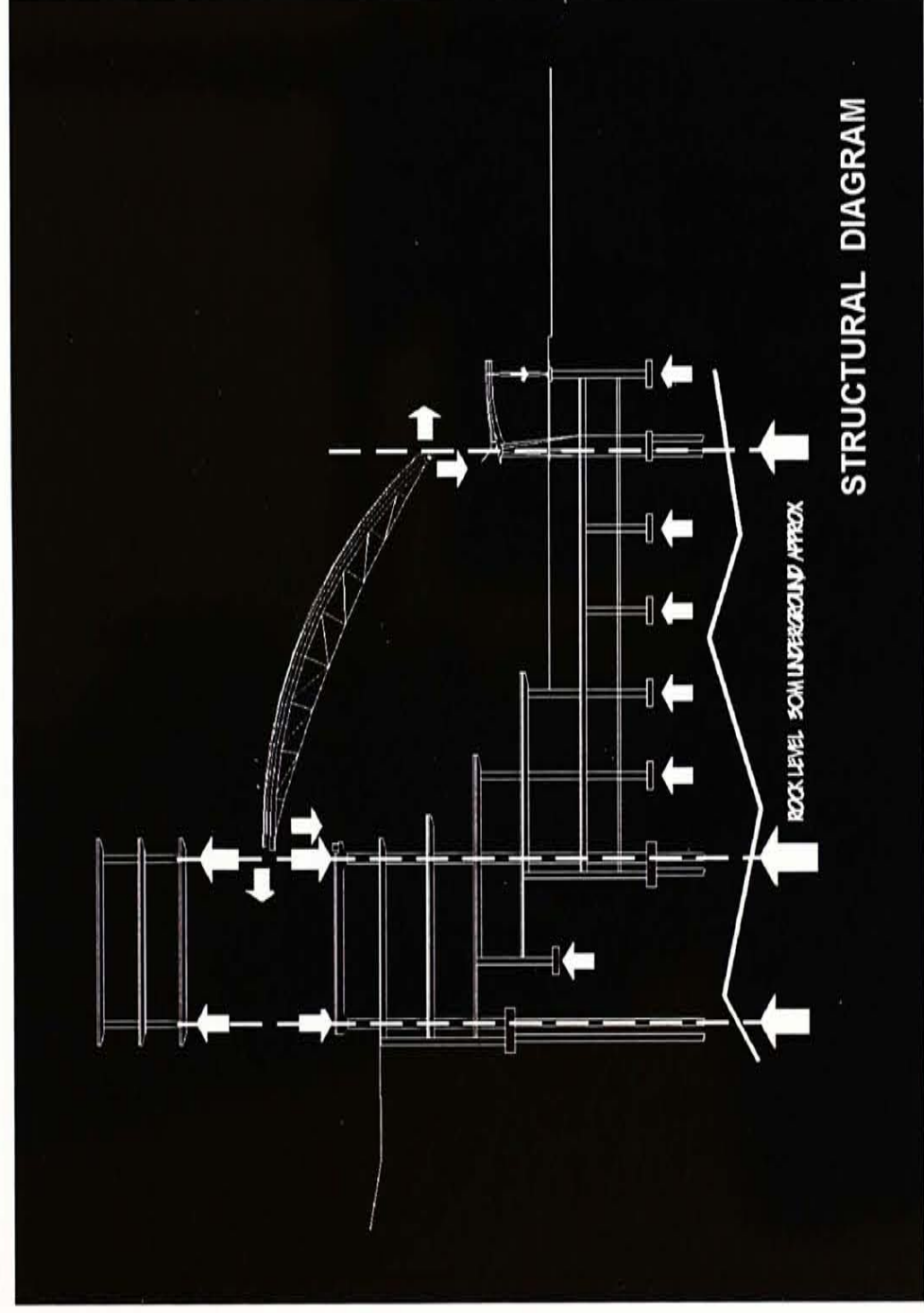
1. The workplace with positive relative pressure
2. The atrium space with negative relative pressure

There are two ways to ensure the smoke will be extracted:

1. Mechanical extraction in high level.
2. Buoyancy effect through the hole broken on the glazing roof by water gun.
  - When there is a fire in the workplace, smoke will move from the positive pressure space into the negative space.
  - The smoke will stored in the top of the atrium and extracted by the high level extraction system.
  - In order to reduce the extra heat load to the structure, water gun will spray on the structure to ensure structural rigidity.



STRUCTURE



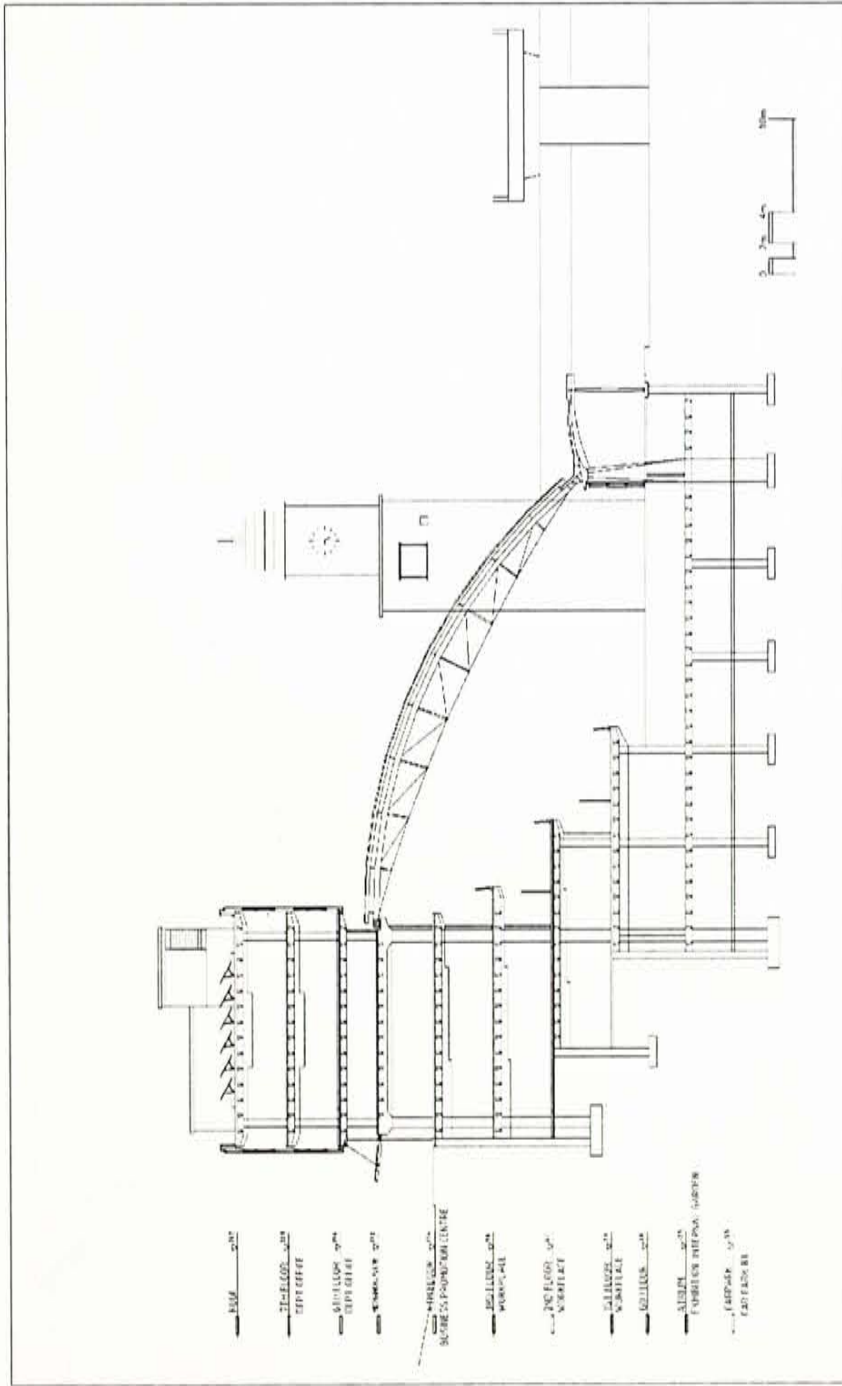
5.1 Structural Concept

The Roof Structure

- Truss system is composed by steel circular hollow section, steel cable and steel rod.
- It is a simple span system at 30 m spanning distance with two pinned joint on both end.
- To enhance the visual lightness of the roof structure, the structural member is approaching the minimal size according to the behaviour of the steel.

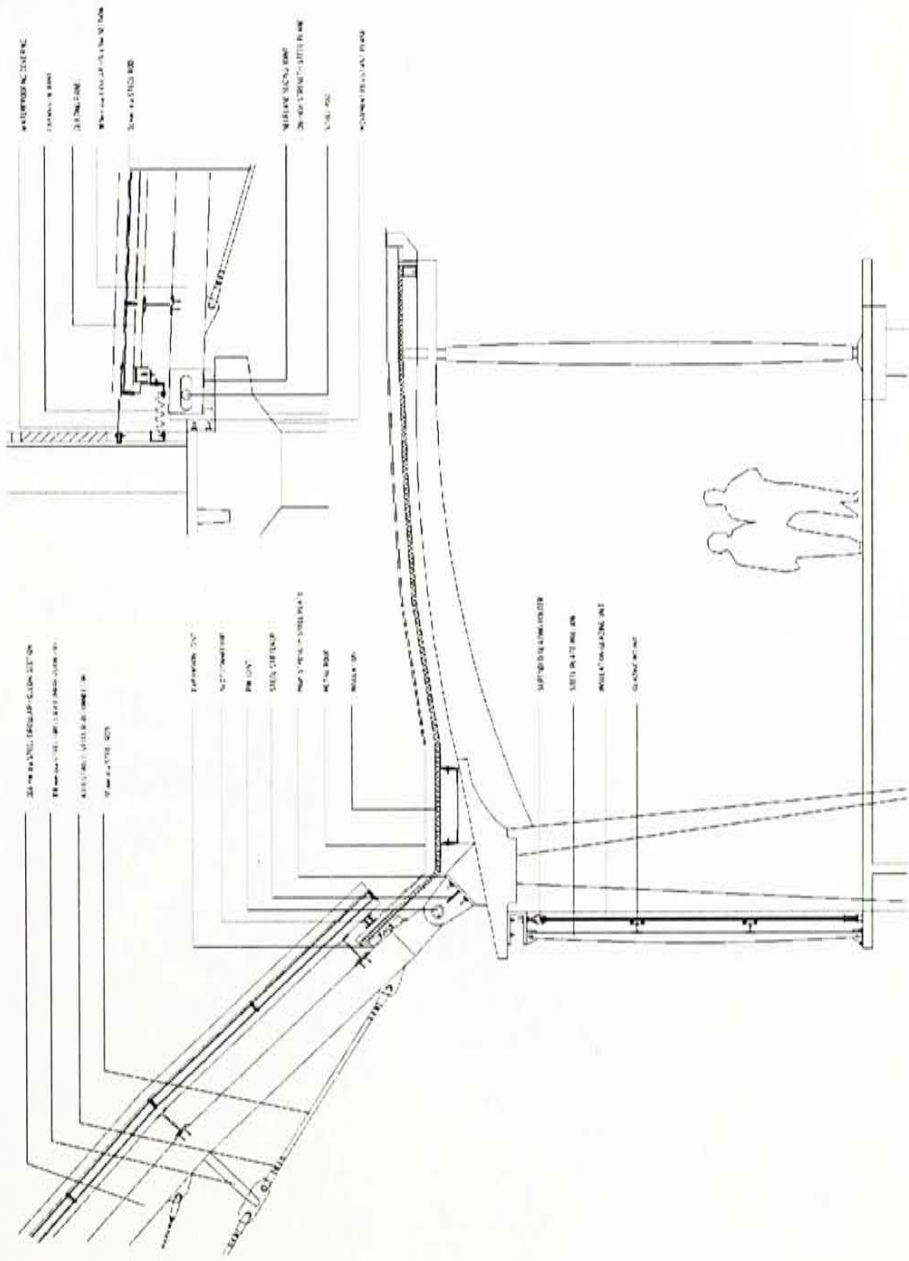
The Superstructure

- Basically, the superstructure is composed of concrete frame with 6x12 m column grid.
- The floor slab is supported by rig beam system within the column grid.
- The pile have to reach 30 m below ground which is the hard rock level.



Structural design

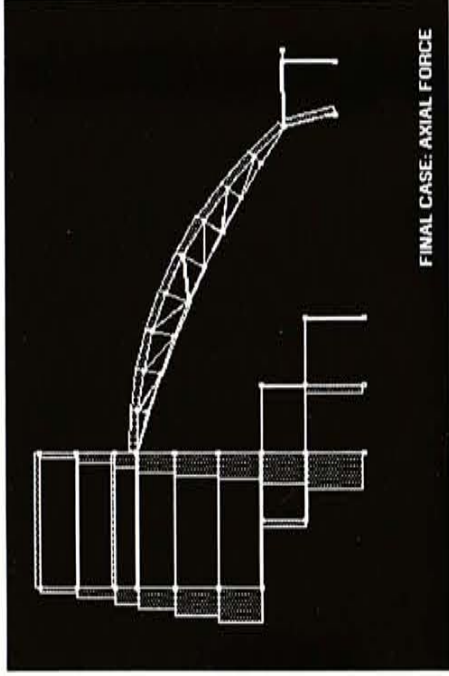
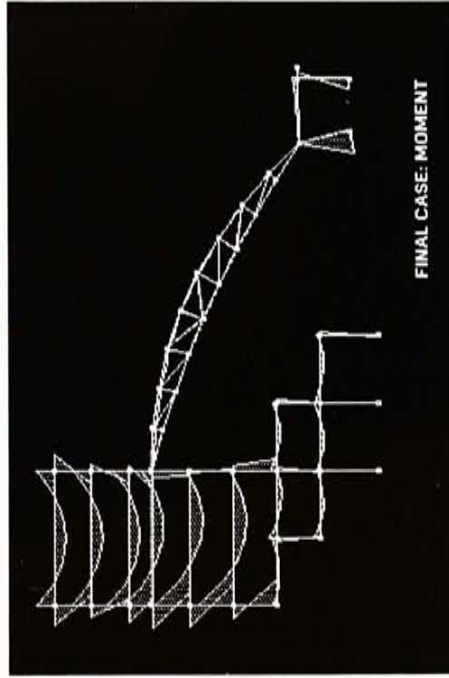
- The column support the roof structural immediate should be bigger.
- The joint for that level of the concrete frame should also strengthen.
- The column supporting the roof structure of the arcade should resist the horizontal force and moment acting on it.



The Roof Structure

- The spanning distance of the roof truss is about 30 m, One of the main concern for the structural behavior will be the thermal expansion of the structure itself.
- For the lower joint which connect the steel truss and the concrete arcade column, there is a pin joint which allows minor rotation of the structure.
- For the upper joint which connect the steel truss and the concrete beam , there is a sliding joint which allows horizontal movement of the structure.





5.2 Computation of Structural Analysis

Bending Moment Diagram

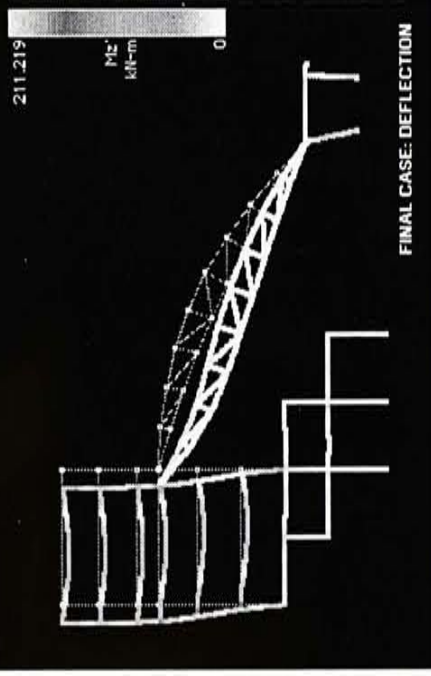
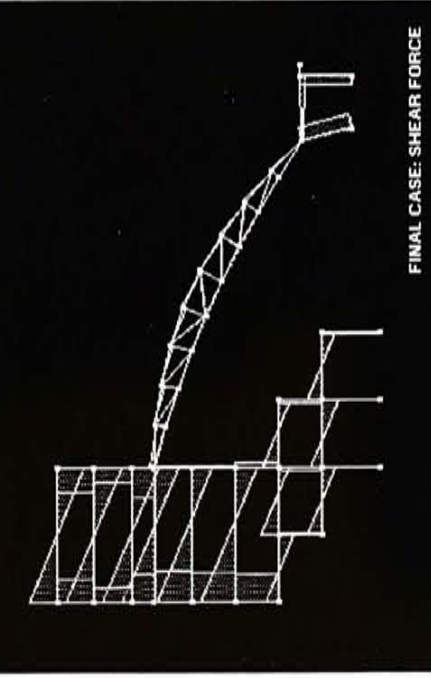
The concrete column of the arcade received a great deal of moment

Shear Diagram

The shear force for the arcade is still large compared with the member in the main structure.

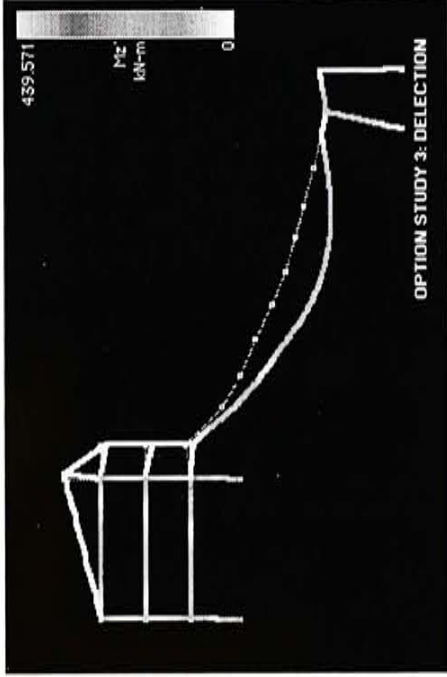
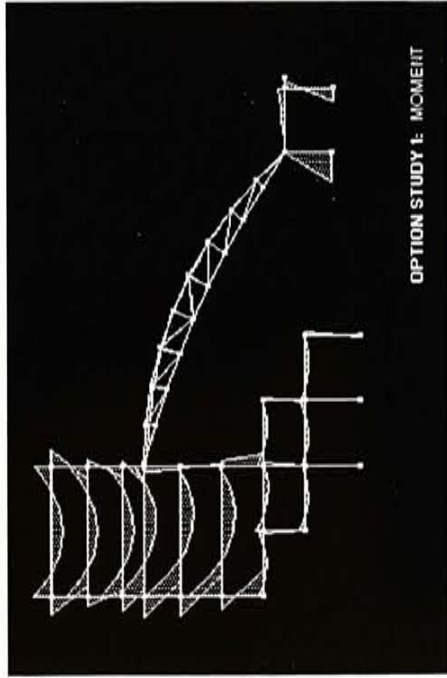
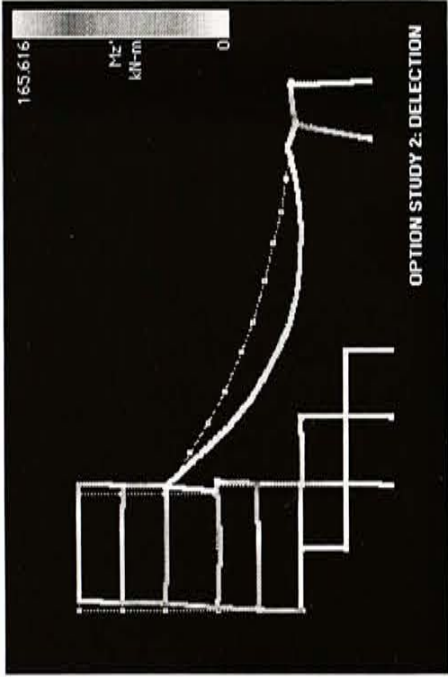
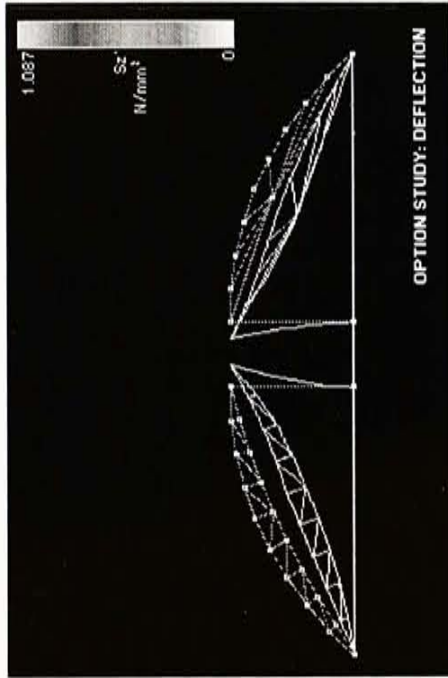
Axial Force Diagram

By examining the axial force of the truss set, all the top member is in compression, all the bottom member and diagonal member is in tension.



Deflection

The main structure has received a lot of horizontal force when the structure deflect. Hence, the joint of the floor connected to the truss set has to be strength.



### 5.3 Options Studies

#### Comparative case

There is another approach which is also very efficient. As the architectural reason and construction consideration, the scheme was eliminated.

#### Option 1

The arcade column in vertical form will received great bending moment. In order to reduce the moment, the design is making a angle.

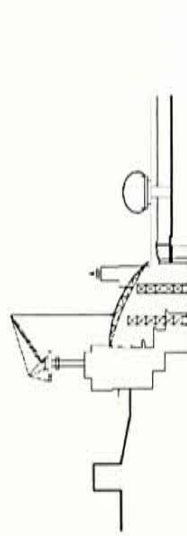
#### Option 2

During the previous scheme, the roof is designed in suspension structure. However, the movement of the suspension structure will affect the glazing system on top.

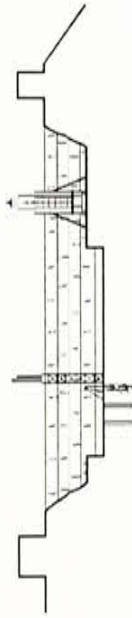
#### Option 3

The tension force created by the suspension structure is difficult to be resolved by the cable pulling on it.

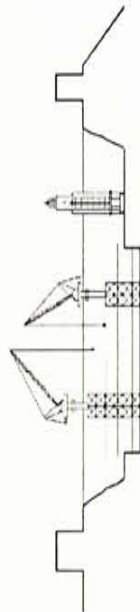
**CONSTRUCTION**



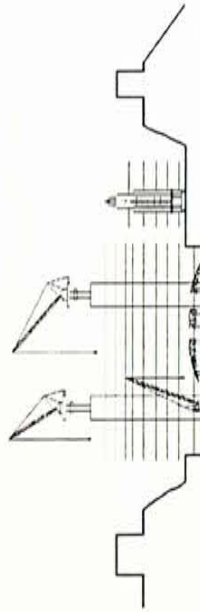
Step 1



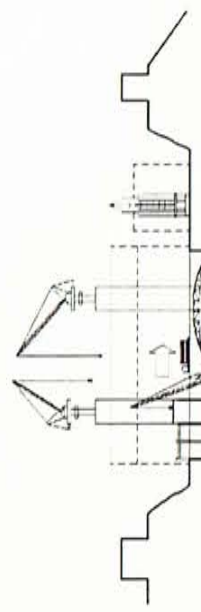
Step 2



Step 3



Step 4



Step 5

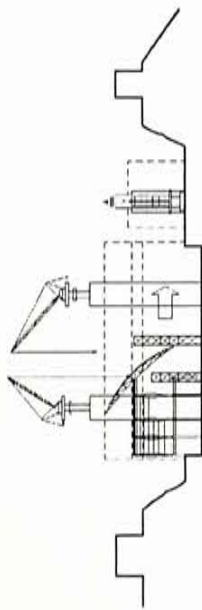
**6.1 Construction Sequence**

With the front open space for welding, temporary storage and moving material  
Crane site on the structural core of the building  
Truss system welded and inspected on site.

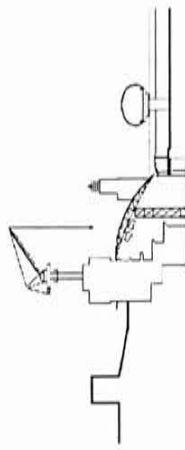
The concept of the construction method is as follows

1. Demolish the existing building bay by bay and approach from the western side toward the clock tower side.
2. With bore pile foundation to minimize the vibration which will affect the structural stability of the clock tower.
3. Crane built and jet up on the structural core of the building to transport the required material
4. On site welding of the steel truss and go through Infra-red inspection before it erected.
5. Joining of the precast unit of the front arcade.
6. With the movable temporary scaffolding support, setting the truss set in position.
7. Installing the truss set bay by bay with the movable temporary support followed.
8. Adjusting the tensioning of the truss set after all the primary truss member is built.
9. Installing the roof glazing system by the transporting of the material by the crane.
10. Casting the final floor slab in front open space, removing all the temporary support and crane.

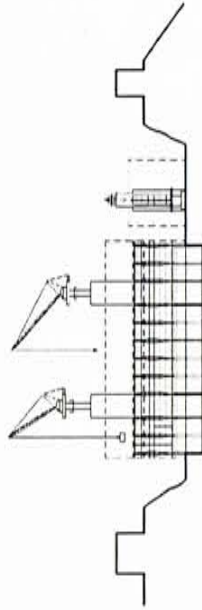
Step 6



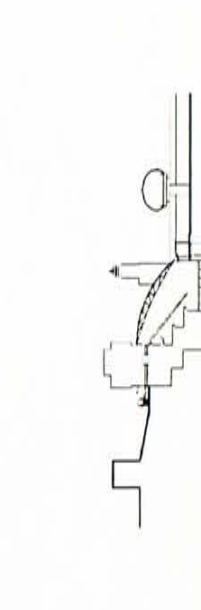
Step 7



Step 8



Step 9

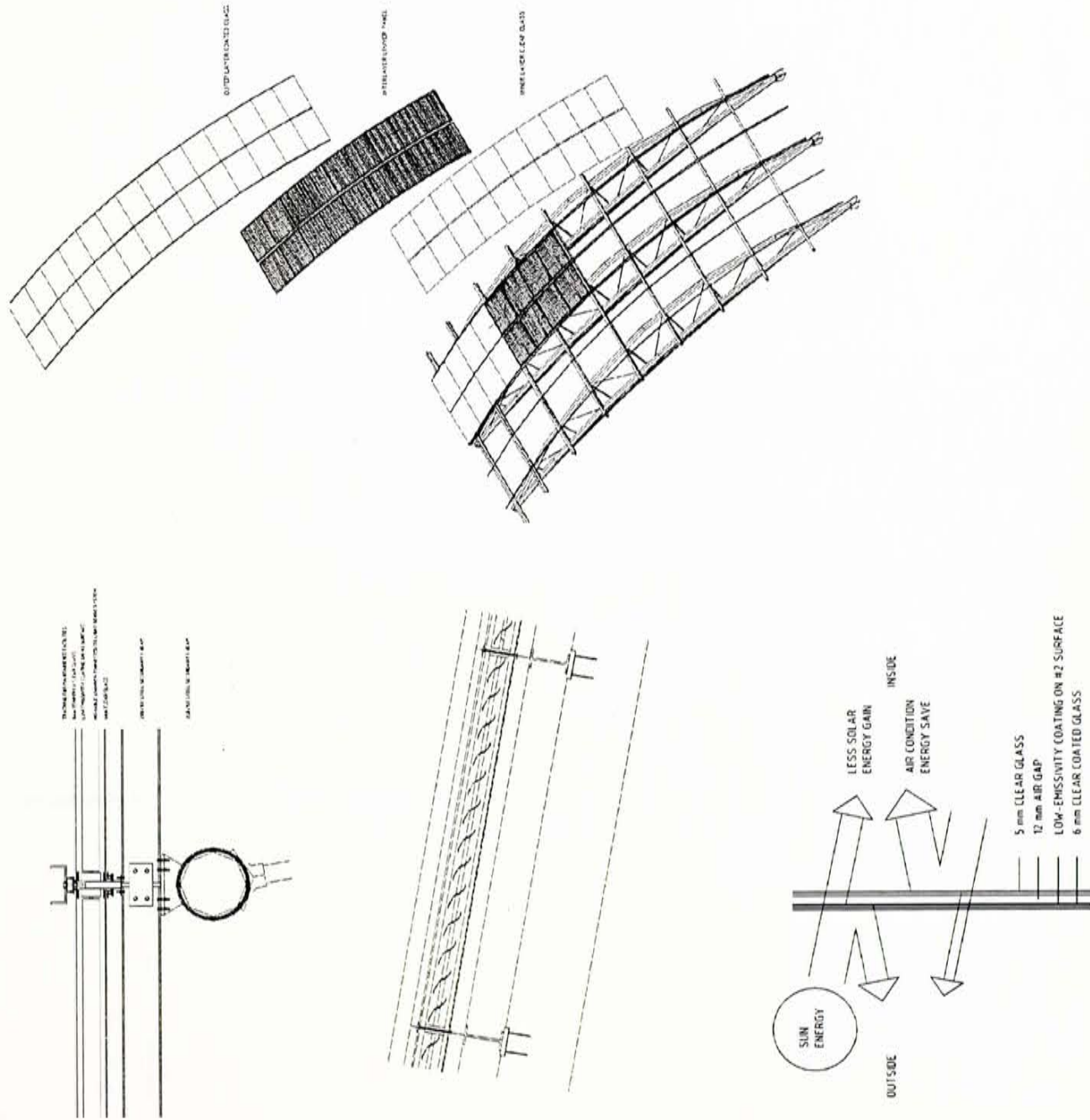


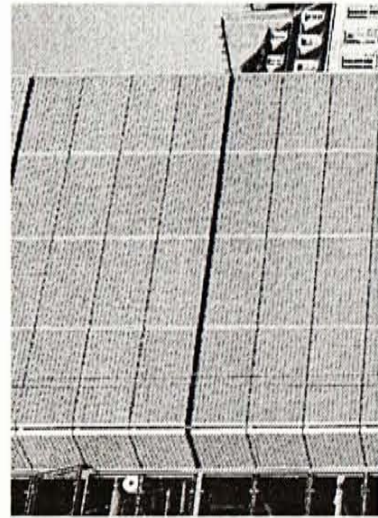
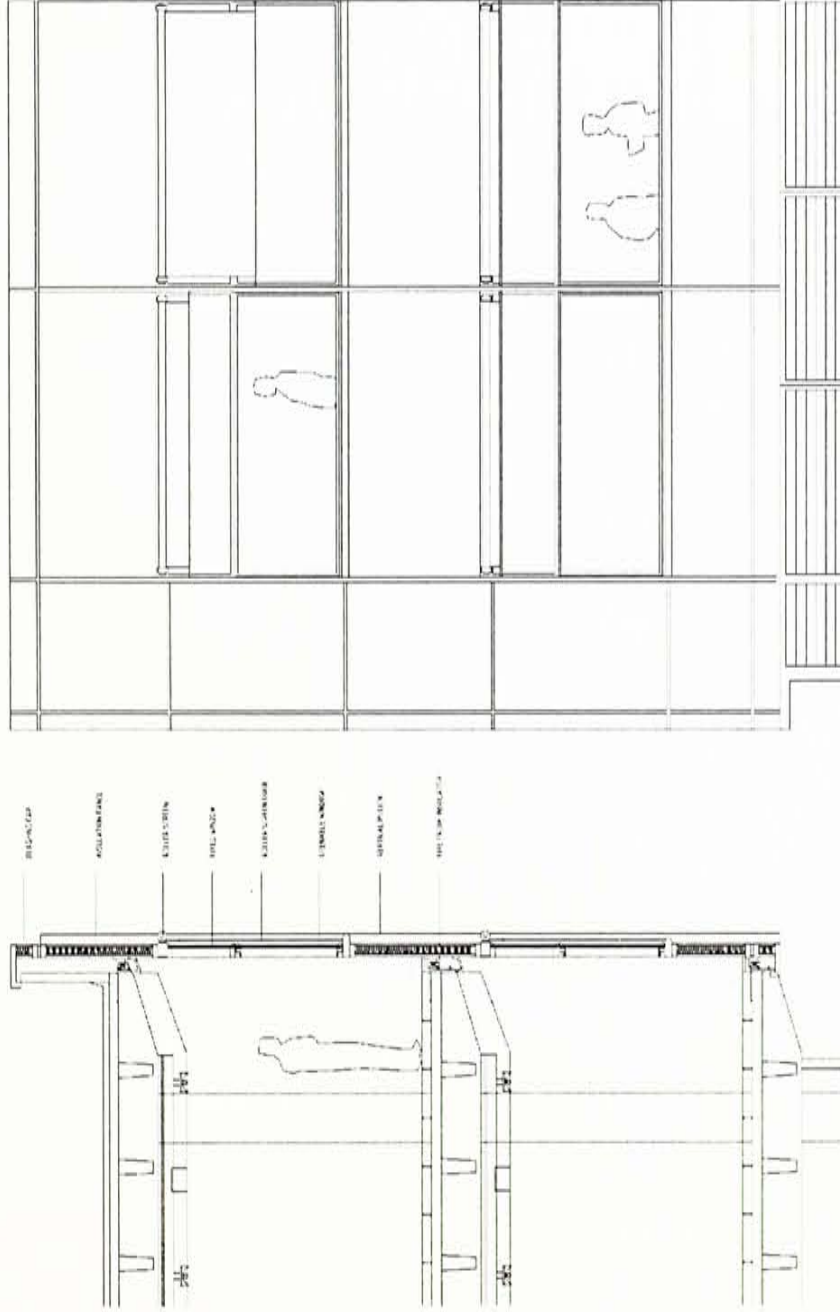
Step 10

### 6.2 External Skin Approaches

The glazing system for atrium roof :

- It is a thermal and lighting control device for the atrium space, it control the solar radiation penetrate into the space.
- The movable louvre interlayer is controlled by light sensor system which vary the angle of the louvre to control the density of day light enter the space.





## 6.2 External Skin Approaches

### The external enclosure,

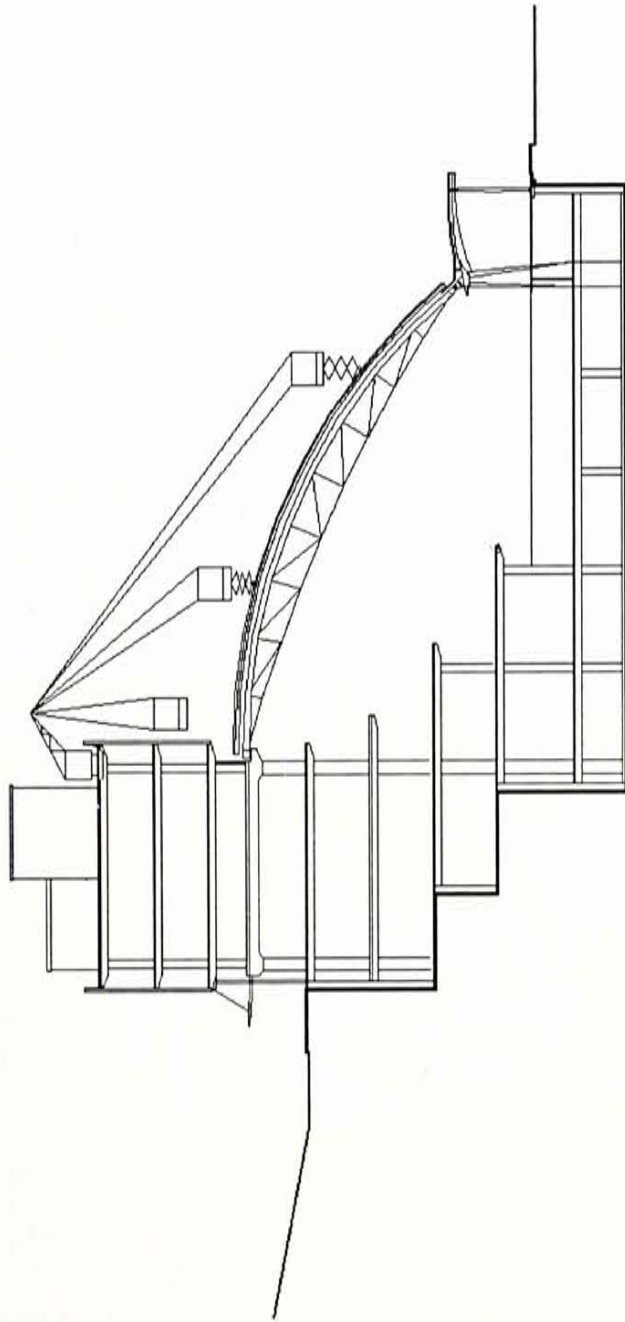
- The enclosure of the workspace above the glazing atrium
- The design of the facade is go for clean and intimate approach.
- The facade is adapting curtain wall system. 60% of the glazing area can be opened for natural ventilation.
- For the glazing area, there will be double glass unit with low-e coating on the second surface of the glass pane.
- For the non-glazing area, there will be insulating panel to reduce the thermal gain into the interior.

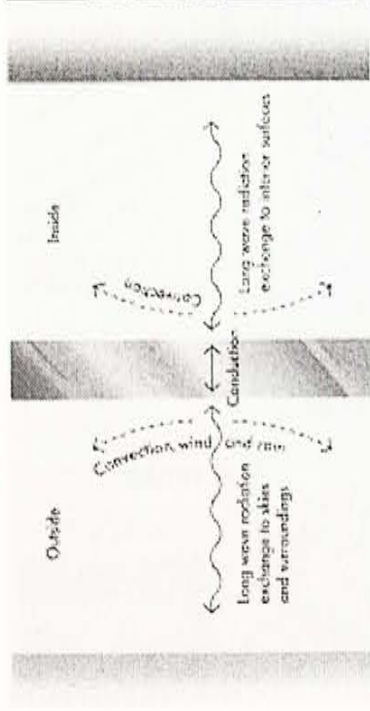
### The external finishes,

- To response with the existing clock tower appearance, the design of external finishes of the new development has picked up the scale of finishes on it.
- IRCAM extension in Paris designed by Renzo Piano has also adapted this system.

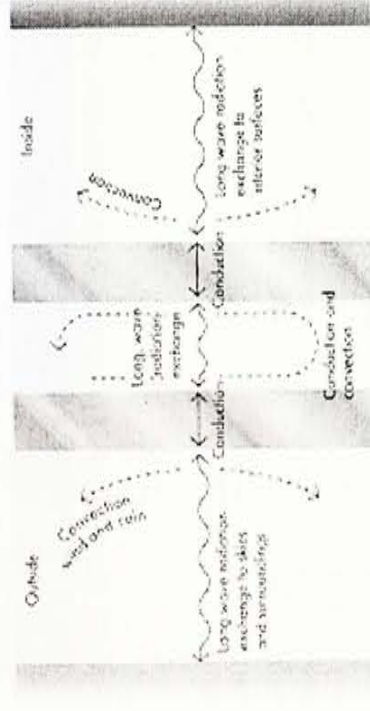
### 6.3 Approach to Maintenance

- The biggest concern for the maintenance issues is to clean and fix the glazing system of the atrium roof.
- There is a permanent tracking gondola system running along the perimeter on the roof.
- The Gondola will hinge from the fixing device to run along the top of the glazing along the tracing system.

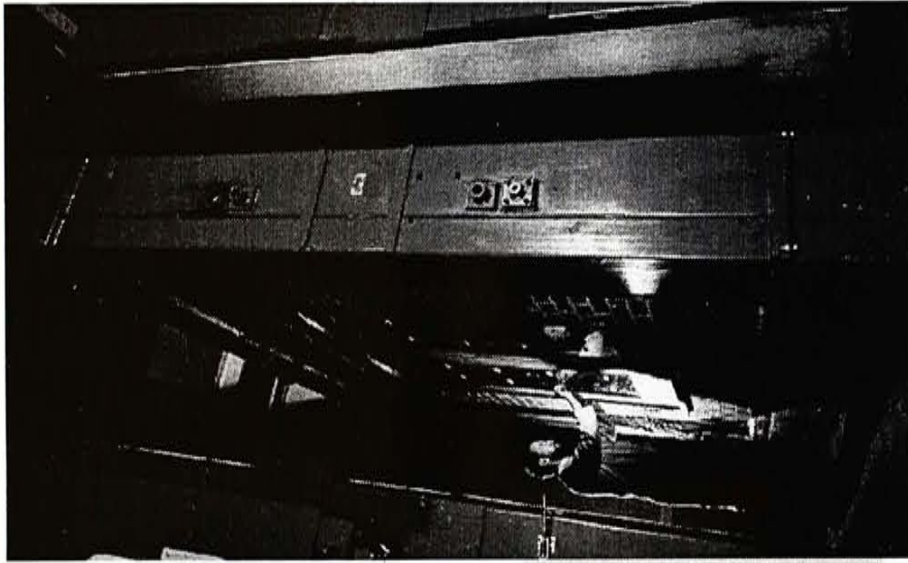




Mechanism for heat gain through single glass



Mechanism for heat gain through double glazed units



The Hot Box test, at Pilkington Glass Ltd, St. Helen, UK

There are three major requirements for the use of glazing in Hong Kong.

- To provide high level of solar control and minimize solar heat gains, air-conditioning load, and to avoid overheating.
- Insulating of the building to outside, and prevent glare from direct sunlight.
- There is also a need to provide natural lighting and a view to the outside.

### 7.1 Insulating Mechanism

To prevent heat gain through the glazing system by conduction and convection, we have to increase the insulating properties of the glazing unit.

Heat gain to external glass surface from the room, whenever the glass surface is at a higher temperature than the internal air temperature and the room surface temperature. The heat is gained in two ways:

- By exchange of long wave radiation between the glass surface and the room surface.
- By convection /conduction from the room air moving over the surface of the glass.

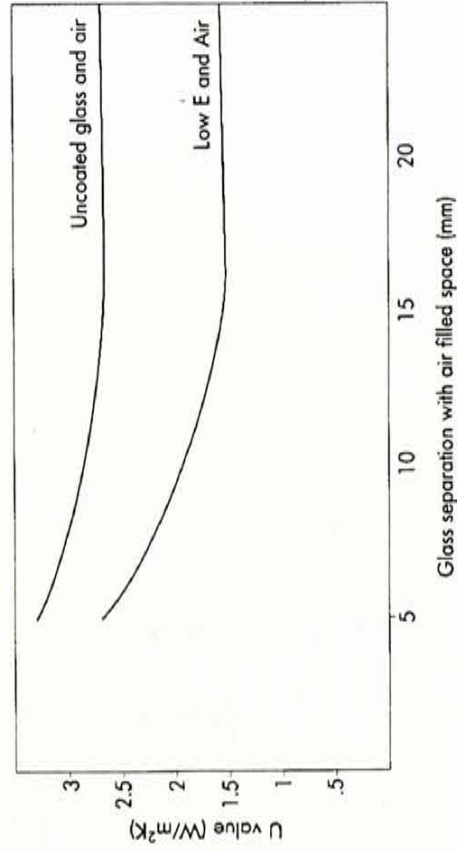
Single glass is relatively little resistance to gain of heat, as glass readily conducts heat and is a poor insulator. To increase the resistance, one effective method is to add a second pane of glass separated from the first pane by an air space, to form an additional resistance by virtue of the low thermal conductivity of air while the second pane provides additional thermal resistance to long wave re-radiation exchange.

### Testing, Measurement and Standard

The development of simple codes to categorize the insulation of the whole window depends on the use of standardized measurement methods. International standards are currently under development by the International Organization for Standardization (ISO) and in Europe by the commission Europeenne de Normalisation (CEN). These standards concern direct measurement of U-value which are obtained by the use of a hot box method.



Filling double glazed units with argon Flachglas AG, Germany



Effect of glass space U-value

### Increase the width of the air space

By increasing the width of the air space, extra resistance is provided. There is a limit due to convection within the air space, which occurs at about 15 mm width, after which little extra thermal benefit is obtained. Adding a third glass pane to give a second air space provide further improvement.

### Evacuating the air space

The air space may be fully or partially evacuated. The technology is currently being developed to overcome the problem of:

- Air pressure on the outside, causing the panes to deflect and collapse inwards.
- Maintaining the vacuum for long periods which places new demands on edge sealing of the unit.

### Gases of lower thermal conductivity

Sealed Low E double glazed units may also contain gases with lower thermal conductivity than air such as argon, providing further improvement in U-value. Germany began producing argon-filled, double-glazed windows, which increased the window's insulation level by 25%.

Argon is an inert gas that is both more viscous and less heat conducting than air. More important, it is a cheap by-product from the welding industry. Sulfur hexafluoride was also used as an insulating gas because of its noise-deadening qualities and low price.

There was great concern that the window's insulation value would decrease as the argon fill permeated through the organic edge seals over years. The higher quality double seals used today do an adequate job of containing the above gases over at least 20 years.

Krypton is an even better insulating gas, but it has remained expensive because it is so difficult to wrest from the atmosphere. Nevertheless, Lasitaku in Finland was the first to fill insulated glass units with the high performance gas in the early 1980s.



## 7.2 Various Solar Control Glazing

In Hong Kong, the most serious problem due to the glazing design is the solar gain by radiation.

### Heat gain

Solar radiation passes through glass easily. Coming through windows, it overheats the interiors of buildings during the hot season of the year, causing an energy load on an air-conditioning system. During its multiple reflections around the interior of the building, this radiant energy is converted into thermal (heat) energy. This process is the familiar greenhouse effect.

The mechanism of solar control are defined in term of the following parameter:

- reflectance: the fraction of solar radiation at normal incidence that is reflected by the glass
- absorptance: the fraction of solar radiation at normal incidence that is absorbed by the glass
- direct transmittance: the fraction of solar radiation at normal incidence that is transmitted directly through the glass.

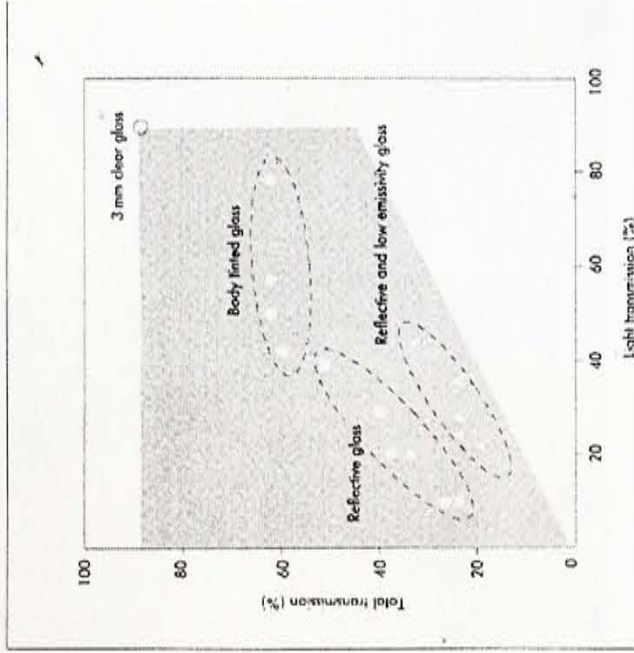
There are several methods being used to prevent this heat buildup and glare.

### Body tinted glass

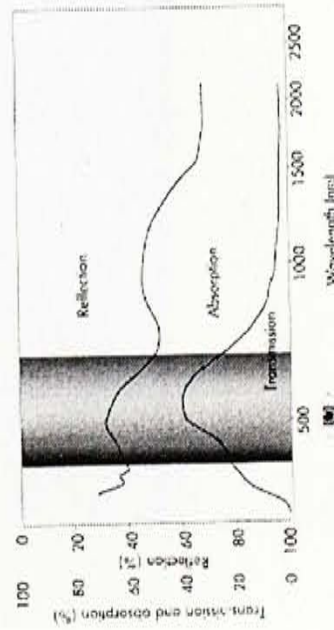
The most common body tinted glass is tinted gray, green, bronze or blue. The solar control properties and colour vary with their thickness whilst their reflectance are slightly less than clear float.

When it is used in double glazed units that are best positioned as the outer pane as the heat due to absorption is more easily dissipated to outside.

Body tinted glass is limited in the amount of solar attenuation which can be obtain its absorption.



Light transmission and total solar heat transmission of various glasses



Reflective coat solar spectrum



Litex ECCELTGLAS

### Reflective coated glass

Increased direct reflection is the best methodology to maximize solar heat attenuation. This can be achieved by means of reflective coatings. The use of coatings in solar control provides:

- greater production flexibility and performance range than body tinted glass
- higher performances (greater solar heat attenuation)
- light/heat ratios nearer theoretical optimum values
- a range of colour appearance in transmission and reflection

The numerous coating compositions available provide a wide range of performances, which is further increased by their combination with body tinted glass products. Thus glass with particular performance may be selected for specific application.

In monolithic form, most of the coated surface must always be glazed to the interior of the building as it is very easy to be evaporate. When coatings are applied to tinted substrate glasses, float glasses heat strengthening or toughening is almost always necessary to overcome thermal stress generated by their high solar absorptance. These glasses will be supplied in heat strengthening or toughening causes some distortion and polarization effects which are accentuated by the application of a reflective coating.

### Pattern Glass

It is a type of glass specifically developed for solar control and glare protection, hereby its performance is enhanced through almost endless design possibilities. The coating can be individual configured as the performance requirement

## Low emissivity coatings

### Definition

The term "Low E" is now generally taken to refer to coatings with an emissivity less than 0.2. These reduce emissivity from 0.9 for uncoated glass to less than 0.1. The infrared reflectivity of an appropriately coated glass in the wavelength region of 3-30 x 10<sup>-6</sup> m increase to over 80%.

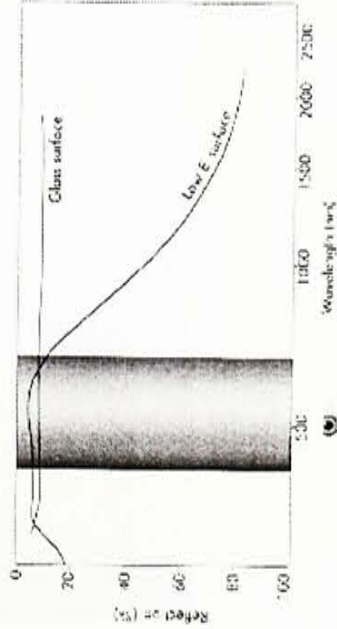
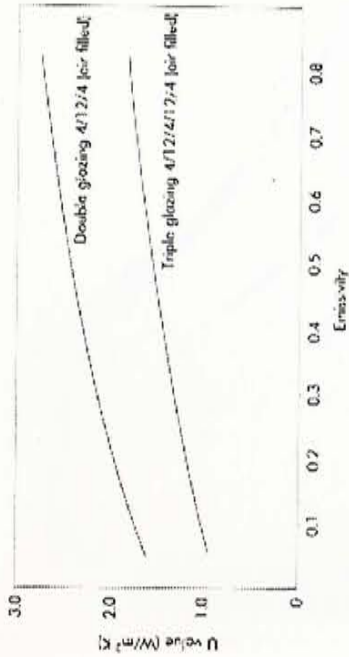
### Mechanism

The use of a low emissivity (Low E) coating on the glass provides the possibility of reducing the long wave radiation exchange between the panes. In air spaces with uncoated surfaces, the long wave radiation exchange between those enclosing glass surfaces is about 60%. With one of the glass surface having a coating with emissivity less than 0.2 (compared with 0.84 for uncoated glass surface), the radiation exchange is reduced by approximately 75% and consequently the U-value is reduced.

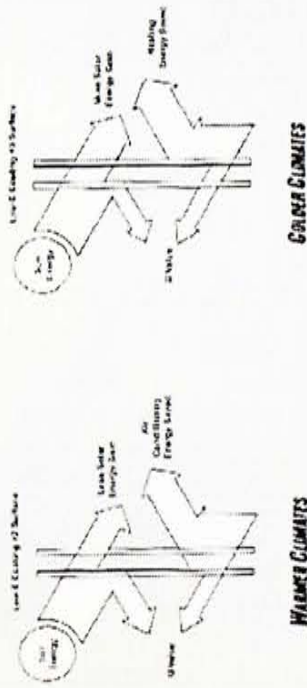
Typical of such coating is formed by three to three layer of Low E coating. One of the important component is expensive metal like, silver, gold or copper etc. With the inner layers reflecting the long wave radiation and the outer layers eliminating reflections to enhance light transmittance. Different types of low emissivity coatings can transmit or reflect different wavelengths in the solar spectrum.

Coatings of the metal are less transparent to radiation in the near infrared. Their attenuation of radiation of this near infrared occurs by reflection and, since about 50% of the total radiation from the sun occurs in this waveband, such coatings are useful for solar control glass which reflect rather than absorbs.

The development of hard low emissivity coatings widens the possibility of including coated monolithic glazing in secondary frames applied to existing windows; the earlier, softer low emissivity coatings were restricted to protected use in sealed glazed units only.



## Effect of emissivity of U-value



Low-e in cool and warm climate

**Application**

In hot humid climates like Hong Kong, condensation can form on the outside of windows in air-conditioned buildings. The higher insulation of double glazed units incorporating low emissivity glass, condensation is reduced. Water on the coated surface of the glass, will cancel out the effect of the Low E coating because of the high emissivity of water.

The Low-e glazing provide neutral coloured similar to uncoated glass. It create a heat barrier to keep heat outside in summer and inside in winter. The use of low-emissivity coatings optimizes the use of natural light while blocking long wave infrared radiation from entering or exiting the building.

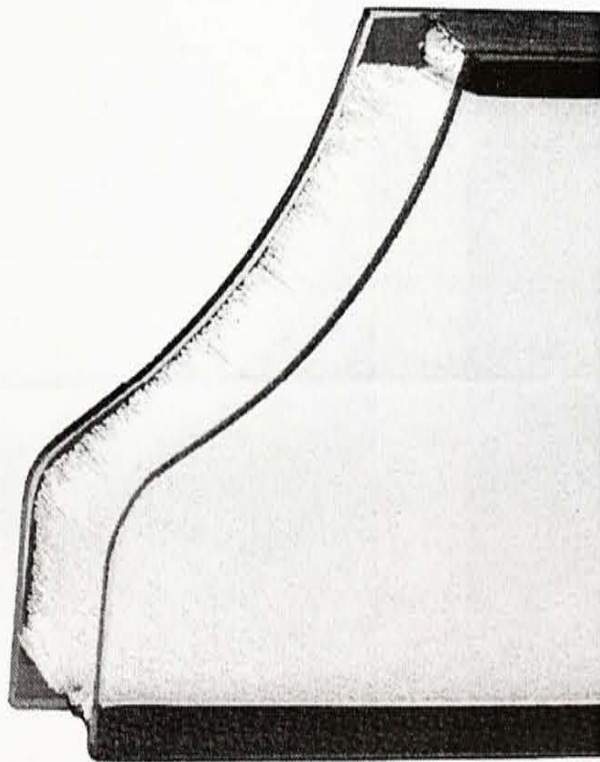
In warmer climates, commercial buildings which are air conditioned year around, Low-e coating are normally applied to the 2nd surface of the exterior glass pane of a insulating unit to improve the shading coefficient by reflecting the solar heat and long wave radiation outdoors.

In colder climates where heat loss is greater, a low-e coating applied to the 3rd surface of interior glass pane of an insulating unit will reflect heat back indoors while allowing the maximum visible light transmission for the greatest solar heat gain.

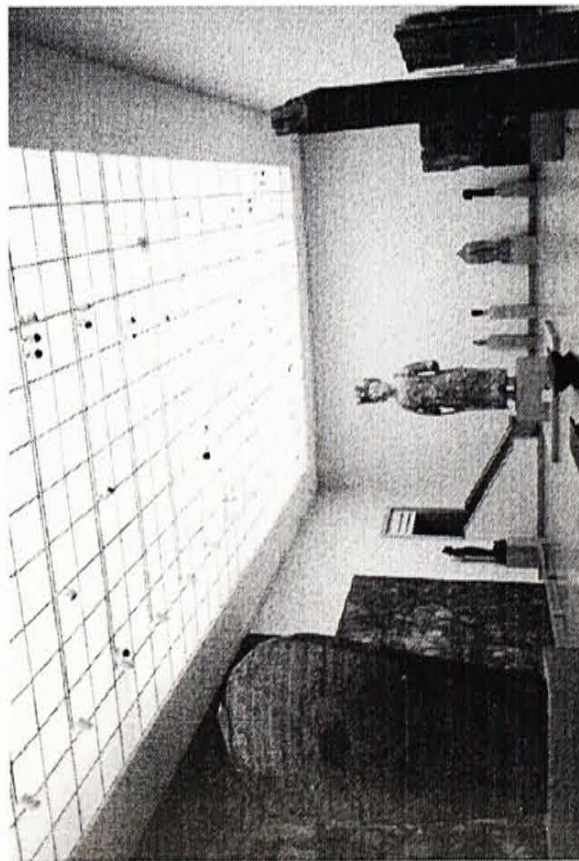
The solar heat gain can be controlled by combining high performance reflective glass on the 2nd surface of the outer pane with a low-e coating on the 3rd surface of the inner pane. Shading coefficients and relative heat gain values will be reduced up to 50 percent more by adding a low-e coating to the inner pane.

**Double glazing unit with translucent material interlay**

Translucent glazing panels which permit evenly diffused natural illumination without excessive solar heat gain and glare and provide improved thermal insulation  
It absorb a large proportion of solar radiation in the UV area of the spectrum and transmits only 0.5% in UV range. Whilst help to reduce the fading and degradation of the sensitive materials.



OkaLux Translucent glazing panels



Metropolitan Muesum, New York

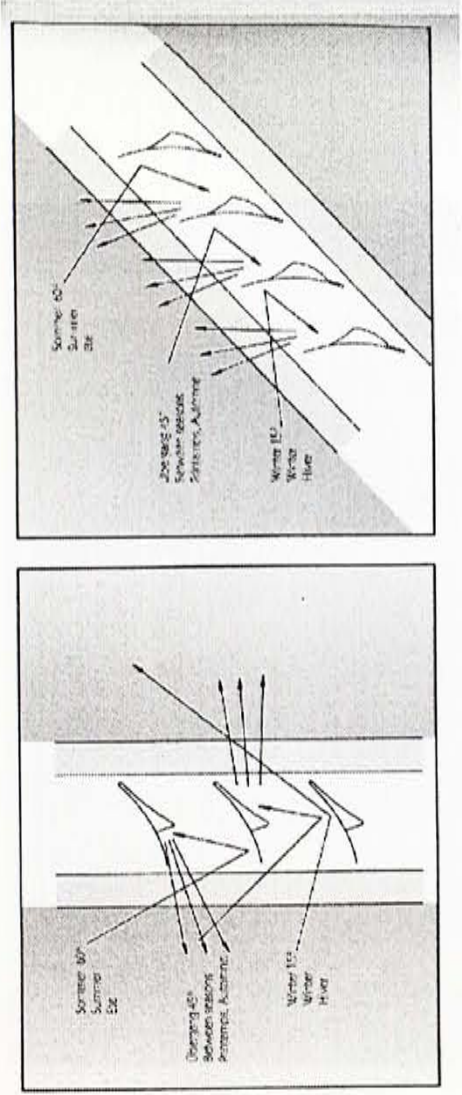
**Single and double glazed units and laminated glass incorporating blinds and louvers.**

The use of blinds in windows will affect the window shading coefficient. This will depend upon the solar optical properties of the glass and the material of the blind, on the coefficients of heat transfer at the window surfaces, and on the geometry of the blind and the angular position of the sun.

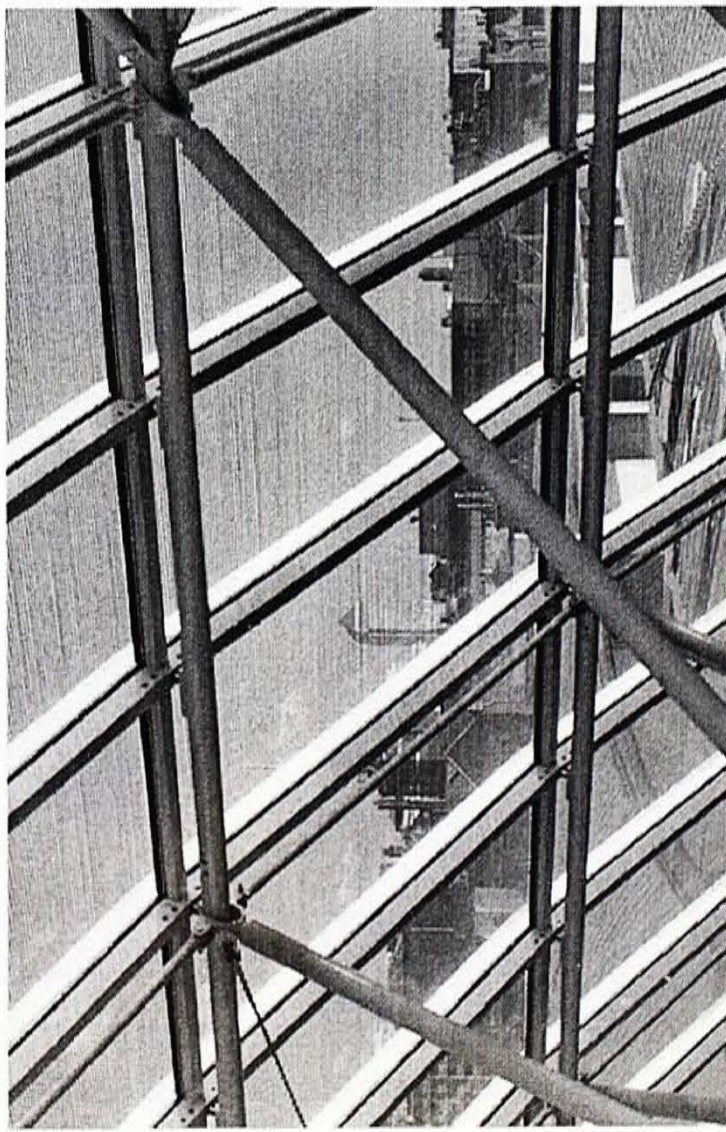
One effect of high performance blinds is to reflect a large proportion of the transmitted energy for a second pass through the glazing so that the energy absorbed in the glass is increased and the temperature of the glass rises. With some glass products in some glazing systems this increased temperature can introduce a risk of thermal fracture of the glass.

**Okasolar**

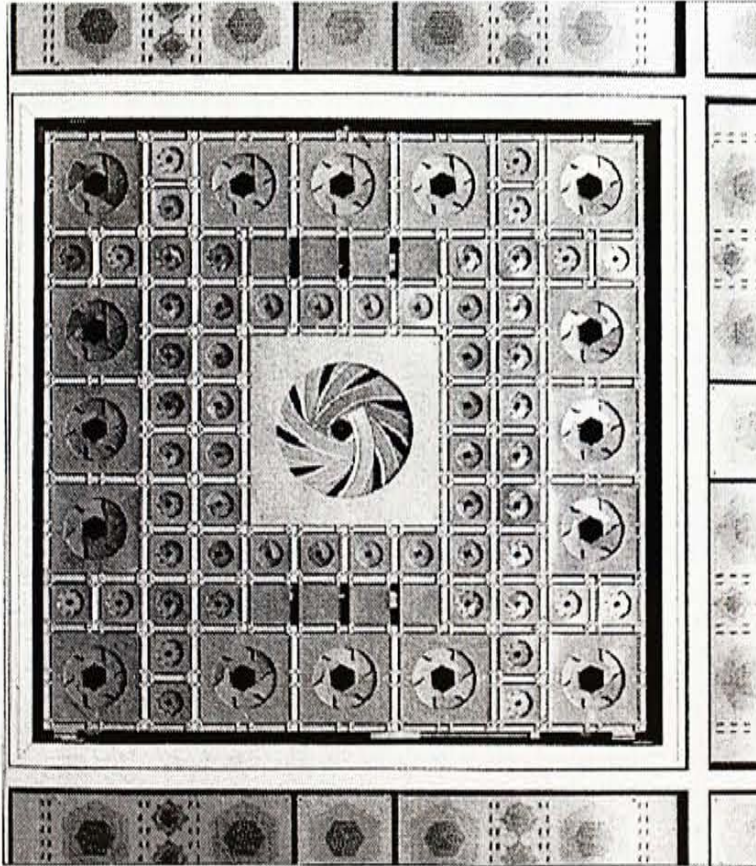
It is available with different louver type and setting. The choice of the most suitable system depends on the criteria such as orientation of glazing area to the sun, daylighting and solar shading requirement.



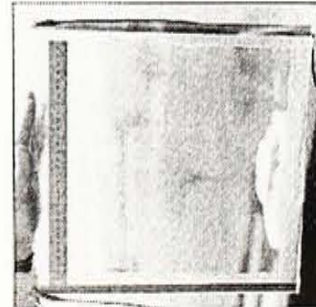
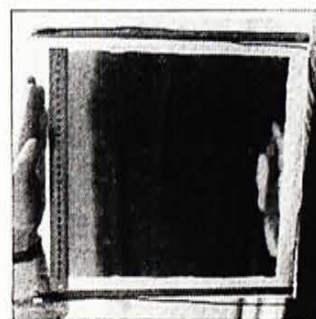
Okasolar



Swanled Secondary School Whitechapel, London



Arab Institute, Paris



Electrochromism Glass

### Variable transmission glass

#### Mechanical approaches

- In the facade of the Arab Institute, Paris, France, shading devices perform like an iris in a camera, continually opening and closing to control solar attenuation.

#### Electrochromism approaches

- Electrochromism is the property of a material or system to change transmission reversibly under an applied electrical potential.
- Coatings that can be actively controlled are preferred since they can be continuously adjusted over a range of performances.
- Electrochromic coatings are transparent multi-layer coatings which are more complex than coatings currently available.
- A small electrical voltage activities the electrochromic layer, changing the tint and thus the total solar transmittance and light transmittance.
- Reversing the voltage restores the original transmittance. The voltage may be generated from the building services control or manually by the occupant.
- However, products being developed will probably have no compromise on their ability to respond to heat and light transmission across a wide spectrum, as they will be required to save both on cooling load and on electrical lighting load.

### 7.3 Discussion of Building Control in Glazing Design in term of Energy Conservation

#### Background

As an international commercial city, one of the most important building type in Hong Kong is commercial building. With the common adaptation of the curtain wall in commercial buildings, solar radiation heat up the interior of the commercial building very easily. The summer temperatures of Hong Kong will go up to thirty degree Celsius. Most of the running cost of a commercial building are spend in air-conditioning.

There are three parameters which can reduce the cooling load in summer and heat load in winter:

- Insulation the interior environment with the outside
- Control the solar gain through the windows.
- Increase the use of daylighting than artificial lighting

#### Regulation

In late of 1995, Hong Kong Government issue the first building code which dealing with the energy conservation of the building facade design was launched. It is the first time the government tries to control the energy consumption practice of the local developments. The code established at that time did not have an very big impact to local building development. However, the implication of the request of change of the local practice of energy consumption should be aware.

Code of practice for Overall Thermal Transfer Value in Buildings, Buildings Department, Hong Kong, 1995.

- The principles of Control of overall thermal transfer value is as follow,
- For design and planning of energy-efficient buildings. Government is developing a comprehensive energy code to cover inter alia lighting and air-conditioning. Overall Thermal Transfer Value (OTTV) is one aspect of energy conservation.
  - OTTV is a measure of energy transfer from a building envelope. Its formulation allows person responsible for the design and construction of buildings freedom to innovate and vary important envelope components such as type of glazing, window size, external shading to windows, wall colour and wall type to meet the maximum OTTV criteria. Any measure to improve energy efficiency or to save energy should be considered in planning a building.

#### Definition of terms

##### Absorptance:

The capacity of a material to absorb radiant energy; the ratio of the radiant flux absorbed by a body to that incident upon it.

##### Conductance:

The time rate of heat flow through a body from one of its bounding surfaces to the other for a unit temperature difference between the two surfaces, under steady state conditions.

##### Emissivity:

The ratio of radiant existence of a thermal radiator to that of a full radiator (black body) at same temperature.

##### Emittance:

The capacity of a material to emit radiant energy; the ratio of the total radiant flux emitted by a body to that emitted by an ideal black body at the same temperature.

##### K-Value:

International Standard ISO 9050: 1990 (E) measure of thermal conductivity values of glazing materials taking into consideration the thermal resistance of the material and the air or gas space; the superficial thermal exchange coefficients of the interior and exterior faces of the glazing; and the average temperature of the glazing. The lower the number, the better the performance of the product. Metric units are expressed in  $W/m^2/^\circ C$ .

##### Relative Heat Gain:

The amount of total instantaneous heat gain through a glazing material taking into account the effects of solar heat gain (shading coefficient) and conductive heat gain (U-value). The lower the relative heat gain, the better the performance of the product. Metric units are  $W/m^2$ . Relative heat gain is calculated as  $RHG = (\text{Summer U-value} \times 7.8^\circ C) + (\text{shading coefficient} \times 630 W/m^2)$ . Note:  $7.8^\circ C$  is the difference between outdoor and indoor temperature.  $630W/m^2$  is an ASHARE solar heat factor.

- Siting a building to avoid extensive glazed facades with a southerly aspect or introducing shades to window areas can reduce solar heat gain. Appropriate choice of windows with a low thermal transmittance characteristic will also minimize solar heat transmission.
- Artificial lighting consumes electricity and creates heat which increase energy consumption. Consequently, when determining the size and location of windows as well as choice of glass in the envelope of building, efforts should be made to provide as much natural lighting into the building as possible.
- Other measure include more extensive use of energy-efficient building services equipment and appliances, e.g. energy-saving lamps, low-loss luminaries and high-efficiency air-conditioning and more sophisticated building services control systems.

**Glass affect the OTTV value on two levels:**

- Directly in the formulas, where the Shading Coefficient is used. The lower the Shading Coefficient, the better the OTTV.
- Indirectly by means of the light transmission: the higher the light transmission, the less artificial lighting is needed, thus reducing the heat generation from the building.

As we should be aware, this code is just a beginning of the energy consumption policy started by the government. It is very different in foreign countries, the concept of OTTV has been established for a long time, such as UK. There is a lot of unclear and insufficient area inside the code.

**Solar Factor:**

The ratio of quantity of heat entering a room through the glazing to the intensity of the total direct incident solar energy radiation. The lower the solar factor, the better the performance of the product.

**U-value:**

Heat loss is quantified by the thermal transmittance or U value, normally measured in  $W/m^2 K$ . The U value is the rate of loss of heat per square metre, under steady state conditions, for a temperature difference of one Kelvin or degree Celsius between the inner and outer environments separated by the glazing.

It can be also be quantified in terms of thermal resistance, R value. This is the inverse of the U value:  $R = 1/U m^2KW$ .

Winter U-values are based on standard ASHARE condition of -17.8 °C outdoor temperature, 21 °C indoor air temperature 24 km/hr outdoor air velocity, natural convection of indoor air and no sun (night time).

Summer U-values are based on standard ASHARE conditions of 32 °C outdoor temperature, 24 °C indoor air temperature 12 km/hr outdoor air velocity, natural convection of indoor air and 788 W/m solar radiation.

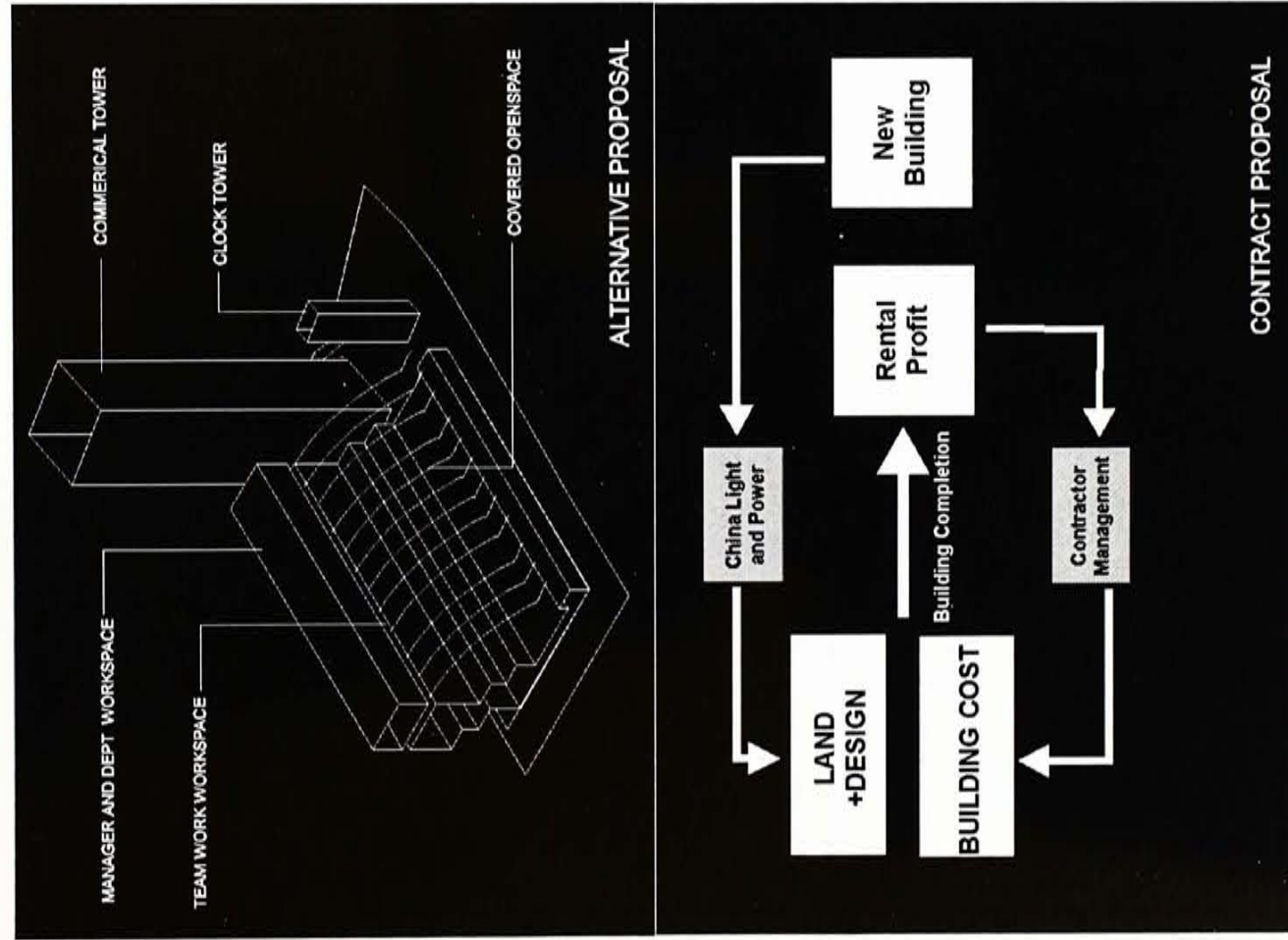
U-value is one of the most important and common index for us to identify the thermal resistance of the material on the perimeter of the buildings.

One of the standard and calculation method is the BS 6993: Part 1: 1989: British Standard Thermal and Radiometric properties of glazing Part 1. Method for calculation of the steady state U-value (thermal transmittance), British Standard Institution.

This part provides a consistent basis for the calculation of the U-value of the combinations of glass, with and without coatings, with air filling or certain gas filling, as used in sealed units or in coupled windows. The Technical Committee responsible for this Part is of the opinion that the calculation method given will enable producers to describe U-values on a comparable and fair basis. The method has been made as simple as possible, consistent with accuracy.



**COST**



**8.1 Source of finance**

**Development Gain:**

Since several office space occupied by China Light and Power are located in rental office, to develop the existing headquarters can really reduce the long term overheads of the office operation.

**Land Cost/Premium:**

As the lots have been modified to be office used before, there may incur no premium to be paid to the government especially China Light and Power is a public Utilities Company.

- In order to reduce the financial burden of the company and affect the financial state of the company. Built-transfer contract may be adopted.
- An alternative approach can be considered as the recreation block to be developed as a commercial development at an early stage to finance the rest of the development.
- The contractor responsible for all the development cost for the development of the commercial block and the first 15 year rental income of the commercial tower can be the profits for the company.
- Architects and Consultant should be assigned by the client to guarantee the design qualities.
- After 15 years, the commercial Tower will be returned to China Light and Power's Office as the company expands.

## Calculation Sheet

### G.F.A breakdown

Total Site area 6600 s.q.m.

Total Gross area 18000 s.q.m.

Total landscaped/paving area 2800 s.q.m.

Gross area of workplace 15,000s.q.m.

Gross area of basement carpark (below road level) 3,000s.q.m.

### Site Development Cost

(including site investigation, preparation, drainage & landscaping plus utility supplies)

HKD 2.000 million

Preservation of the Clock Tower, approximate HKD 5.000 million

By early of 1996, according to surveyors Aevett & Bailey first quarter of 1996 prices

The average cost for office (High Quality) HKD 12,000

The average cost for basement carpark HKD 7,500

By the early of 1994, according to Spon's Budget Estimate Handbook 2nd Ed. 1994

The average cost for high quality landscaping/paving HKD 700

According to the inflation assumption, by the mid of 1998 in term of HKD

The average cost for office (High Quality) = HKD 12,000 x 1.1<sup>(2.5)</sup> = 15,250

The average cost for carpark = HKD 7,500 x 1.1<sup>(2.5)</sup> = 9,525

The average cost for landscaping/paving = HKD 700 x 1.1<sup>(4.5)</sup> = 1,075

The construction cost for workplace = 15,000 x 15,250 = 228.750 million HKD

The construction cost for carpark = 3,000 x 9,525 = 28.575 million HKD

The construction cost for landscaping/paving = 2,800 x 1,075 = 3.010 million HKD

Add

Cost of the Steel/Glazing roof for the atrium to be 20% of the construction cost of the office space  
228.750 x 0.2 = 45.750 million HKD

Total building cost

2.000+5.000+228.750+28.575+3.010+45.750 = 313.085 million HKD

Add Professional fee estimated to be at 12% of building cost

313.085 x 0.12 = 37.570 million HKD

**Total development cost = 350.655 million HKD**

## 8.2 Cost Analysis

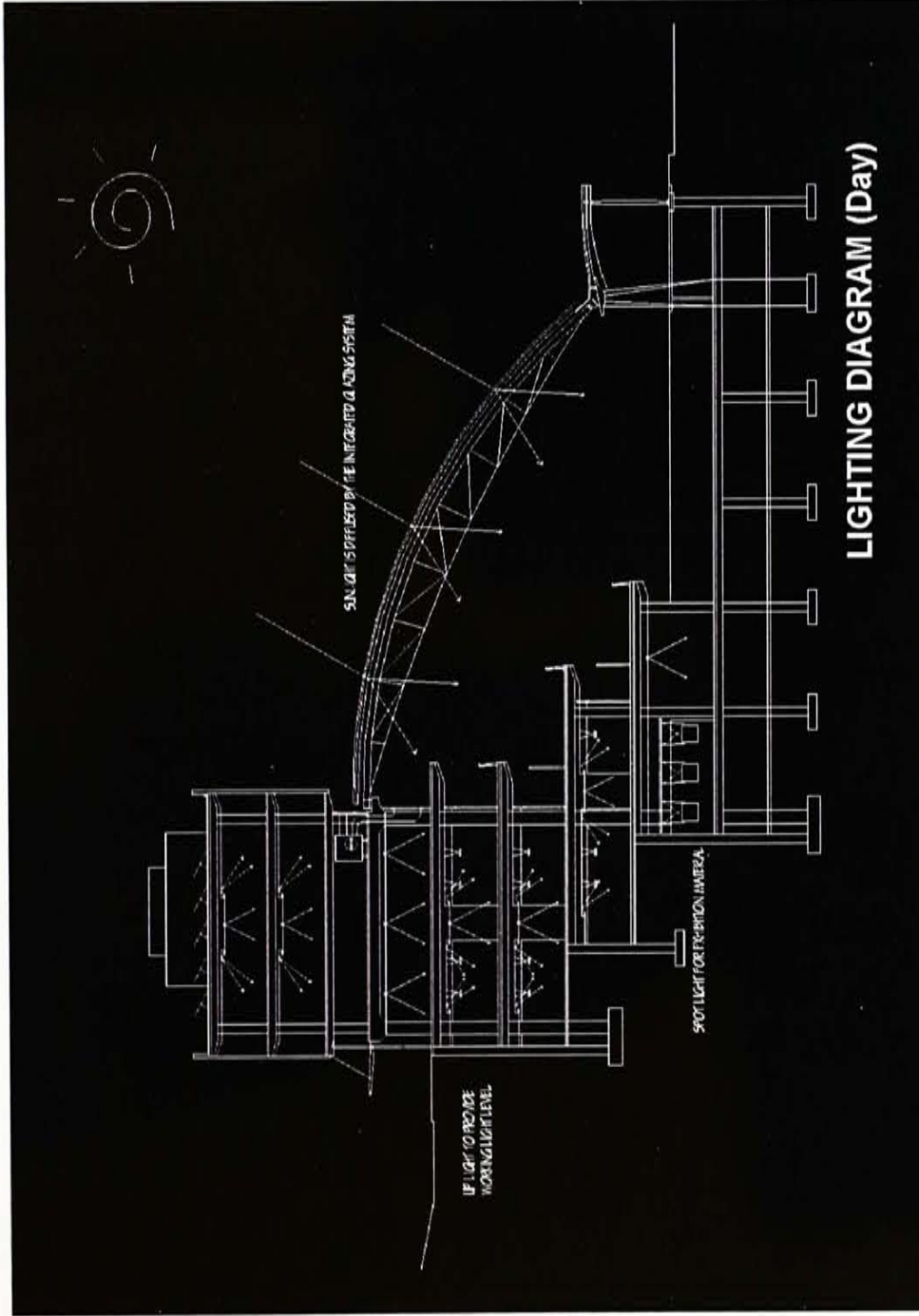
### Assumption:

Approximately 10% inflation per year (compound) for purpose of calculation.

Averages cost based on the construction costs for first quarter of 1996 prices, by Pace Sep 1996 according to surveyors Aevett & Bailey and Spon's Budget Estimate Handbook 2nd Ed. 1994.

Assume the commencement date on June of 1998 to date of completion on Dec of 1999. The total construction period is 18 months.

Cost of construction calculation projected to tenders stage, at the beginning of the construction period.



**9.1 Day Lighting/ Artificial Lighting Concept**

Day-time

For the atrium space,

- The harsh direct sunlight is diffused by the integrated glazing system.
- The illumination of the space will be depended on the diffused light from the glazing system
- The level of light density can be adjusted by integrate glazing system.

For the rear workplace,

- The ambient lighting level is depended on the up lighting fixture.
- The task lighting level is depended on the task light fixture on their individual desk.

For the circulation space,

- The illuminance is depended on the diffuse light with supplement by the down light above.

Night-time

For the atrium space,

- The lighting level is depended on the reflected light from the up light device on both sides.
- The louver in the glazing system can reflect the uplight down to the space.

For the rear workplace,

- The ambient lighting level is depended on the up lighting fixture.
- The task lighting level is depended on the task light fixture on their individual desk.

For the circulation space,

- The illuminance is depended on the down light above.

## 9.2 Design Criteria

The electric lighting serves to supplement daylight when and where it is insufficient and the daylight contributes an element of variation and directional flows to the appearance of the interior.

### Illuminance:

One generally applicable recommendation that no continuously occupied working space should have an illuminance of less than 200 Lux on the working plane.

### Illuminance ratios:

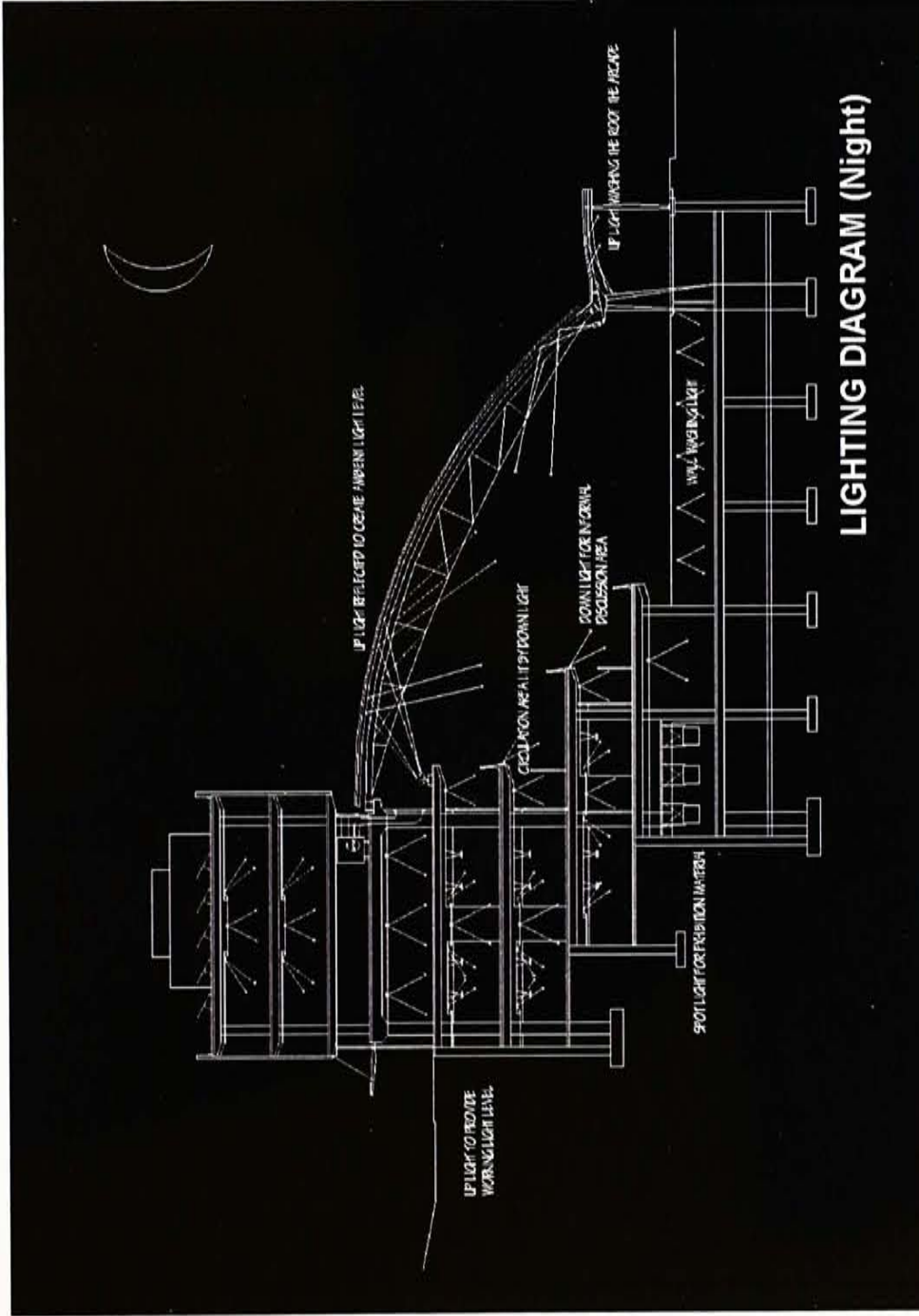
Uniformity of illuminance can be considered over two areas; on and around the task itself, and over the whole interior. For the task area and its immediate surround, uniformity of illuminance is important.

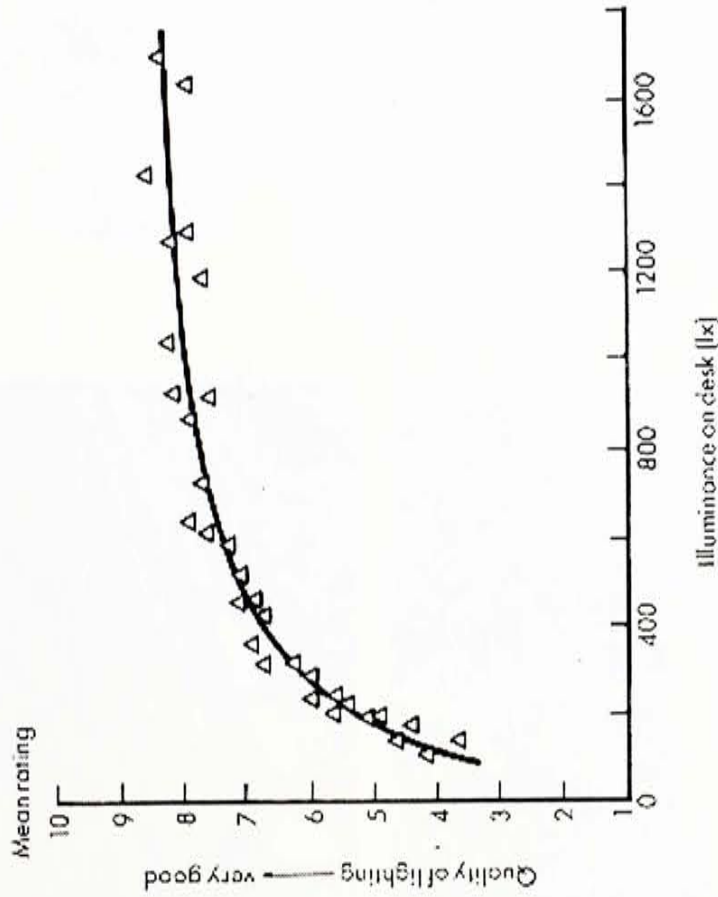
Sudden changes in illuminance in this region are likely to cause distraction and dissatisfaction and may affect task performance.

- The ratio of the minimum illuminance to the average illuminance over the task area should not less than 0.8.
- In an interior with general lighting, the ratio of the average illuminance on the ceiling to the average illuminance on the horizontal working plane should be within the range 0.3 to 0.9.
- In an interior with general lighting, the ratio of the average illuminance of any wall to the average illuminance on the horizontal working plane should be within the range 0.5 to 0.8.
- In an interior with localized or local lighting, the ratio of the illuminance on the task area to the illuminance around the task area should be more than 3:1

### Glare:

Glare occurs whenever one part of an interior is much brighter than the general brightness in the interior. The most common sources of excessive brightness are luminaries and windows. (reference from CIBSE Code 1984)





Mean assessment of quality of lighting from CIBSE Code for interior lighting

**Design Concern:**

In the project, I would like to design a more creative and effective working environment, improve and enhance social interaction. Apart from that, human comfort and energy efficiency is also extremely important to the design. In term of lighting quality, a workplace should have good visual and spatial quantities: no glare, good illumination and visual comfort.

During the design process, there is numbers of options of various component in the design which will affect the daylight quality of the space

- Design of integrate glazing facade.
- Material selection of interior.
- Overall form and coverage of the atrium.

Among the different parameter, I am especially interested in the design of the integrate glazing system. It will affect the day lighting quality and thermal performance of the space dramatically.

The final solution:

The final solution is approaching toward intelligent Glass Facades design, which have ability to respond to the changing environmental conditions according to of the day or year, in such a way as to reduce primary energy needs for heating, cooling and lighting, and thus to make a contribution to environmental conservation.

However, it is very difficult to predict the daylight qualities created by the glazing system designed. In order to evaluate the design, I have adapted the scientific computation method to review the design.

### 9.3 Computation of Day Lighting Analysis

Collaborate with Mr. Chow Ka Ming, Benny, Department of Architecture, The Chinese University of Hong Kong

**The Purpose:**

To review and improve the day lighting condition inside the atrium of the main complex

- Illuminance level
- Glare visual comfort

**Device:**

"SGI" platform

Digital Design Studio in Chinese University of Hong Kong.

**Program:**

Radiance, from Lawrence Berkeley Laboratory

**Daylight Condition:**

CIE Standard sunny sky distribution on September 1st 9:00 am  
12:00 am and 5:00 pm

by Radiance sub-program "gensky"

Transmissivity at normal incidence on Radiance manual

$t_n = (\sqrt{0.8402528435 + 0.0072522239 \cdot T_n \cdot T_n}) -$

$.9166530661) / .0036261119 / T_n$

where (Tn) stand for transmittance from glass catalogue.

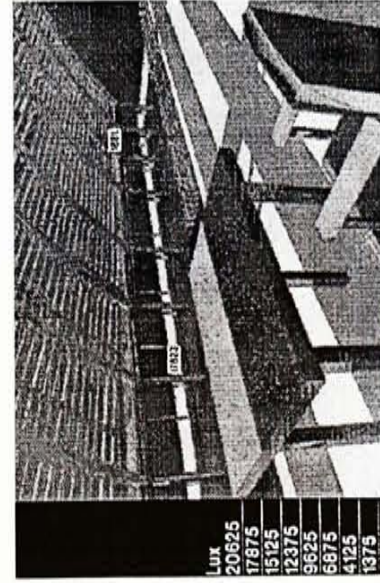
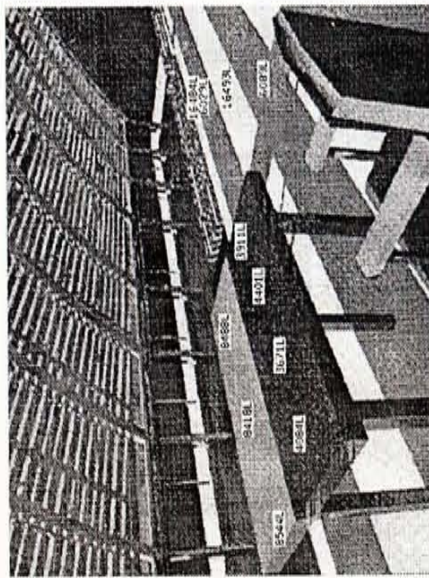
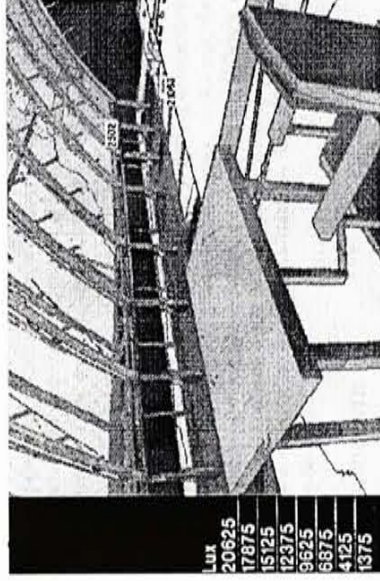
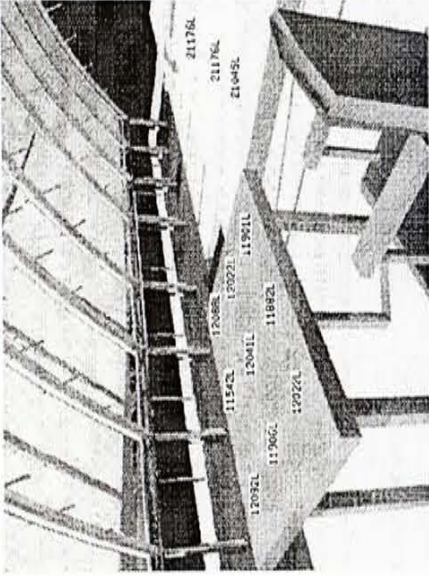
**Previous Option:**

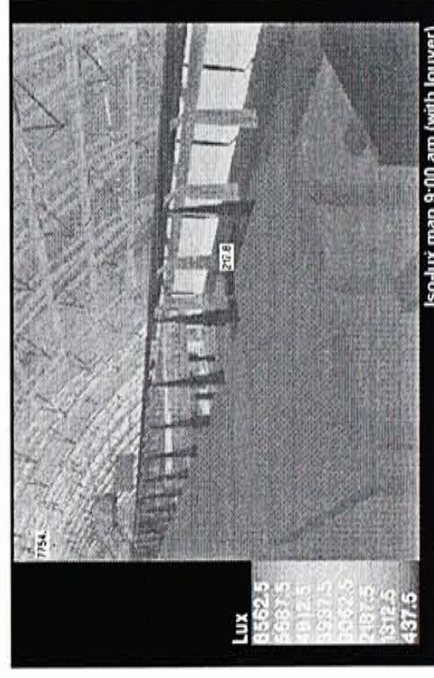
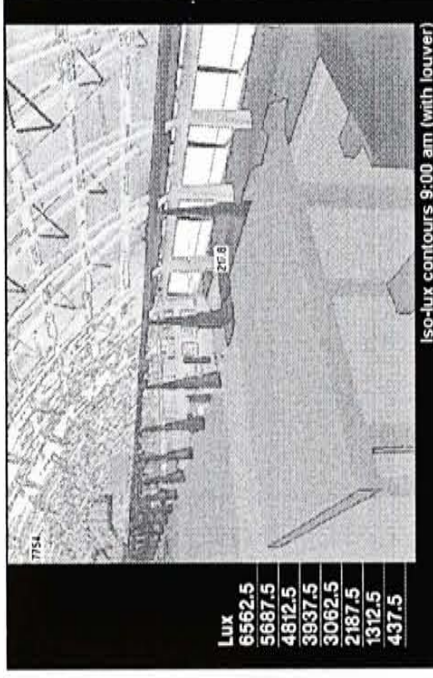
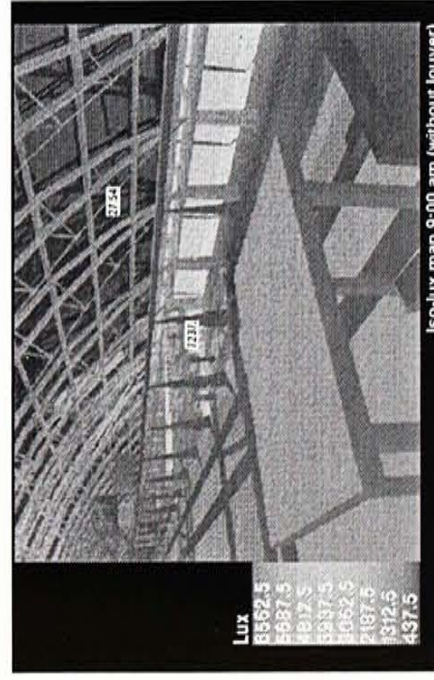
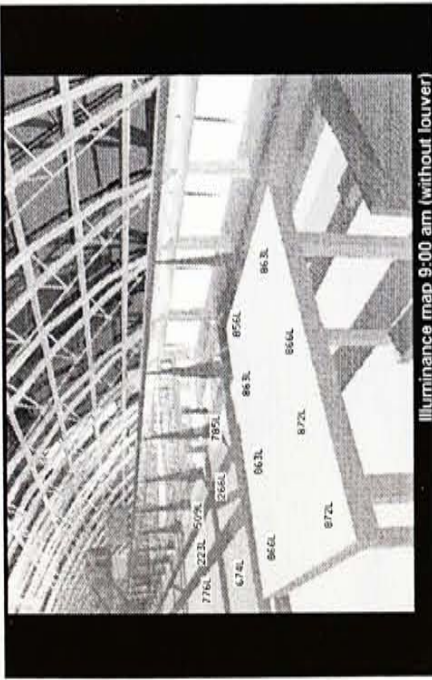
In this version, the design is integrate with simple louver in certain distance. The design of the louver is only in preliminary stage.

The test is based on two options to generate comparative results.

1. Glass without louver.
2. Glass with louver.

The result outcome is the first result have too much light come in and the second result have the harsh shadow create by louver.





**Final Solution**

The final design is approaching toward intelligent Glass Facades design , which the angle of interlay louver will change according to the sky condition to provide the most appropriate lighting condition inside the atrium space.

**Setup**

The test is based on two condition in three time period during a day. 9:00 am, 12:00 pm, 5:00pm on 1st Sep

1. The first condition: Double glazing without lighting control device.
2. The second condition: Double glazing with interlay control louver device.

To simplify the problem, all the angle of louver is remain the same under three different time period.

**Evaluation of Result:**

**Illuminance map:**

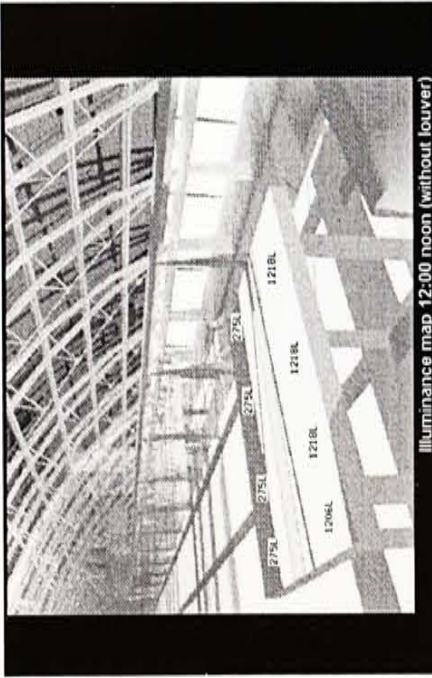
It shows light level on different surface. It allow us to review the light level in different location to make sure the illumination level of different surface is suitable for workplace

**Iso-lux contours:**

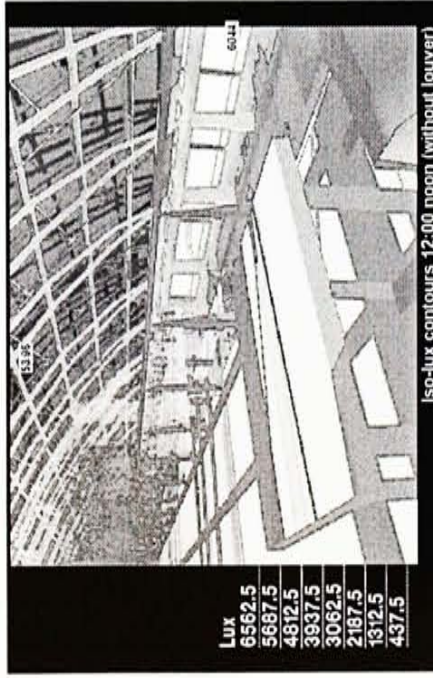
It shows the contour of different light level. It let us review the light level on different surface when you look around.

**Iso-lux map:**

It highlight the highest and lowest light level in the space Luminance is displayed on a linear scale, where dark areas are blue and brighter areas move through the spectrum to red.



Illuminance map 12:00 noon (without louver)



Iso-lux contours 12:00 noon (without louver)



Iso-lux map 12:00 noon (without louver)



Illuminance map 12:00 noon (with louver)



Iso-lux contours 12:00 noon (with louver)



Iso-lux map 12:00 noon (with louver)

The result:

9:00 am

The uniformity of light level difference of case 2 is much higher than case 1.

The light level in case 2 is around 520 Lux, the light level is suitable for working.

The light level in case 1 is from 270-900 Lux, people will feel discomfort when they are working in such environment.

12:00 noon

The uniformity of light level of case 2 is much higher than case 1 and the situation is more serious.

The light level in case 2 is around 550 Lux, the light level is suitable for working.

The light level in case 1 is from 270-1270 Lux, people will feel discomfort and some area is too bright for working space.

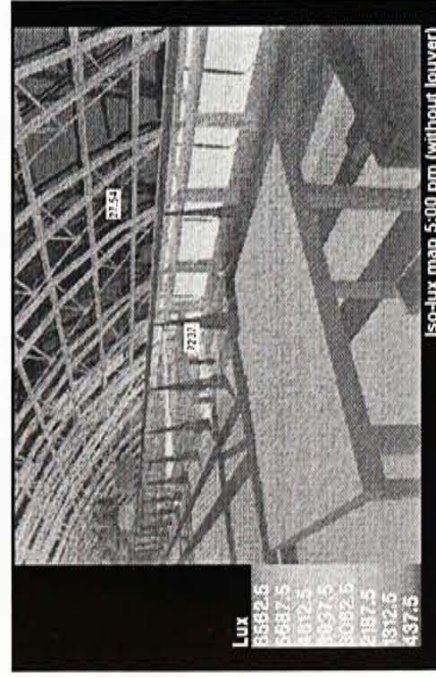
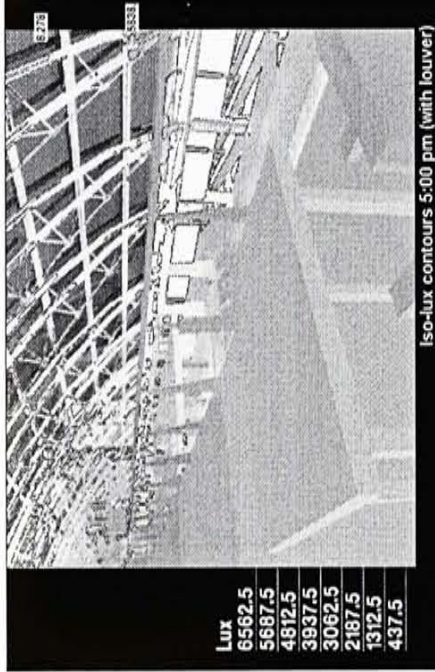
5:00 pm

The uniformity of light level of case 1 become more even.

The light level in case 2 is around 380 Lux, the light level is very suitable for working.

The light level in case 1 is around 140 Lux, the light level is below working requirement which the shadow of the above structure casted on the surface.





- According to the result, it can conclude that
- Case 2 with integrate louver design provide much better lighting qualities than case 1.
  - The time will affect the light level of the space during daytime a lot. The problem will be greater in case 1.
  - If the louver can adjust according to the external lighting condition. It can really help to control the lighting condition of the space.
  - To achieve the best lighting condition, the reflective material is not suitable to be used in interior.
  - The shadow of the structure above can be reduced by the integrate louver system and uniformity of the light level is also improved

**Discussion:**

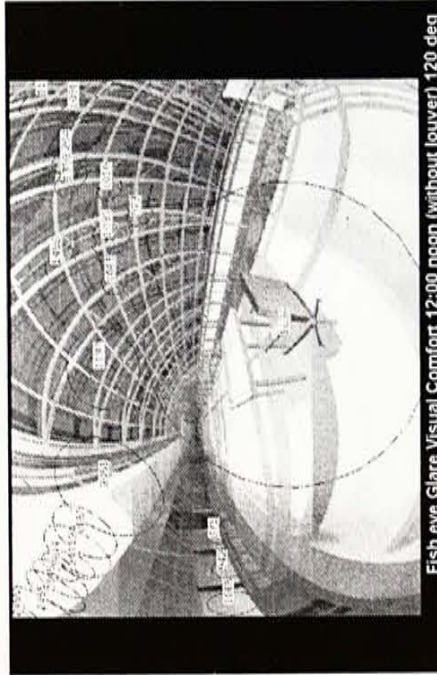
Radiance provide a very power tools for the architectural design. It help us to study an space in term of lighting quantities and qualities.

It also provide realistic visual image for user to review the space in a very convenience way.

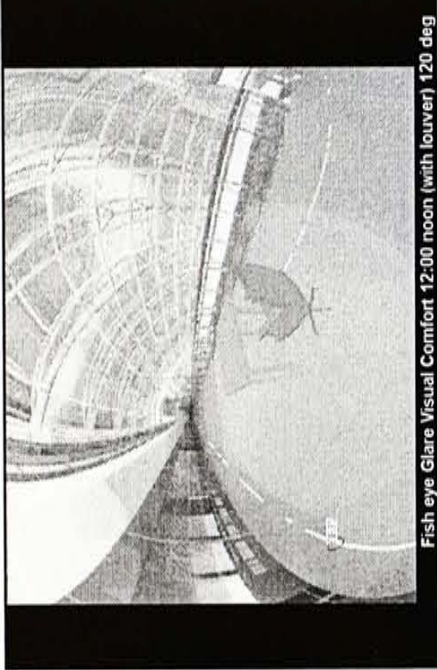
However, Radiance was difficult to use, especially who are not familiar with UNIX environment. Also it require a lot abstract numerical input which should depended on expertise knowledge.

There should be a full set of photometric database, and the should be a complete material library which contain material commonly available in market. The lighting condition generated is still limited by insufficient information regarding reflective surface.

There is still a lot of perimeter in the programme which is still need more time to investigated. Otherwise, it would be a problem when we want to define some more advance definition in term of material properties and condition of environment.



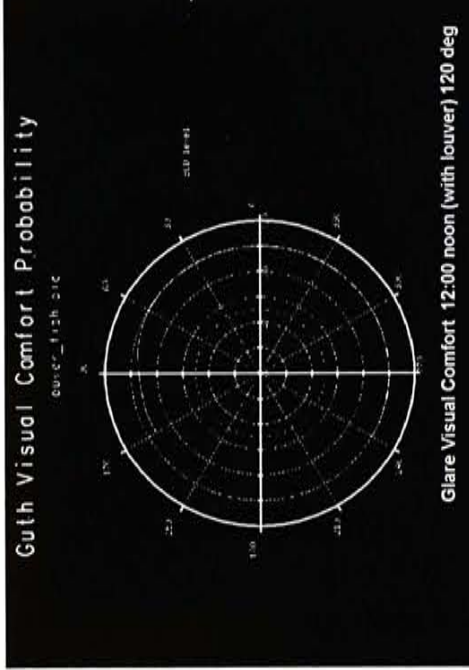
Fish eye Glare Visual Comfort 12:00 noon (without louver) 120 deg



Fish eye Glare Visual Comfort 12:00 noon (with louver) 120 deg



Glare Visual Comfort 12:00 noon (without louver) 120 deg



Glare Visual Comfort 12:00 noon (with louver) 120 deg

## Human Comfort Analysis

### Findglare

The output is a list of glare source directions, solid angles and average luminance's, plus a list of indirect vertical Illuminance values as a function of angle. Angles are measured in a degrees from the view center, with positive angles to the left and negative angles to the right. It identifies glare sources as directions that are brighter than 7 times the average luminance level.

### Fish eye view

A fisheye perspective is a type of distortion that allows a wider field of view than standard perspective image. The field is used by findglare to locate any and all bright spots that might affect visual comfort.

### VCP

The result is plotted to a Guth Visual comfort probability(VCP) is a very easy way to understand, it give us a result in terms of a percentage of people who would be satisfied.

Comparing the results, there is two major source of glare.

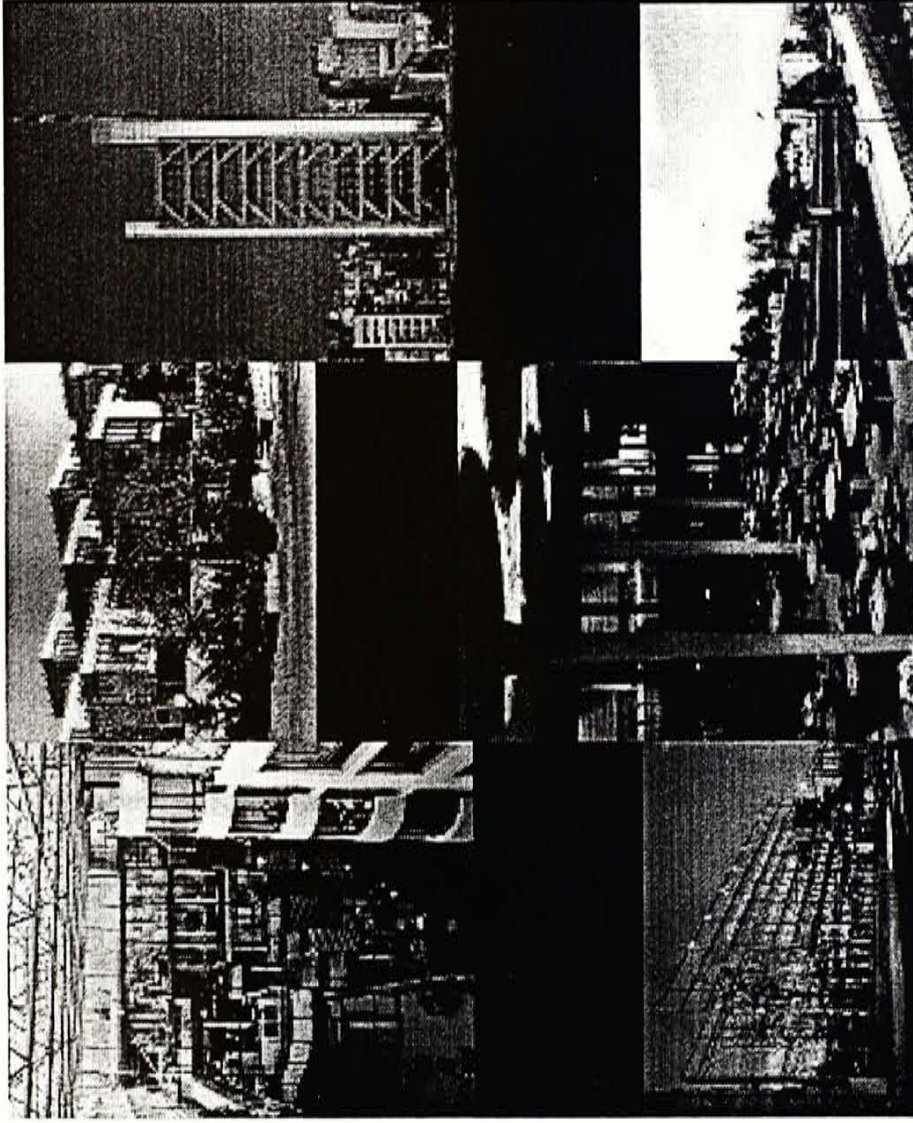
1. The light come through the glazing roof
2. The reflection form the interior glazing partition of the workspace.

In order to avoid glare happen, the choice of the material for the interior material is extremely important. A matte or dull finish material is more appropriate to use in the interior.

For the case 2, glare is reduced a lot. as the direct sunlight is not entering the space. The diffuse light seem to be more appropriate in the space. The overall environment become more gentle with good uniformity for working. The choice of material finishes to provide different reflective index is also very important which can reduce unnecessary visual discomfort in the space.

# A FUTURE WORKPLACE

HEADQUARTERS OF CHINA LIGHT AND POWER



PROGRAMMING REPORT  
MASTER YEAR 2, DEPARTMENT OF ARCHITECTURE  
THE CHINESE UNIVERSITY OF HONG KONG

INSTRUCTOR: PROF. STEVEN LOMBARDI  
STUDENT: FUNG CHI HO, MICHAEL  
DATE: 17, DEC 1996

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Miscellaneous

- a. Review Report
- b. Interview Report
- c. List of Development Control Document by Government

Bibliography

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## **INTRODUCTION**

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## 1.1 Preface

“A Future Workplace” .....A working place for the Headquarters of China Light and Power Co. Ltd. in Hong Kong.



**OFFICE** is a revolution from factory basically. When the living standard and technology improve, the concept of the office gradually change.

Most of the office design at present is still in a manner of the traditional thinking of money making efficiency. The spatial quality and environmental concern of a workplace is usually put into a lower priority. However, it is no longer meet the need of people today. The most important issue for the workplace design should be offering creativity, interactive and healthy environment in an environmental friendly way for the occupants.

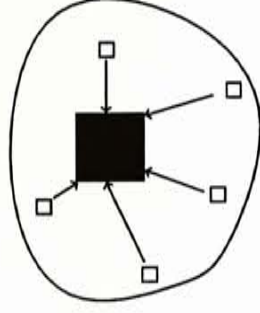
**ENERGY EFFICIENCY** design is one of the most important research topics today. As living standard rises, the building users require a more sensitive living condition and air-conditioning become essential in the Office building design. With the common adaptation of the curtain wall in the Office buildings, solar radiation heat up the interior of the building very easily. Office buildings are one of the largest energy consumers.

The energy crisis and environmental pollution may not be stopped, the concept of environmental friendly and energy efficient workplace should be considered more seriously

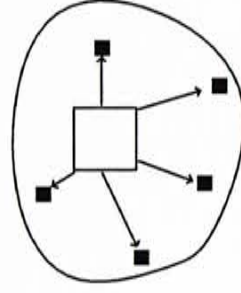
**FORM: CONCENTRATE OR DISPERSER:** Heading toward the 21 st Century, the office in the cities will gradually change in form accompanied by diffusion of information and changes in life style of office workers as we. The issue of whether office should be dispersed or concentrated would be the most important issue when operating an organization.

With the advance of information-oriented society, the office can be dispersed in theory and can be site at any place. It is now possible to perform a major bulk of work in a hotel room, at home, or even inside a car. It is difficult to envisage that people will continue to find the current way of work desirable in the next century. On the other hand, face to face communication may be more important, and this inevitably results in preference of concentration of the offices in urban areas.

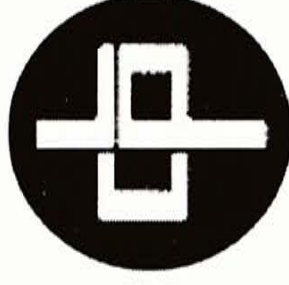
Offices as contained in an organization need not always be an office building as their hardware. When an office as place is no longer needed, the concept of office building will enter the era of reconstruction.



Centralization



Decentralization



## 1.2 Background

Project Title:	A Future Workplace (Headquarters of China Light and Power Co. Ltd.)
Client:	China Light and Power Co. Ltd.
Location:	Ho Man Tin, Kowloon, Hong Kong
Site Area:	6600 sqm
Proposed GFA:	18000 sqm (approx.)
Occupant:	800 staff
Purposed:	Co-operation Office (Single Use)
Number of Storey:	5-10

Hong Kong is an international commercial city, one of the most important building type in Hong Kong is the Office building.

However, most of the designs of the office building in Hong Kong is cannot meet the occupants' requirement. Environmental issues are almost not in consideration.

**CHINA LIGHT and POWER** is a developing company, a lot of new needs will be encountered. In order to propose the new Headquarters for the most dominate public utilities company in Hong Kong, the building will be more than a traditional mixed-use office building. The new headquarters should certainly reflects the image of China Light and Power from its past, present to future.

The company is going into a new century. A significant design of the new Headquarters would be an milestone of the hundred years old company. The client is willing to have a chance to develop a more promising solution so that their headquarters would become a model for future working space development in Hong Kong.

Through an virtual client China Light, the **environmental concern** of the company, we are trying to develop a future energy efficiency and environmental friendly workplace. The future building will adapted the most **Hi-thinking** but **Low energy** approach to control the environment instead of totally mechanical environmental control in the past.

Apart from that, we are also going to investigate the office as a system and the role of an **concentrate/group workplace**. Concept of "home-working" and "office can be anywhere" will still the main tread. The major function of the group workplace will change from the container of routine work to the space of social and intelligent interaction. The social organism of the present office will be changed and should be totally redesigned.



**1.3 Acknowledge**

Prof. Tunney Lee, Head of Department of Architecture, Chinese University of Hong Kong

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Prof. Gunitis Plesums, Department of Architecture, Chinese University of Hong Kong

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Ms Katherine Ma, Assistant Public Affair Manager, China Light & Power Company, Ltd.

Ms H. F. Yeung, CLP Delight Centre Manager, Kowloon North, Distribution And Customer Service, China Light & Power Company, Ltd.

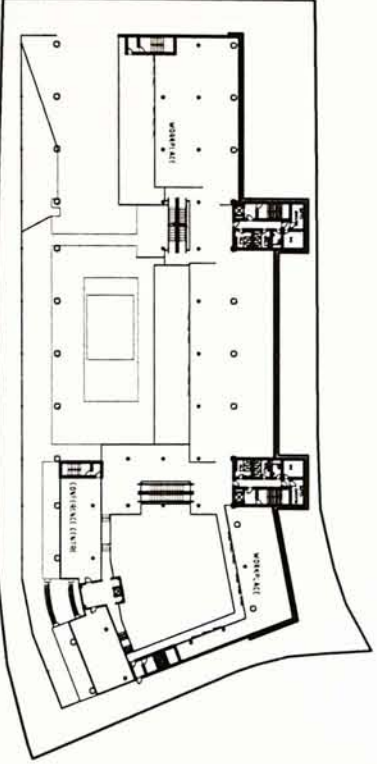
Mr. H K Wong, Computer Planning Officer, China Light & Power Company, Ltd

Mr. Ho of Highway Department

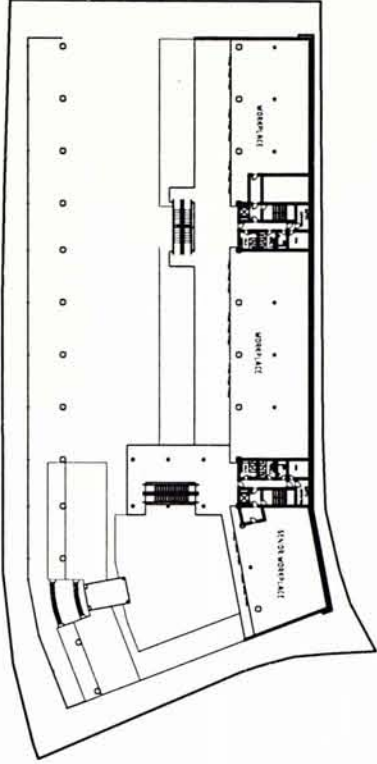
Mr. Lam of Transport Department

Mr. Wong Hon Meng, Senior Environmental Protection Officer of Environmental Protection Department Hong Kong Government

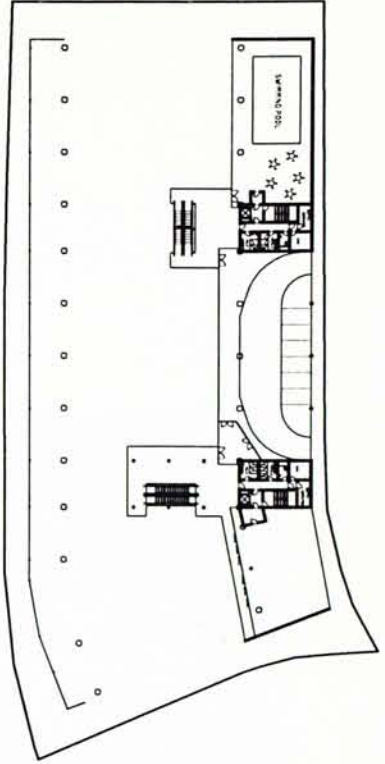
1-2ND FLOOR PLAN



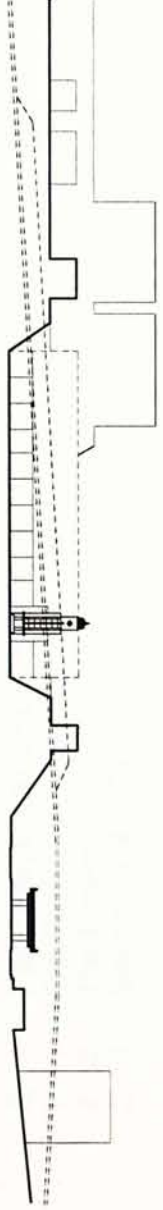
3-5TH FLOOR PLAN



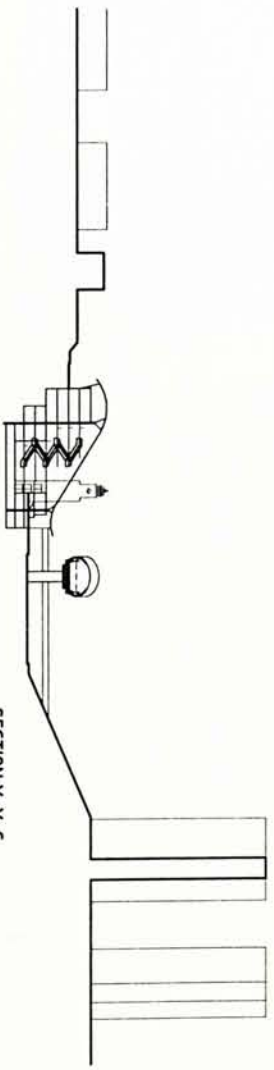
6-7TH FLOOR PLAN



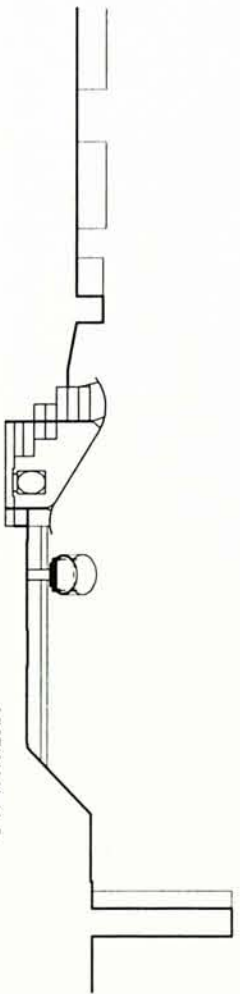
SECTION X-X



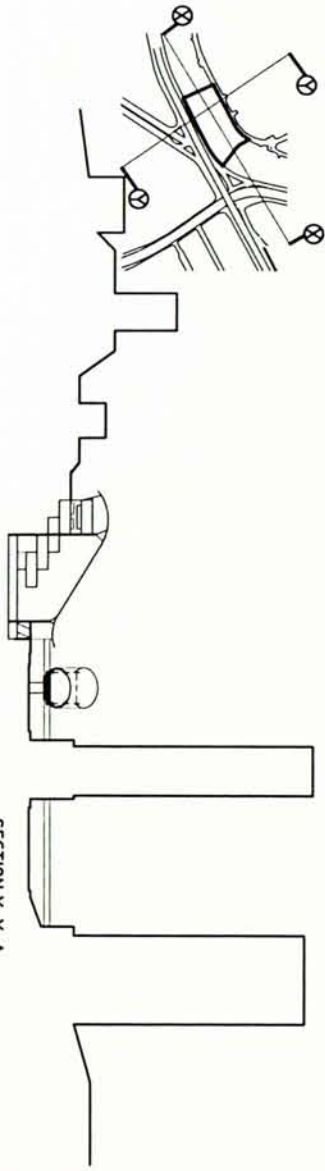
SECTION Y-Y-C



SECTION Y-Y-B



SECTION Y-Y-A



**COMPANY PROFILE**

- 2.1 Past, Present and Future Development of the Company
  - 2.1.1 The Past
  - 2.1.2 The Present
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- 2.2 Philosophy of the Company
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## 2.1 Past Present and Future Development of the Company<sup>1</sup>

### 2.1.1 The Past<sup>2</sup>

China Light and Power Co. is one of the **biggest public utilities company** in Asia, later name as China Light. It was incorporated in Hong Kong in 1901 to supply electricity to Canton and Kowloon.

The first power station in Kowloon had begun to produce electricity on **2 April 1903**. At first the urgent of electricity in Kowloon and New Territories seem to be rare. After a long difficulty period for China Light and Power, the Company have experienced a **rise in sales** of electricity between 1948 and 1951 when the output grew no less than **five times**. Later in 70s, the overwhelming majority of the new and expanded industries were located in Kowloon and the New Territories, and challenge to produce enough power for them therefore fell largely on the China Light's shoulder.

Nowadays, the generating process is controlled by a computer-based data acquisition and supervisory control system. Data are received at the central processor from, and commands issued to, the remote terminal unite, mainly via the company's micro-wave system. In the remote part of New Territories a handful of village is also **benefit from quite extensive networks** of power lines.

### 2.1.2 The Present

Today China Light is one of Hong Kong's largest public companies listed on the Stock Exchange of Hong Kong. It provides electricity to Kowloon and New Territories, including Lantau, Cheung Chau and a number of other outlying islands.

The most important objective of the company is to maintain the liable generation, transmission and distribution of electricity to the Customer.

China Light business activities are divided into two categories. The first is the **core electricity generation and supply** business in Hong Kong. Although growth in local electricity sales has been slowdown in the Hong Kong economy. There is still a lot of chance for the company development. Work on the cable link and substations for both the Chep Lap Kok airport and associated railway have been progressed. The **development of existing** China Light **properties** that are no longer useful for electricity purposes also from parts of the company's operation.

### 2.1.3 Search for New Opportunities

The company is an active invested and manager in a number of electricity-related business **outside Hong Kong** such as power projects in the People's Republic of China and several other Asian countries. Daya Bay Nuclear Station were constructed in the 1980s and is 25% owned by China Light. China is clearly a logical and natural area of potential for China Light. China's power needs are very substantial and to further strengthen their relationships in China, such as the Shangdong project. Promoting the China's project, the company established a representative office in Beijing in August 1995. For the overseas project, China Light reached an agreement to participate in a major power project in India. They are also particularly interested in investing in Taiwan, Thailand and Indonesia.

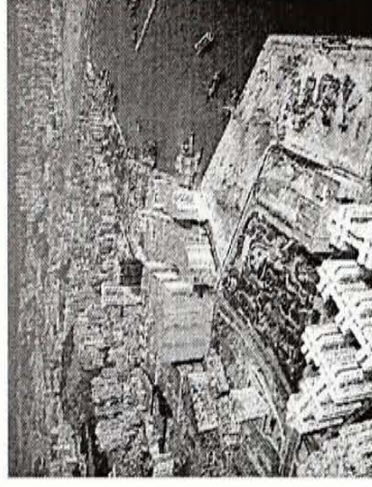


fig 2.1.1 Situated at a prime site, the future Hok Un residential blocks.

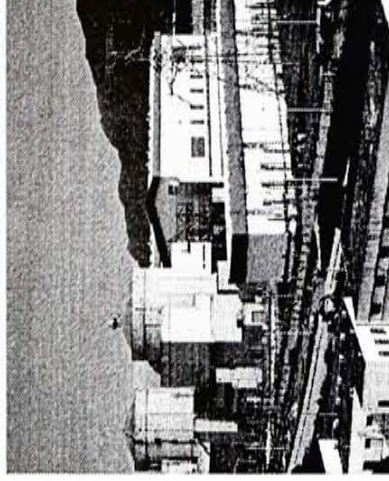


fig 2.1.2 The Daya Bay Nuclear Power

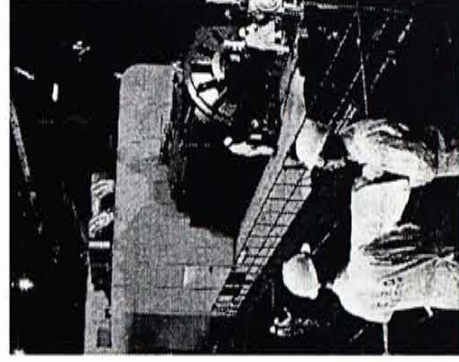


fig 2.1.3 The Black Point Power Station

## 2.2 Philosophy of the Company<sup>3</sup>

### 2.2.1 Public Goods

The philosophy of the company would be trace back from Mr. Shawn, the founder of the company. The most basic reason for the establishment of the company is to supply electricity to the general public and improve our living standard. This objective of China Light is still keep in the mind today and will carry out to future. Not only are they provide their customers with the continuous supply of power they are dedicated to doing so in a manner as **safe and environmental friendly** of Hong Kong.

### 2.2.2 Concern with Safety

Risk assessment are carried out by the company in the implementation of the operation of the Operation Integrate Management System (OIMS). Developing the company, training of the staff may be one of the most important task. Comprehensive awareness and skill training are offered by the company. Recently, various safety awards are obtained by the company.

In order to provide a wider forum for the exchange of ideas and experience as well as update skill with latest trends and development, the company's first Safety Conference was organized with 300 attendees. Also, the annual safety day for staff and their families which attracted over 4,600 people in 1995. The needs of these kind conference and activities will be continued and may be even more urge in near future. To accommodate such events are one of the most important function of the new Headquarters.

### 2.2.3 Image of Environmental Concern

The company has been continues to be leaders in Hong Kong on **environmental issues**. A corporate Environmental Management System has been developed with China Light. This has involved producing position statements on some of the major environmental values are included in the Employee Code of Conduct. The Company continues to actively participate in evaluation programmes of electric vehicles promotion proposed by the Government.

### 2.2.4 Community

Apart from generating business and research, China Light involves a lot of community work in Hong Kong. Specific activities are organized to assist members of community who need a extra care and attention.

China Light is keen to increase **communications** with the community in which they operate in order to **enhance its understanding** of the company. A proactive approach has been adopted in order to make the Company's operations and decision making more **transparent**.

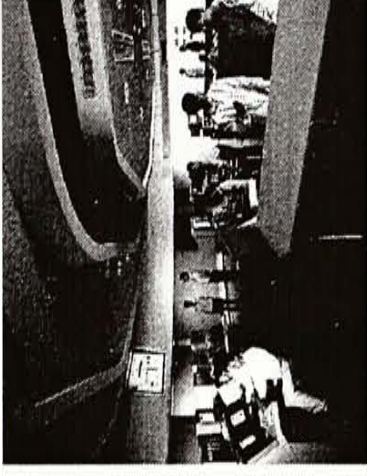


fig 2.2.1 Linemen in full safety gear working on transmission line



fig 2.2.2 The Nerve Centre of the Black Point Power Station

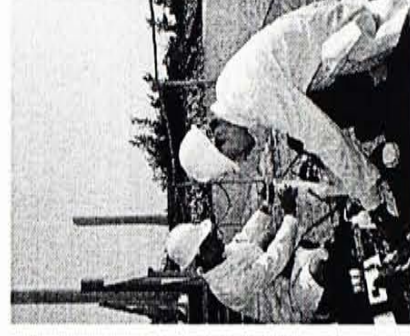


fig 2.2.3 Environmental protection is one of the company concern

## 2.3 Organization and Operation of the Company<sup>4</sup>

There is approximately 6000 employees in China Light, and 300 employee are working in its headquarters in Argyle Street currently. China Light is an very organized and huge company. The operation of this company is very complicate as it involved most advance technology and promising public service. For the top management level, the Senior Executive Committee: There is one Managing Director MD and nine General Mangers GM in China Light. four GM is not work in the Headquarters.

### 2.3.1 Division size

There is total nine major division in China Light.

	Number of staff
Finance	200
Strategic Development & Administration	200
Corporate Affair	200
Corporate Human Resources	100
CLP Development Group	50
China Business Group	50
Generation Business Group	1500
Transmission Business Group	1600
Distribution and Customer Service Business Group	2200

### 2.3.2 Division relation

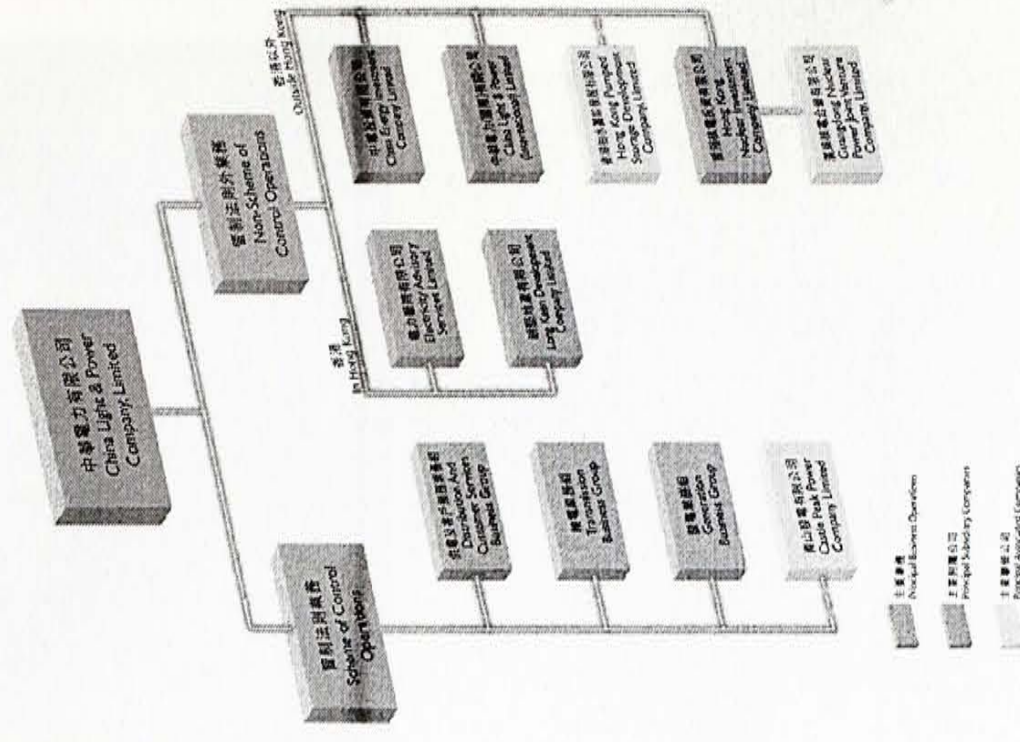
Every office and division have their domestic support staff, such as administration staff. There is a lot of inter department meeting will be held time by time.

Finance, Strategic Development & Administration, Corporate Affair and Corporate Human Resources are mostly responsible for the administration and relation of the Company.

To maintain the company's quality of the service; Generation Business Group, Transmission Business Group, Distribution and Customer Service Business Group which make sure all the supply business in Hong Kong is keep in liable quality.

China Business Group and International Business Division [China Light & Power(international) Limited] of CLP Development Group is responsible to new development in developing area in Asia, such as PRC, India, Indonesia, etc. This international business is keep in a lower profile as adapted by the policy of the company

## GROUP ORGANIZATION CHART



### 2.3.3 Future Office Development

There is two major approaches for their future development of China Light. Remain **subdivided office**: close to certain division, location and public group. To **centralize** the office: reduce duplicate resource. e.g. Telecom The advantage of the locality will also no longer be exist.

Many news reported that the Headquarters will be redeveloped as it is underutilized at present, however there is reason of China Light to hesitate. China Light is an public utilities company, it is difficult for them to justify to develop an too luxury whole new headquarters. It will involved too much investment at the same time.

On the other hand, the development of the new headquarters can reduce the **redundancy** of the office operation. It can also **reduce** the rental cost some rental office. Furthermore, it reduce some of the transportation cost and time of the inter-departments operation.

### 2.3.4 Land Use Issues

The land used by China Light in new development area is most probably the unattractive land assigned by the government. The cost of this land is not according to the development potential of this site, but to the actual **developed usage** by China Light. The land granted by government and condition will be written in the lease. If the land is no more use by China Light, it will change back to the original use of the land and for further develop.

### 2.3.5 International Business

China Light is very keen in develop international business in developing area as mentioned before. The **power generation business** involved long term planning and huge investment. Most of the project is divided into many stages and carry through several years.

Most of the time, China Light will sent staff **fly** to the target countries, to discuss with their government, cooperation business partners To tell them how capable of China Light are, China Light will **invite** some of the important people of these countries come to visit their plants and introduce the facilities and technology of China Light. There should some good showcase for them.

### 2.3.6 Maintain Local Business

To enhance the consumer service, there is about 40-50 person in the business promotion group to promoting local business. In fact, the target of the business is not only the **public**, but also the **industrial, commercial user**.

For the general public, China Light try to introduce **energy saving** and environmental aware **living practice**, such as non-flame cooking method

To the industrial and commercial users, they will introduce the concept of energy saving **building operation and production method**, such as ice-storage for air-conditioning control.

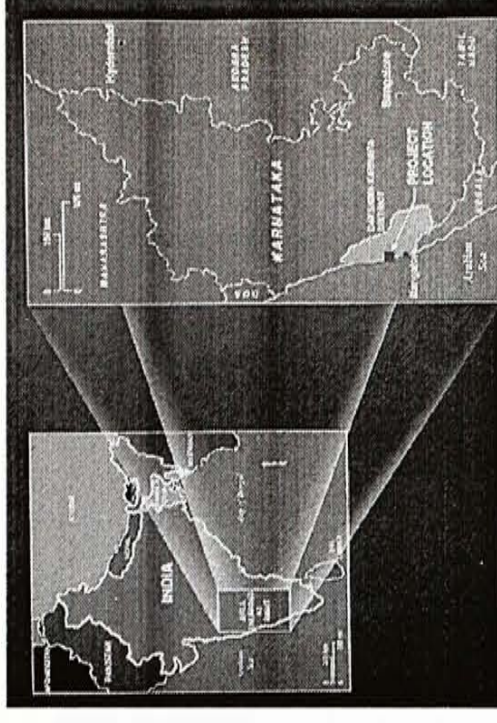
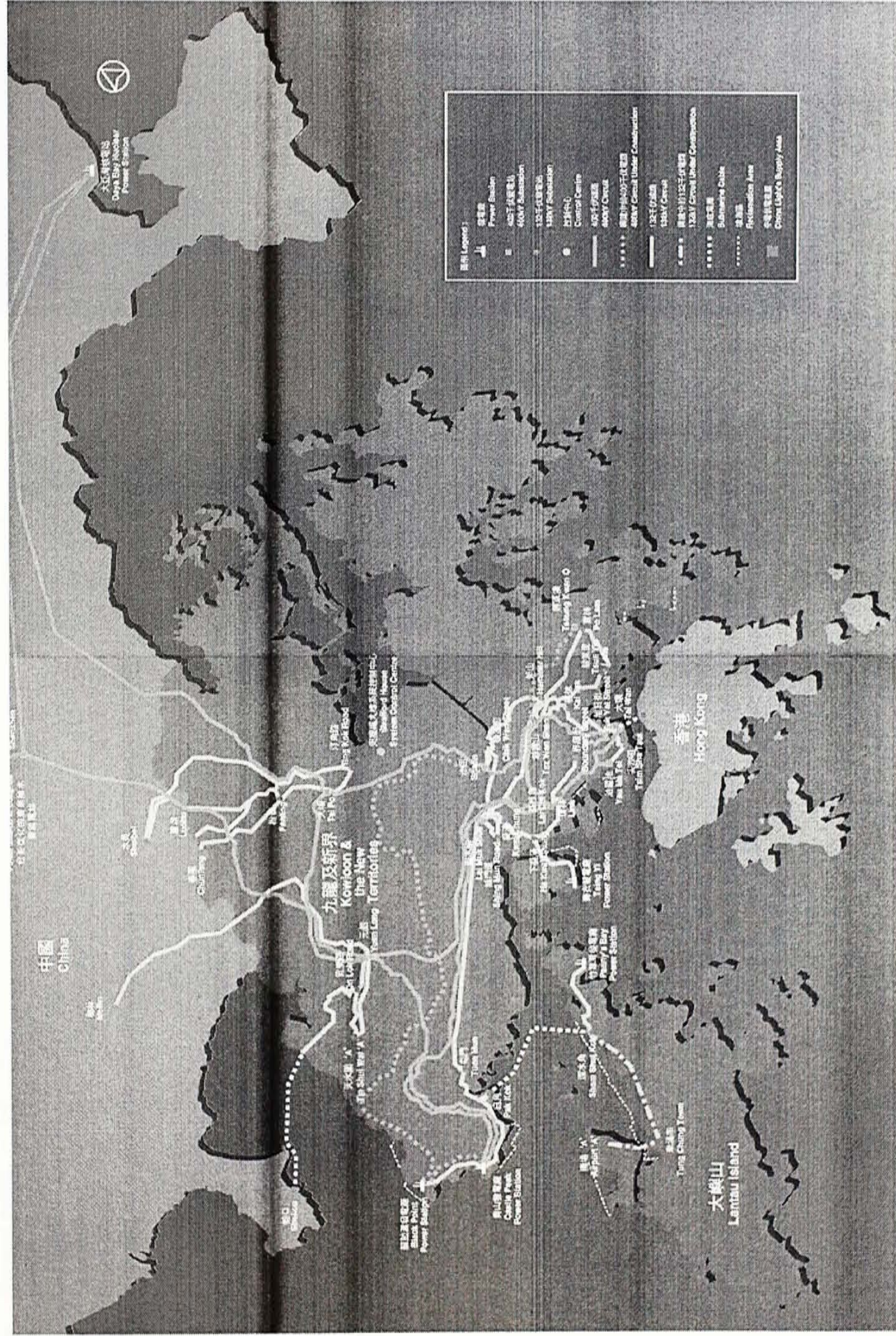


fig 2.3.1 The Mangalore project in India

CHINA LIGHT'S GENERATION and TRANSMISSION FACILITIES<sup>5</sup>





### 2.3.7 Public Relation

There is about 15 staff in Public Relation Division, five main targets for the public relate is as followings;

- General public
- Media
- Legislation Council
- Government
- Stock Market

There should be a good Presentation Centre for information release function.

### 2.3.8 Human Resources

In July 1995, the new Performance Management System is introduced in China Light. The system is designed to help develop its employees. Individual strengths can be identified through the system, which then allows China Light to consider the best method, such as training and special job assignments, to encourage these strengths. The outcome is hopefully to promote capable employees to higher positions where they can best develop their potential.

The target of China Light is to provide 5% of the working time for training time of their staff.

There is **training centre** in Sham Sui Po office, Shatin Centre, also in Tai Po,. There is some on-site training for the staff, e.g. computer stimulation for the generator plant, climbing of electrical tower. By the way, there is also some conference for more than hundred of staff.

Form the employees point view, they need a more pleasant, adventure feeling in the training place. They can relax and enjoy chattering with each other. It is one of the good chance for them to exchange.

### 2.3.9 Re-engineering Coporation<sup>6</sup>

One of the major change which affect the company the most is the implementation of the Concept of **Re-engineering Productive Business (RPB)**. This concept has been adapted by many co-operation in the world. The ideas could be traced back which origin in Japan. Later, many United States Company have to go into the same route since the completion from different aspects.

In China Light, idea of team-working, multi-skill of staff will be the mainstream in near future. The concept of the structure and office space in China Light will undergo a revolution. Document Management System (DMS) have been applied in CLP. Workflow concept and paper less office would be happened in China Light. A work team have be established in transmission division to study the possibility and the requirement for the DMS. In near future all document, drawing can be stored in advance format which can save a lot of space.

## IMAGE OF THE EXISTING HEADQUARTERS

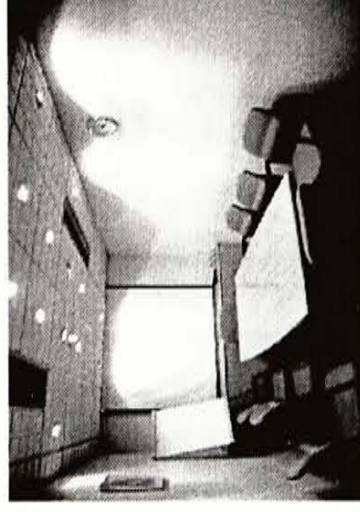


fig 2.4.1 The Common Conference Room

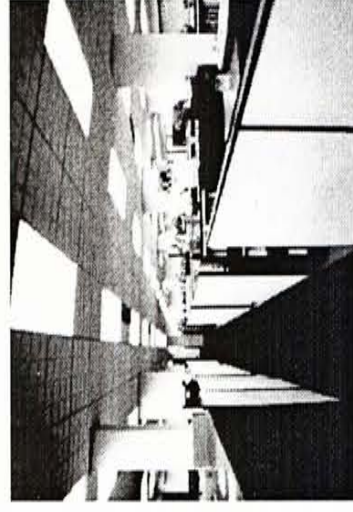


fig 2.4.2 The circulation and typical office area



fig 2.4.3 The customer service centre in headquarters

## 2.4 Study on existing headquarters

In 1940s, the headquarters first built, there is only the eastern portion of the site has been built. Later, the addition is added on the western side and become the nowadays headquarters. There is about 300 employees, the Managing Director, the 5 General Managers is working in the headquarters. The three bay is connected later and become a whole complex.

### 2.4.1 Activities studies

- Every Thursday, there will be regular meeting for the managers held in the Headquarters, there is also many **cross department** meeting held time by time.
- There is a lot travel for these manager as well as other staffs travel place by place, such as the Tai Po Centre, Tsing Yi, etc.
- The **car group** of China Light may be **largest** in Utilities Company among Hong Kong, some for construction work and some for operational meeting and visit.
- There is customer service counter of the entrance of the building. Then the staff can enter the office space through a big door guarded by the security.
- Public can apply the electricity supply and pay the bill there.

### 2.4.2 Spatial

- There is 3 storey in the headquarters, with a strip of northern portion of the site is for car parking.
- Some of the floor is not totally connected, so it is little difficult to go from one place to another.
- There is **lack of spatial variety** between department and department, office space and circulation.
- There is not much spatial interest in existing office space.

### 2.4.3 Facilities

- The office is **computerized** in LAN.
- Most of the facilities is divided by department and run individually.
- MSD is the department which manage the LAN in the Office

### 2.4.4 Physical environment

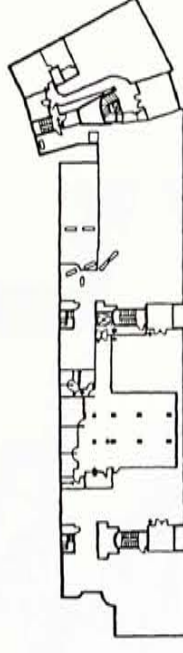
- Most of the office space is **lack of natural light**.
- The Managers' office is quite attractive, with two side window and spacious lobby.
- Most of the working space of employees is **relatively crowd**.
- There is **lack of common space** for communal purpose
- The manager conference room is traditional with one side window.
- The ordinary conference room is lack of natural lighting.

### 2.4.5 Comment form users

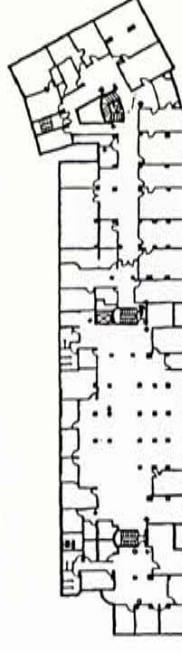
- Most of their lunch is outside, the canteen is only provided the micro-ware cooker.
- The building is quite old and not well-equipped enough.
- It is difficult for the circulation between three bay of the building.

## FLOOR PLAN OF THE EXISTING HEADQUARTERS

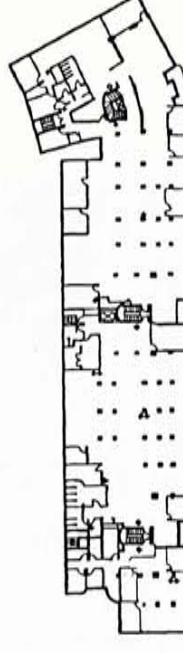
THIRD FLOOR PLAN



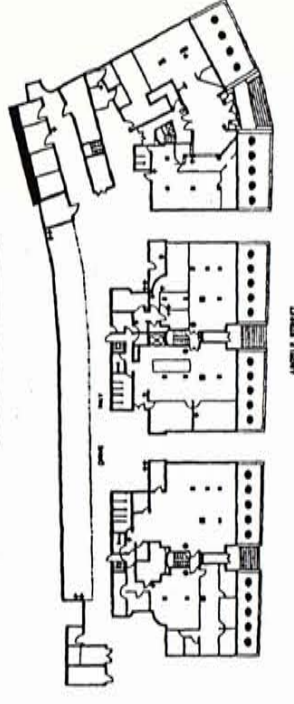
SECOND FLOOR PLAN



FIRST FLOOR PLAN



GROUND FLOOR PLAN



## 2.4.6 Other Offices

Argyle Street Headquarters is the **origin** of the office organization of China Light. Most of the department was located in Argyle Street in past. However, the company expand, the office of some of the department have to spread out to other area as not enough space in the existing Headquarters.

There are five major office of China Light

- Argyle Street Headquarters
- Sham Sui Po
- Yau Ma Tei
- Tsz Wan Shan
- Shatin

Among the above five, Yau Ma Tei is a **rental office** and all the other is the properties of China Light. Most of the International Development division is situated in the Yau Ma Tei office.

Up to now, there is no concrete plan to develop an new office for China Light to centralize these offices. There is also no plan to relocate and modify the department which work at the Headquarters in near future.

If the China Light really go to centralize the office space, there will be possible to house **1000** staff in the central office. The Technical division like :Generation, Transmission and Distribution should be located individual.

## IMAGE OF THE EXISTING HEADQUARTERS



fig 2.4.4 The Manager Conference Room

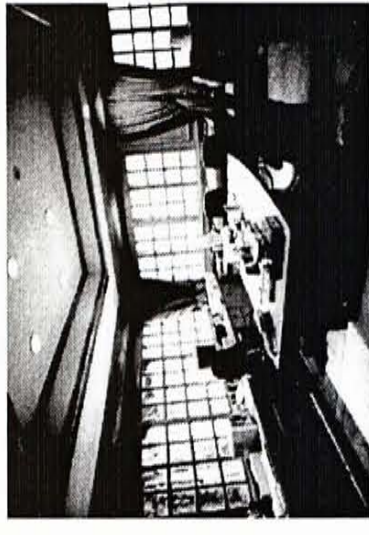


fig 2.4.5 The Manager office



fig 2.4.6 The Manager's secretary

## 2.5 Study of Display Area of China Light and Power

### CLP Delight Centre

CLP Delight centre is the multi-purposes centre of Distribution and Customer Service Group. It is a central and directly contact from China Light to its customers.

- It is the concept of "One stop shop service" which means customers can come to the centre and made many thing at a time.
- Public can apply electricity , pay the bill, change the account and stop the account and other customer service in the centre.
- There is consisted a exhibition gallery for electrical appliance.
- There will be some cooking course especially non-flame cooking and interest course for public
- There is also a demonstration centre to tell public how is the electrical life.

Another major purpose of the centre is to tell the interesting, convenient and comfort bring from electricity to the customer, hopefully will be appreciate by them.

The concept of the learning course and demonstration is very new to China Light, it is only the initial stage. The student mostly come Kowloon, some of them come from Hong Kong, and New Territories.

There is a lecture room for several purpose, such as meeting and conference from other organization apart from China Light. There is also a cooking classroom for the cooking course.

It is prefer to have such facilities in more different location rather than a big centralize one.

### Castle Peak Generation Station

There is many school visit are arrange with China Light in Castle Peak station. Most of the school, student is arranged by Rental bus to visit the station once a year.

Student can learn the process of the electricity generating process and related knowledge

Advantage:

Student can come to the Generating Plant to see the process of electorate generating directly.

Disadvantage:

The location of the Generation Station is quite away from urban. The traffic to the site should be more difficult.



fig 2.5.1 Delight Centre



fig 2.5.2 Exhibition space in Centre

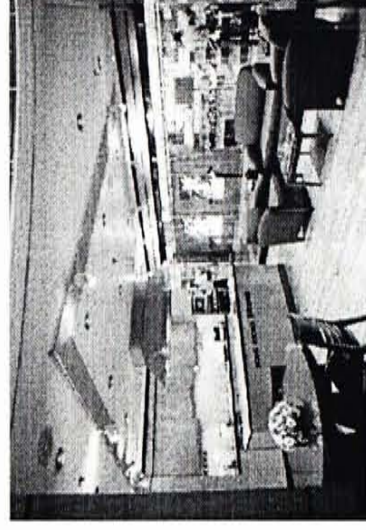


fig 2.5.3 Cooking classroom in Centre

<sup>1</sup> China Light and Power Company, Limited: Annual Report 1995  
Web site: [www.chinalightandpower.com.hk](http://www.chinalightandpower.com.hk)

<sup>2</sup> Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982

<sup>3</sup> China Light and Power Company, Limited: Annual Report 1995

<sup>4</sup> China Light and Power Company, Limited: Annual Report 1995

<sup>5</sup> Fact and Issues, China Light and Power Company, Limited 1996

<sup>6</sup> Michael Hammer and James Champy, *Reengineering the Corporation ,manifesto for business revolution*, 1993 HarperBusiness New York

## **SITE ANALYSIS**

- 3.1 Site History
- 3.2 Development Control
- 3.3 General site Issue
- 3.4 Geographical Studies
- 3.5 Environmental Awareness
- 3.6 Solar Shading Studies
- 3.7 Traffic Assessment
- 3.8 Density Studies

The address of the site is 139-147 Argyle Street, Ho Man Tin Lot number, Kowloon inland Lots KIL 6005, KIL6035, KIL6036, KIL6037, KIL6038

### 3.1 Site History

The headquarters at the intersection of **Argyle Street and Waterloo Road** were completed in 1940, where upon the offices of the manager, the executive staff, and most of the accounts department and large portion of the distribution department were moved there from Kowloon Tong substation where, for many a year, they had been making a lot of improvement in accommodation. On the north of the street is **Kadoorie Avenue**, which is also the name of Kadoorie Family.

Many years ago, the senior staff of China Light have considered to redevelop the site. However, these feasibility studies have been turned down since the financial implication.

### 3.2 Development Control

The total site area: 6600 sq.m (approximately)  
Existing Total GFA: 7700 sqm (approximately)

#### Planning Control

According to Town Planning in Hong Kong published by Building and Lands Department in 1988.

#### Areas of special control for Kowloon and New Kowloon (SCA)

There is **no special restriction** on building development

#### Density zoning-Kowloon and New Kowloon

It is class as **Zone 2** of Density Zoning :medium dense area.

According to Outline Zoning Plan produced by Building and Lands Department (May 1995)

- It is classified as **Residential B**.
- It is forbidden to develop commercial use. When we going to develop this site as **Utilities Office** use, an Planning Report may have to submit to Town Planning Board.
- Development in these area are subject to a maximum **plot ratio** of 5.0.

#### Building Regulation Control

According Building (planning) Regulation

The site is abutting two street, which classified as Class B site.

The permitted plot ratio: 15

The permitted Site Coverage: 62.5%

However, it is subjected to Town Planning Board comment and Building and Lands Department control.

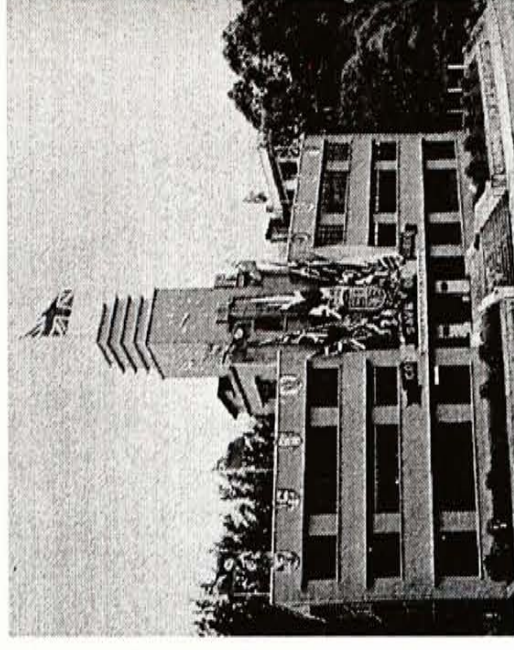
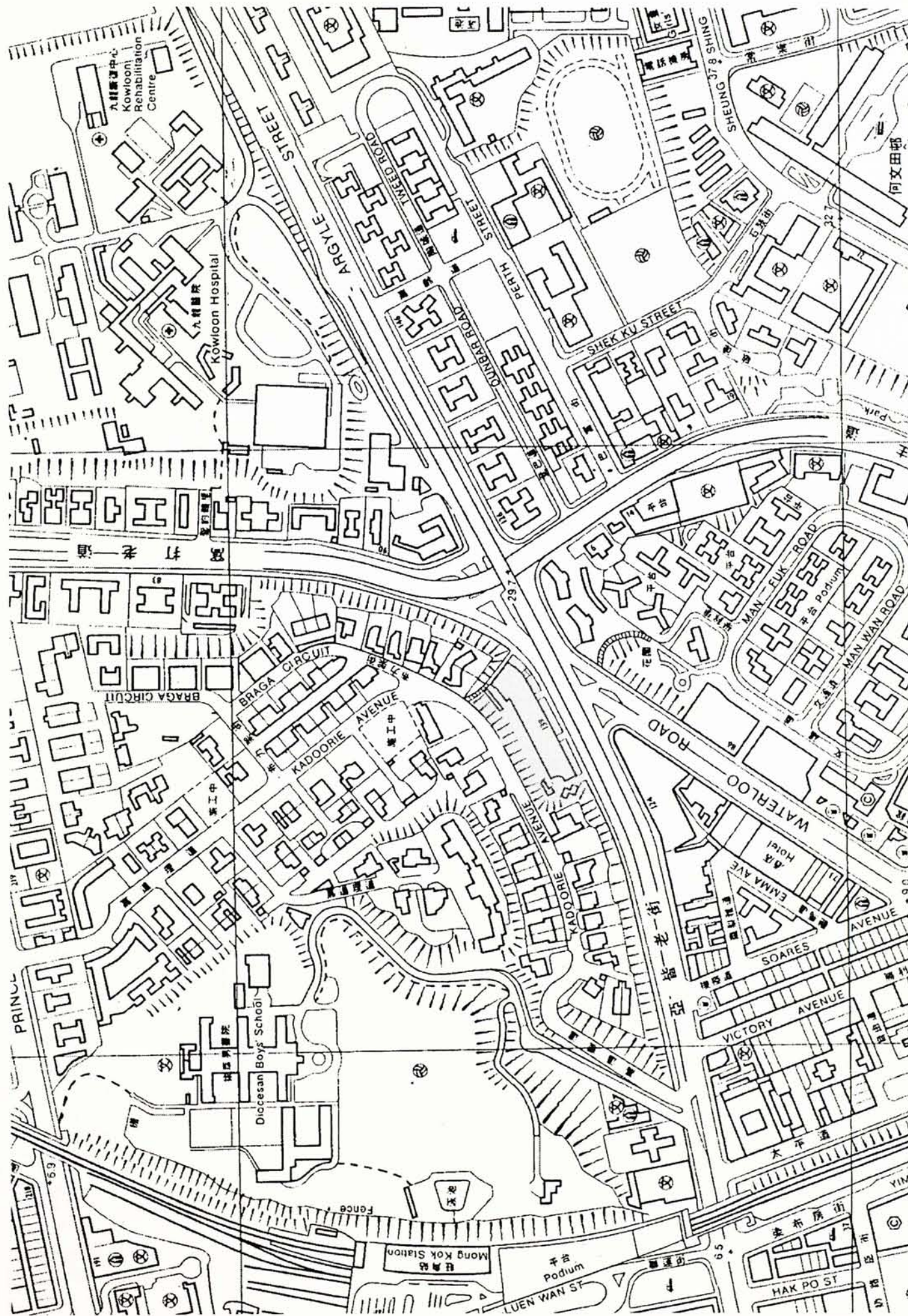
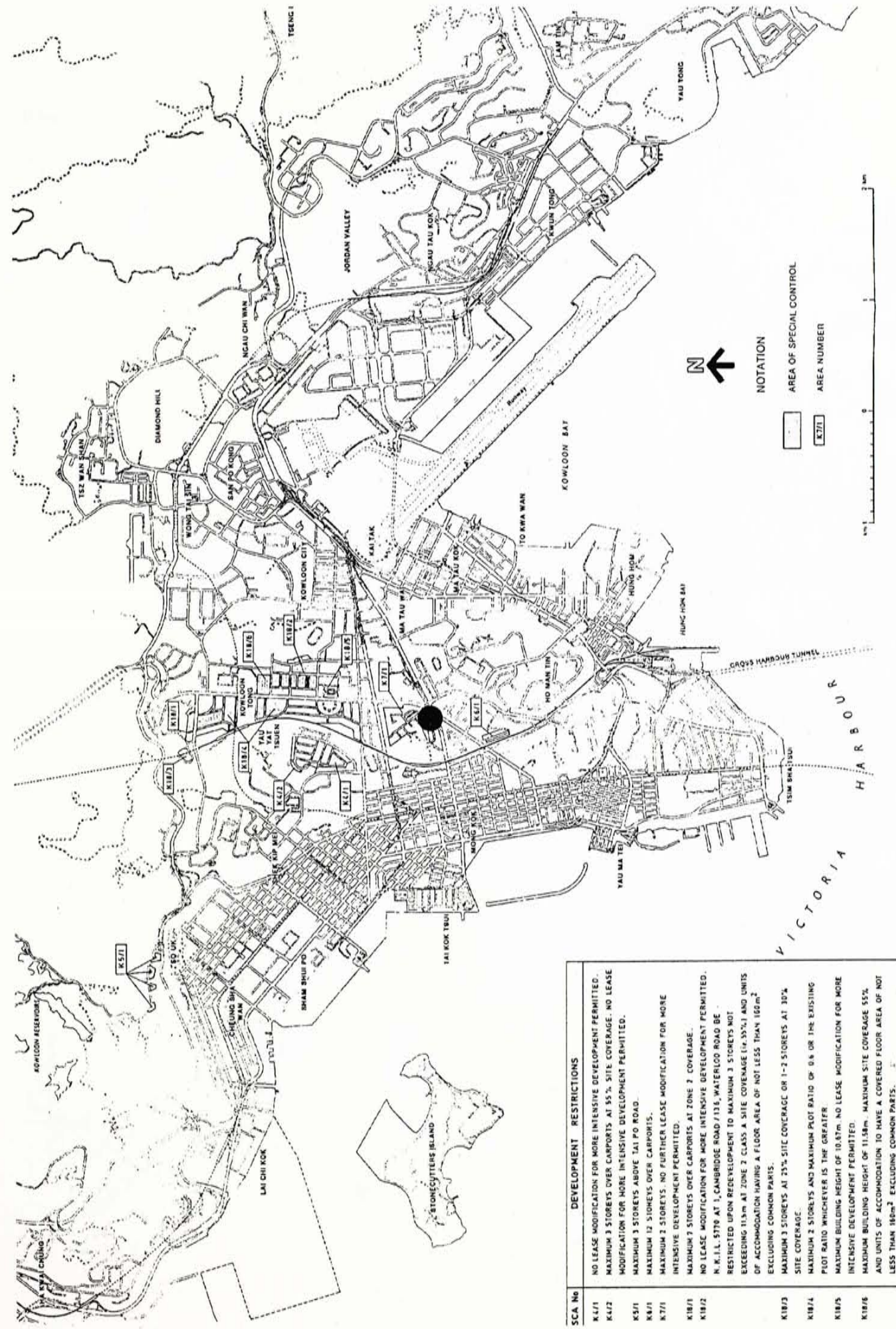


fig 3.1.1 The site Headquarters in 1950s



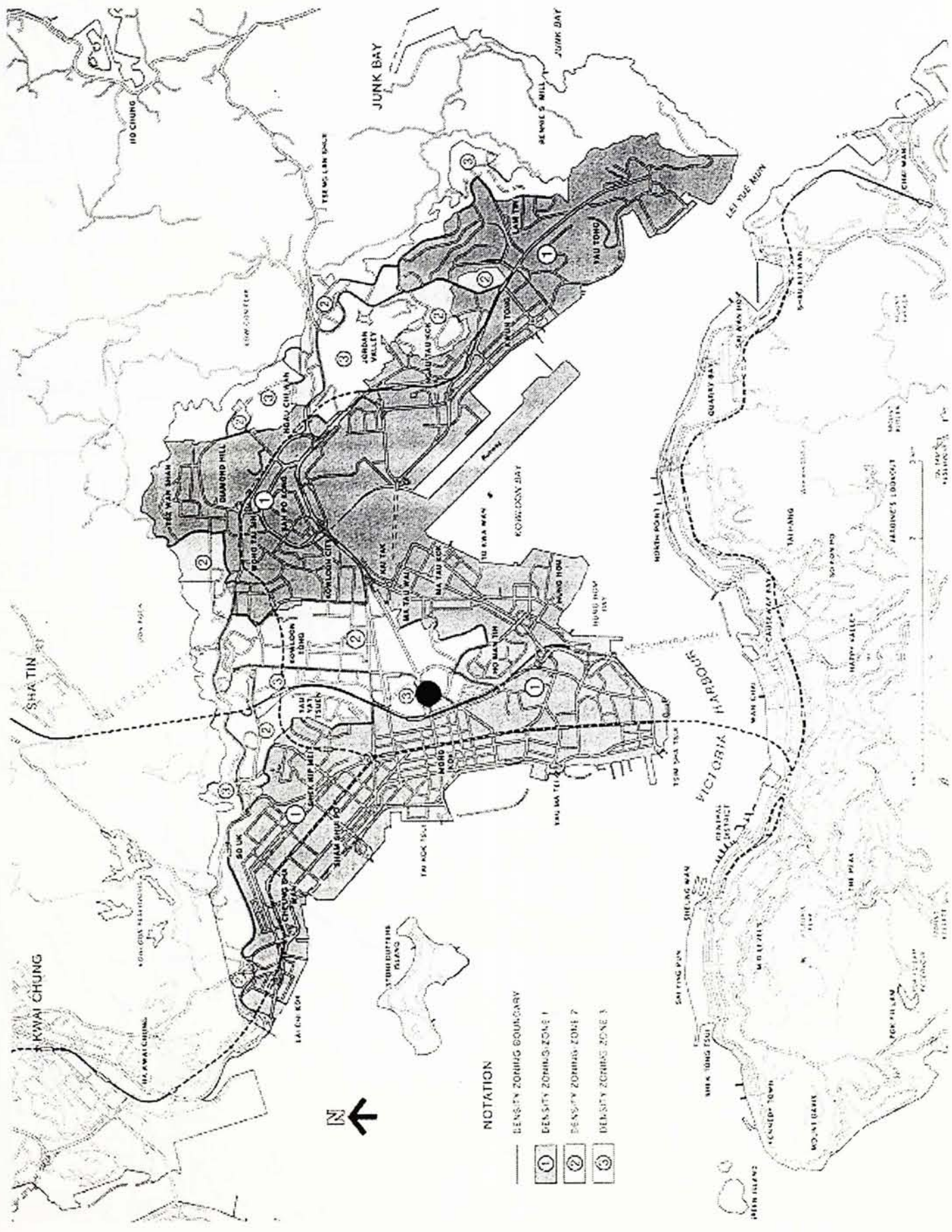
LOCATION PLAN



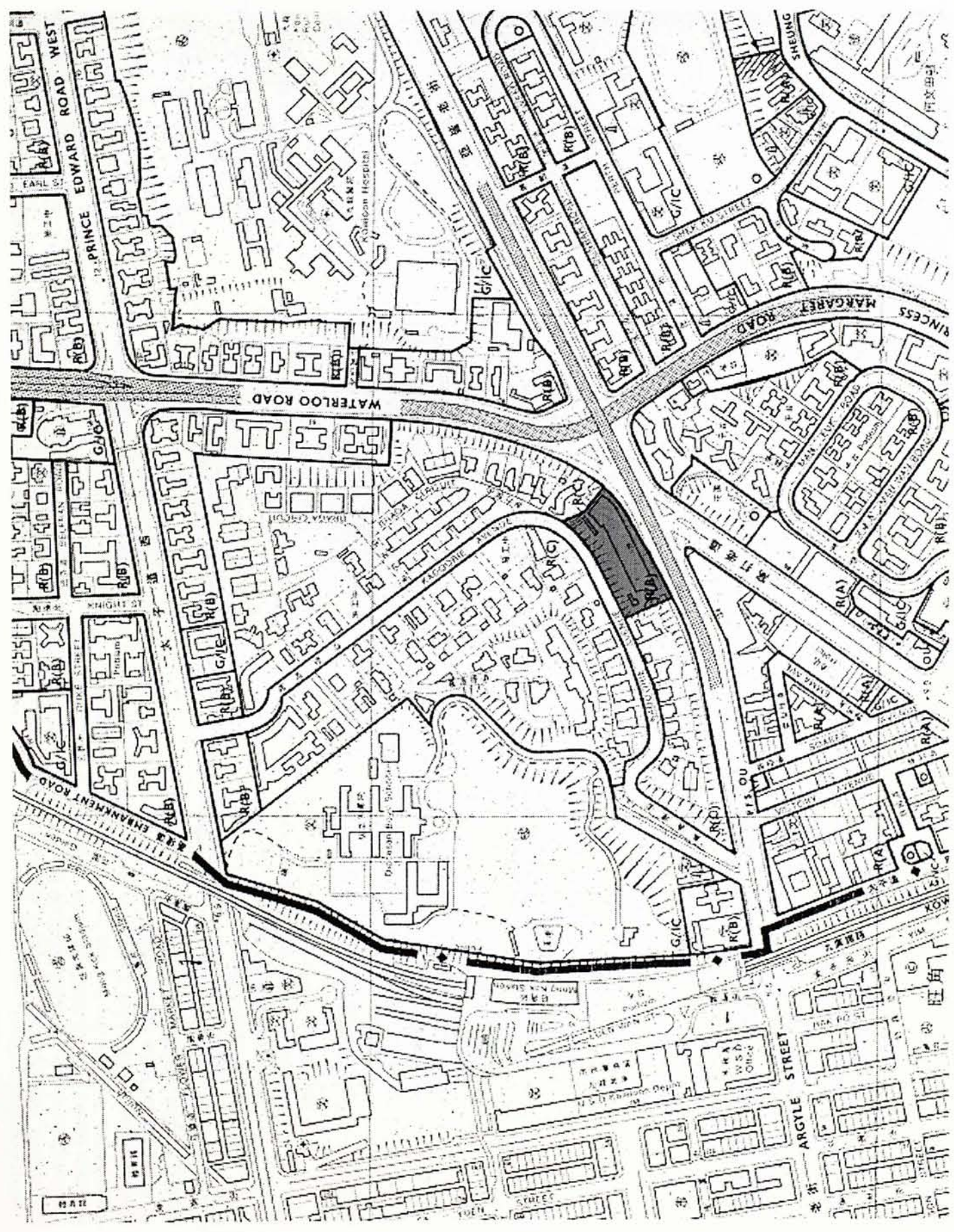


SCA No	DEVELOPMENT RESTRICTIONS
K1/1	NO LEASE MODIFICATION FOR MORE INTENSIVE DEVELOPMENT PERMITTED.
K1/2	MAXIMUM 3 STOREYS OVER CARPORTS AT 55% SITE COVERAGE. NO LEASE MODIFICATION FOR MORE INTENSIVE DEVELOPMENT PERMITTED.
K1/3	MAXIMUM 3 STOREYS ABOVE TAI PO ROAD.
K1/4	MAXIMUM 12 STOREYS OVER CARPORTS.
K1/5	MAXIMUM 2 STOREYS. NO FURTHER LEASE MODIFICATION FOR MORE INTENSIVE DEVELOPMENT PERMITTED.
K1/6	MAXIMUM 7 STOREYS OVER CARPORTS AT ZONE 2 COVERAGE.
K1/7	NO LEASE MODIFICATION FOR MORE INTENSIVE DEVELOPMENT PERMITTED. N. K. I.L. 979 AT 1, CAMBRIDGE ROAD / 113, WATERLOO ROAD BE RESTRICTED UPON REDEVELOPMENT TO MAXIMUM 3 STOREYS NOT EXCEEDING 11.5m AT ZONE 2 CLASS A SITE COVERAGE (14.35% I AND UNITS OF ACCOMMODATION HAVING A FLOOR AREA OF NOT LESS THAN 160m <sup>2</sup> EXCLUDING COMMON PARTS.
K1/8	MAXIMUM 3 STOREYS AT 25% SITE COVERAGE OR 1-2 STOREYS AT 30% SITE COVERAGE.
K1/9	MAXIMUM 2 STOREYS AND MAXIMUM PLOT RATIO OF 0.6 OR THE EXISTING PLOT RATIO WHICHEVER IS THE GREATER.
K1/10	MAXIMUM BUILDING HEIGHT OF 10.67m. NO LEASE MODIFICATION FOR MORE INTENSIVE DEVELOPMENT PERMITTED.
K1/11	MAXIMUM BUILDING HEIGHT OF 11.88m. MAXIMUM SITE COVERAGE 55% AND UNITS OF ACCOMMODATION TO HAVE A COVERED FLOOR AREA OF NOT LESS THAN 160m <sup>2</sup> EXCLUDING COMMON PARTS.

Areas of special control for Kowloon and New Kowloon (SCA)



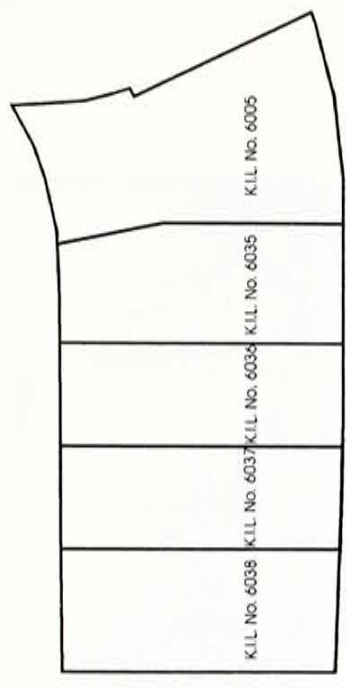
Density zoning-Kowloon and New Kowloon



OUTLINE ZONING PLAN

**Lease Control**

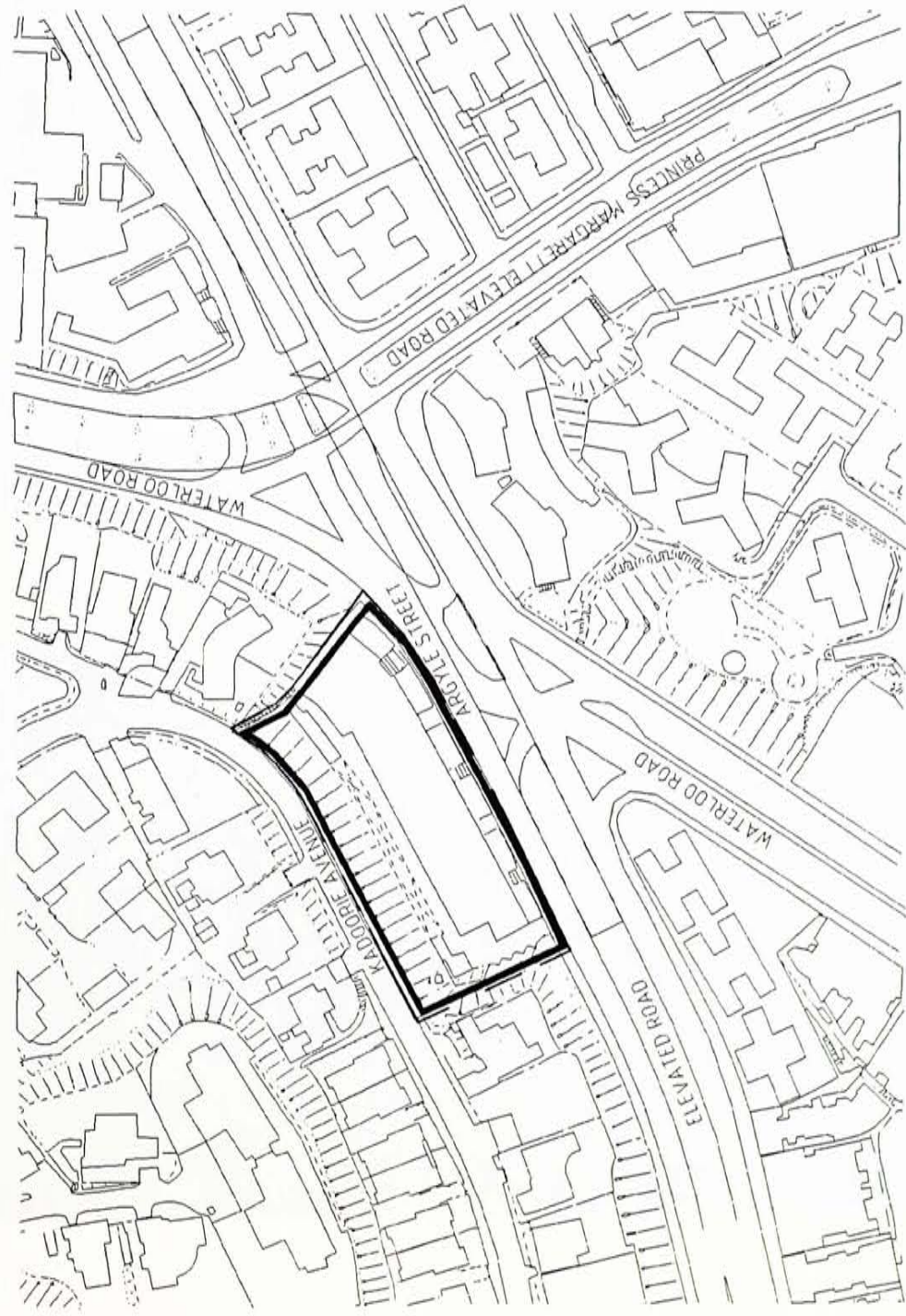
Lot number, Kowloon inland Lots KIL 6005, lease signed on 24 Nov 1948  
 Kowloon inland Lots KIL6035, KIL6036 lease signed on 28 Aug 1959  
 Kowloon inland Lots KIL6037, KIL6038 lease signed on 30 Sept 1968  
 From 16 Nov 1931 All the five lots have to renew after 75 years  
 Five Lots are restricted for 3 storey European House development, but all the lots have obtained approval of **modification** to be use as **office**.  
 Among the five lots, there is similar lease control.



Block Plan of the site

Usage	"Business of a Brazier Slaughterman Soap-maker, Sugar-baker Fellmonger Melter of tallow Oilman Butcher Distiller Victullar or Tavern-keeper Blacksmith Nightman Scavenger or any other noisy noisome or offensive trade or business whatever without the previous licenece of His said Majesty signified in writing by the Governor or other person duly authorized in that behalf."
Deposit	"And will not deposit any excavated earth either upon the said piece or parcel of ground or upon any adjoining Crown Land which the lease shall have obtained authority so to utilize in such manners as shall expose the slopes of such excavated earth to be eroded and washed down by rain and will properly turf and if necessary secure such slopes by means of masonry toe walls and will remove all refuse matter daily from the said piece or parcel of ground and will not allow any sewage or refuse water to flow from the said piece or parcel of ground."
Building form	"Any building other that detached or semi-detached residential premises of European type or such other buildings of European type as the said Director may approve with garages and all proper and relevant outbuildings thereto and shall not use or permit to be used without the consent in writing of the Governor in that behalf first had and obtained any building or buildings now or at any time erected or being on the said piece or parcel of ground otherwise than for the purpose of a private dwelling house and shall obtain the approval of the said Governor to the design of the exterior elevations the plans height and disposition of any building or buildings which it may be at any time proposed to erect." "3 storey European House.
Slope protection	"Any cutting away of hill to level or develop the site or to protect any filling in connection with the same and should a landslip occur as a result of such cutting leveling developmnet of filling will be responsible."
Others	"Necessary to intercept and carry off storm water falling upon or flowing" "Shall not remove any trees from the said piece or parcel of ground that in case any trees shall interfere with building operations."

3.3 General site Issue



Site Plan (1:2500 approx.)

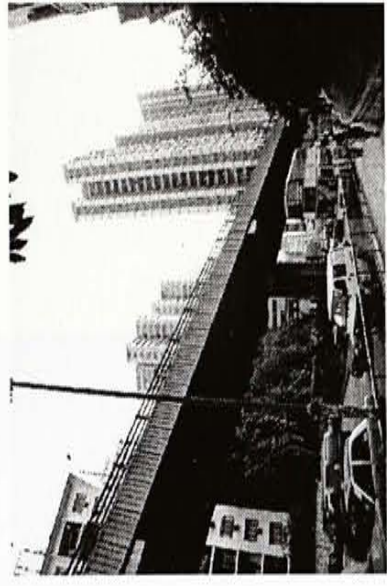


fig 3.3.1 The Rock Surface of the retaining on both side of the facade of the site



fig 3.3.2 The dynamic of the flyover and road along Argyle Street

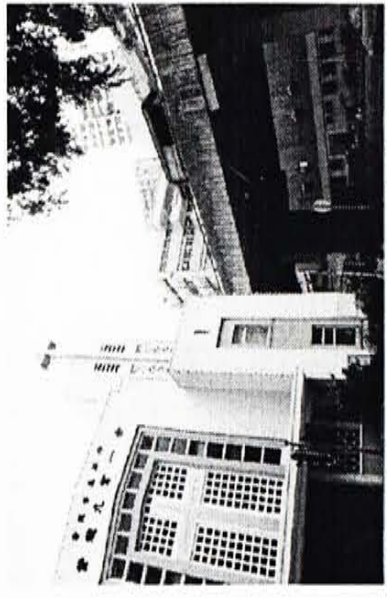
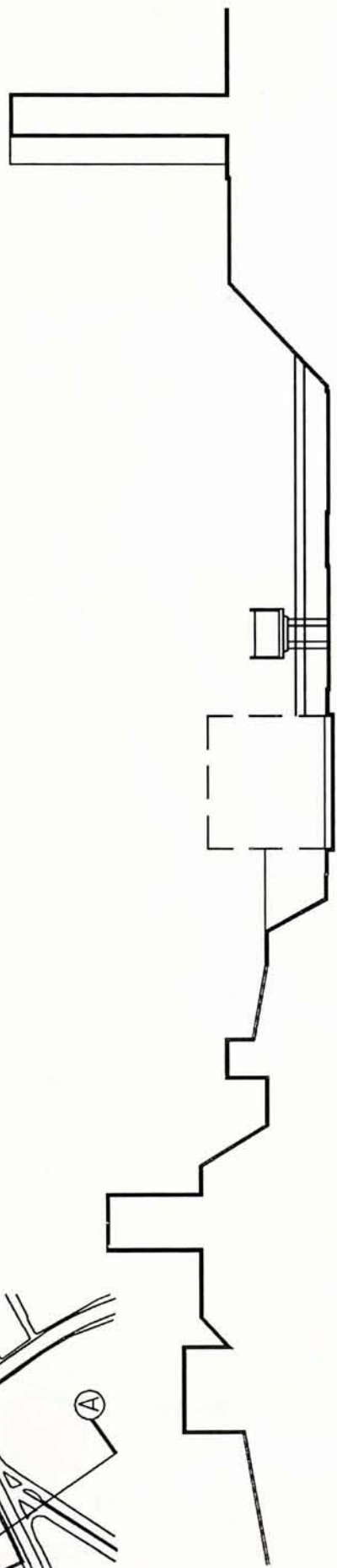
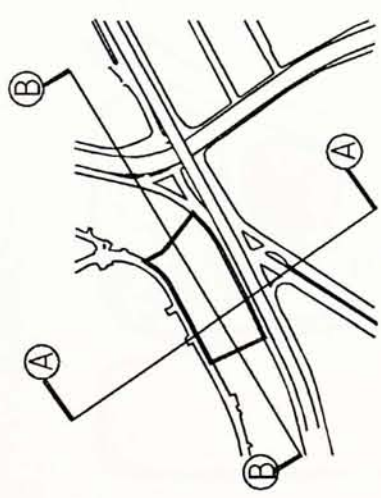


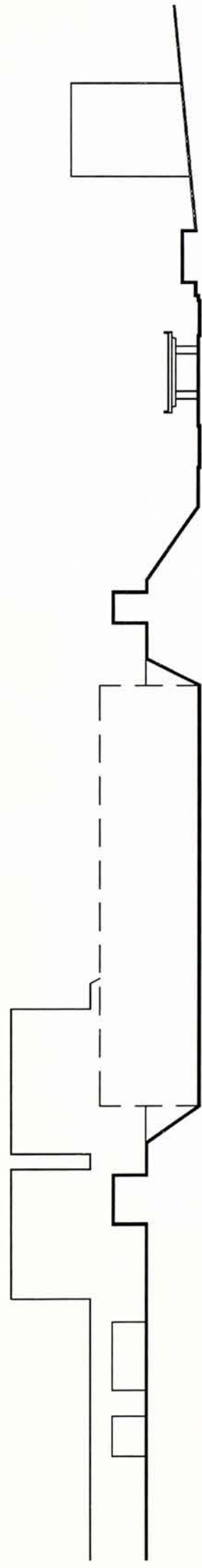
fig 3.3.3 In-between the dynamic flyover, there is some more static and spiritual element, like church and school



Aerial Photo 1996

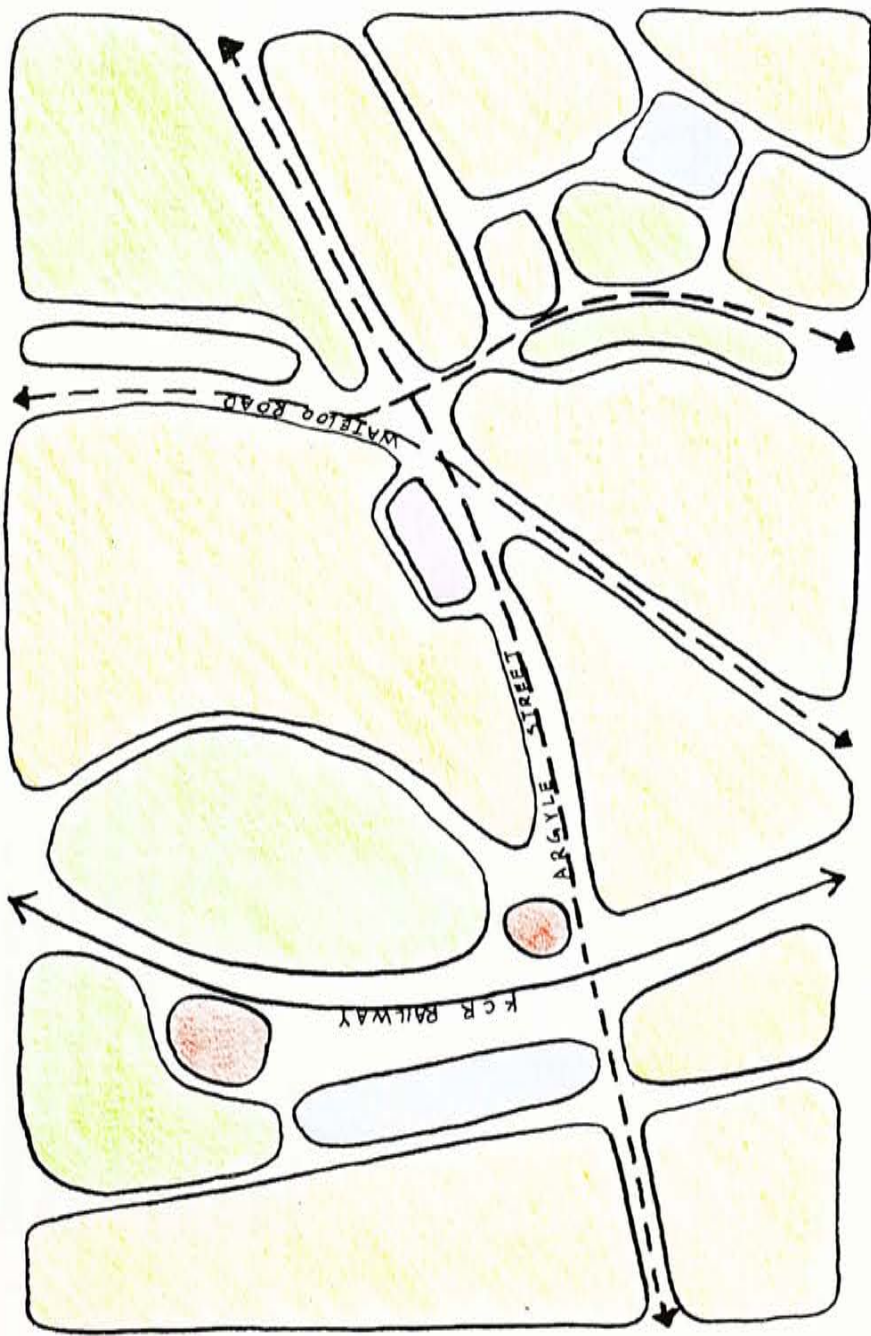


SECTION A - A



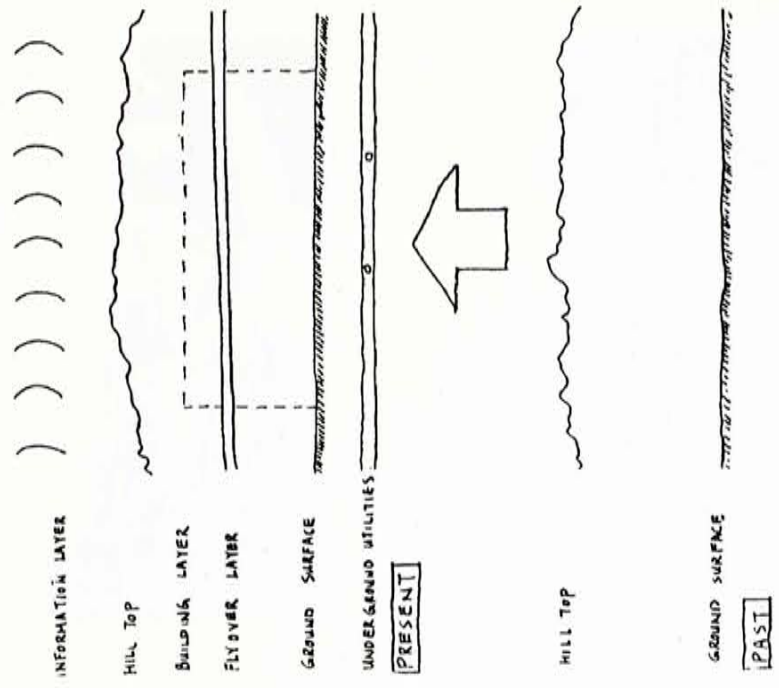
SECTION B - B

Site Section (1:1600)



- Site Location
- Major Residential
- Commercial
- Institution
- Government Utilities

Site Zoning Diagram



Site Vertical Layering



### 3.4 Environmental Awareness

- Compared with other urban areas, the environmental problem in Ho Man Tin is less serious. The Town Planning Board is intend to maintain the existing environmental qualities in the area.
- Most of the land use in this area is for **less dense residential**.
- **Air Quality:** Since the traffic around, the air quality will affect the site a lot, in a general sense, natural ventilation is not prefer in the site.
- **Noise:** The main facade of the headquarters is facing the Argyle Street and the flyover and on the east of the site is the flyover of Waterloo Road, most of the noise will come from there.
- **Shading:** The site is extreme open from south-east side and become open from three storey above from all side.



Acoustic Diagram

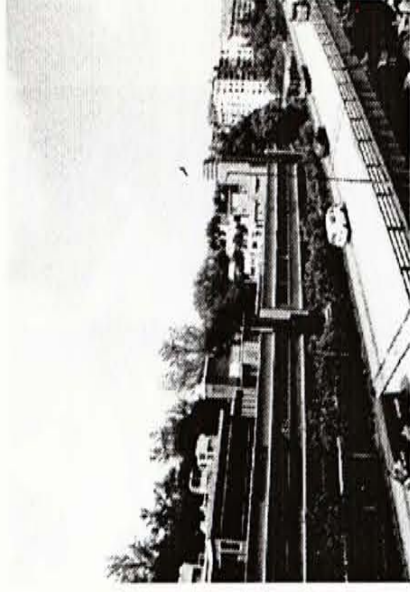


fig 3.4.1 The flyover in front of the site

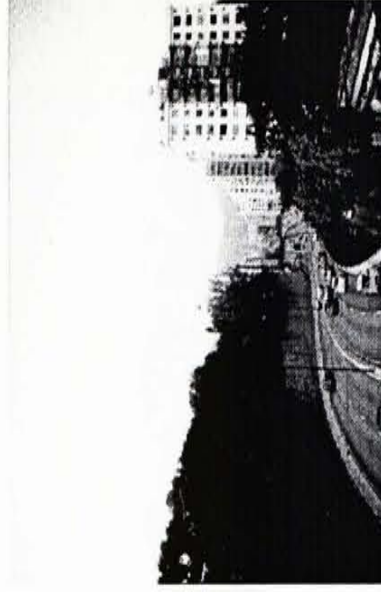
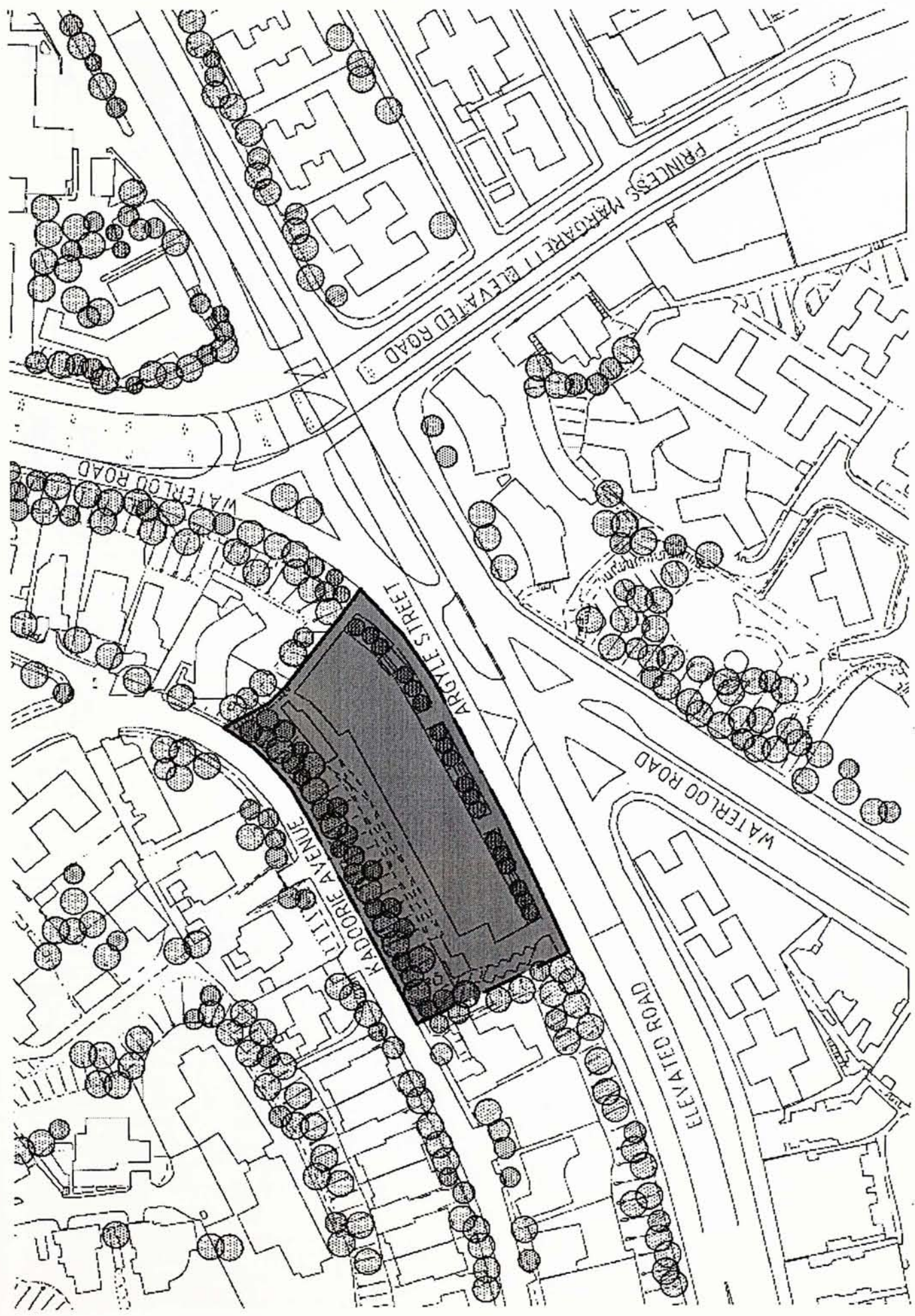


fig 3.4.2 The northern Waterloo Road east of the site

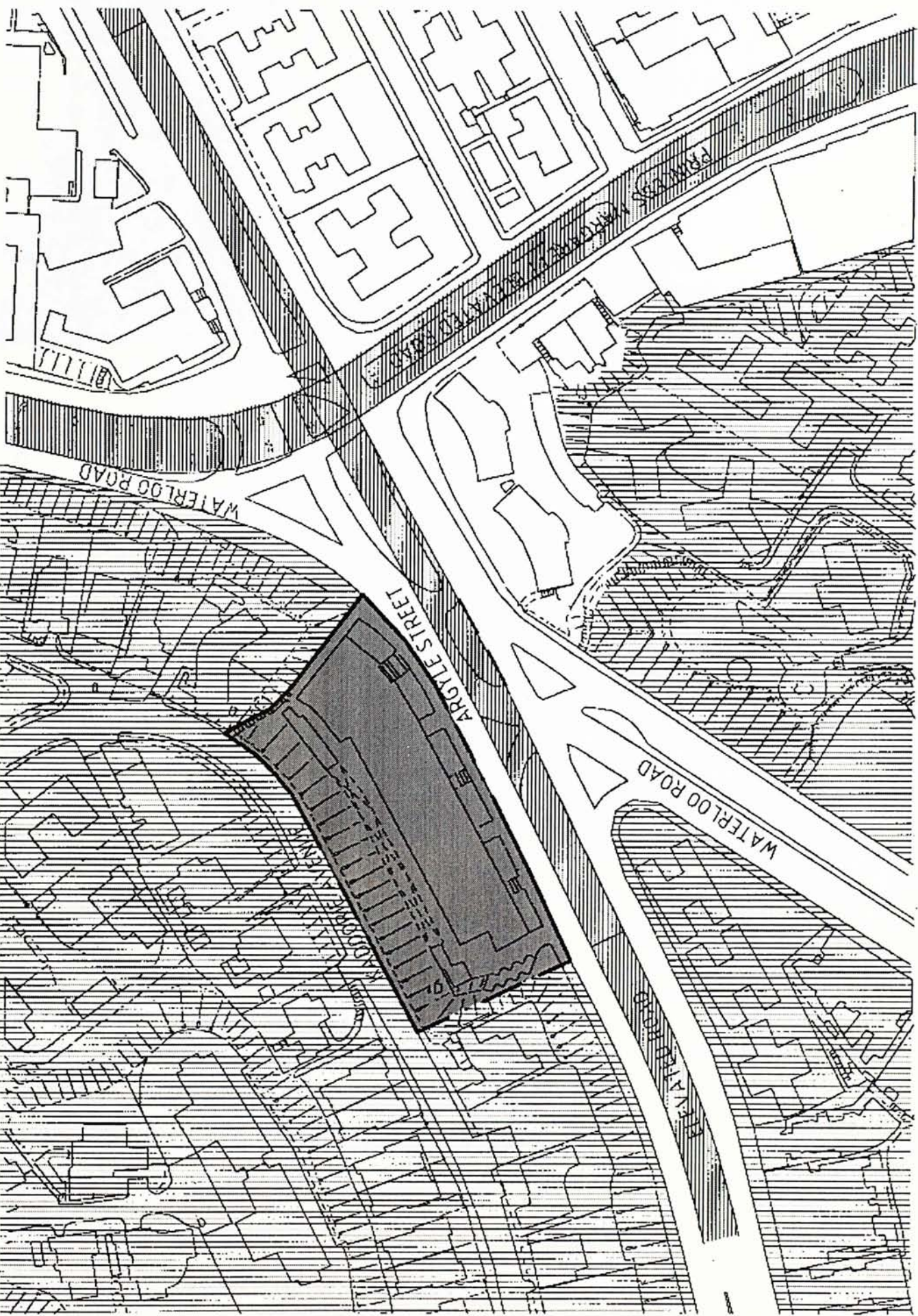


fig 3.4.3 The site surrounding by green





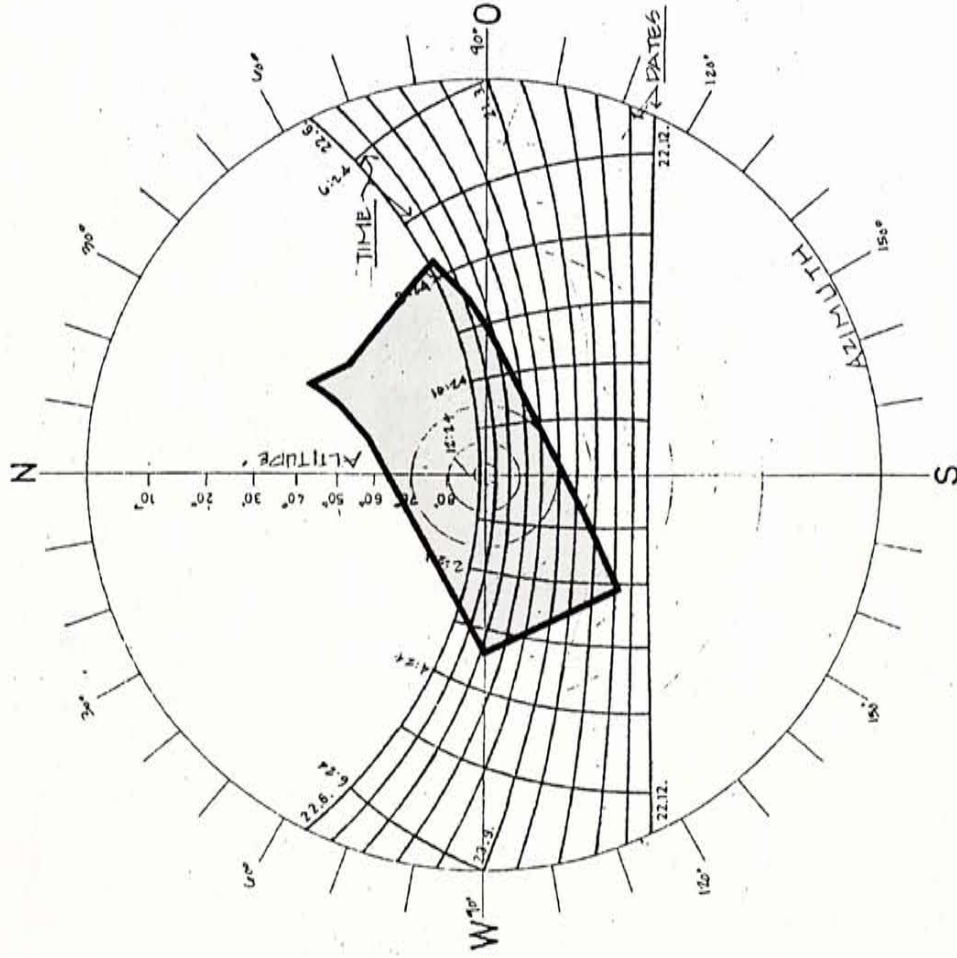
Existing Tree Location Diagram



Plateau Diagram

### 3.6 Solar Shading Studies

The site is very exposed site which is unshaded above three storey. Hence, solar control is an very important for the envelop design.



Solar Diagram

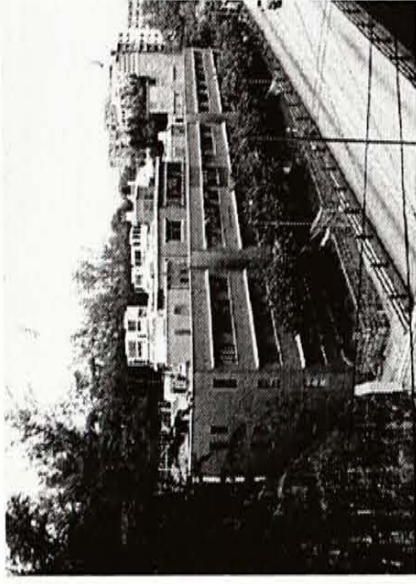


fig 3.6.1 The rare side of the site is shaded by the tree, but on the south front facade is very exposed

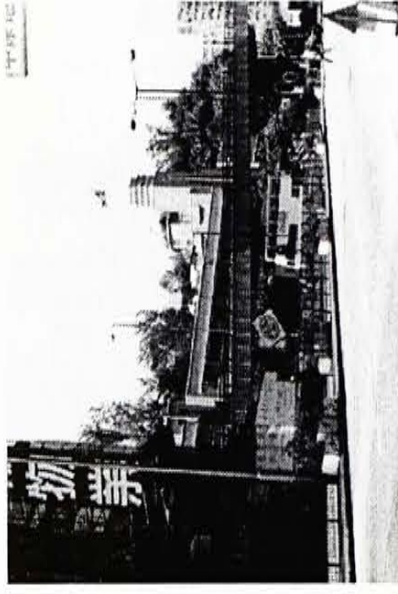


fig 3.6.2 The building is almost unshaded up on 3 storey

### 3.7 Traffic Assessment

By public transport:

- West of the site is the Mongkok **MTR** and **KCR** station
- 8 mins walk from KCR station
- 10 mins walk from MTR station
- There is numerous of **bus** running in Argyle Street and Waterloo Road can reach the site fairly easy.

Density:

- There is very **less traffic** running in **Kadoorie Avenue**.
- The traffic is **quite busy** in **Argyle Street**. When the traffic met the flyover, the traffic is distributed and the traffic release.
- The **vehicle entrance** along the Argyle Street is quite often **crowd** with traffic.
- The maximum plot ratio is restricted in order to **restrain traffic growth** which will otherwise overload the existing road network.

Connection:

- The Princess Road and Waterloo Road jointly make up the Kowloon section and New Territories.
- These two truck roads pass through the area and connect **northwards to North Kowloon**, and the New Territories via the Lion Rock Tunnel, and **southwards to Hong Kong Island** via the cross Harbour Tunnel.
- The **east-west** direction through the peninsula is connected by Argyle Street and Prince Edward Road west.

Accessibility

By private transport:

- The site is easily access form the **south side where the Argyle Street**
- It is also possible to be accessed form the **north side where Kadoorie Avenue**, but the level of Kadoorie Avenue is **13.4 m higher** than that of Argyle Street.

Vehicle Entrance:

- Existing entrance from Argyle Street may not be the most ideal entrance to the site since it is facing a very narrow road next to the flyover.
  - Another possibility for the entrance may be from Kadoorie Avenue, however it may increase the loading of the traffic on the low-dense residential zone.
  - The entrance to the site should be carefully design since the complexity of the traffic of the location.
- Comment from Transport Department: it may not be most ideal to entrance the site from Kadoorie Avenue (refer to Appendix b) Pedestrian Entrance
- Most public will entry the building on the Argyle street.
  - Unlikely the people will entry the site from Kadoorie Avenue since not public transport are located on this side.



fig 3.7.1 The flyover of Argyle Street

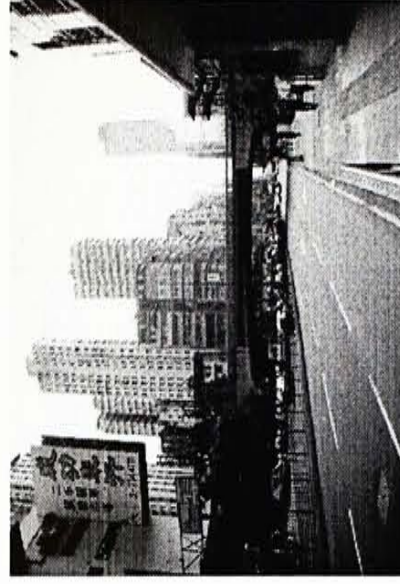
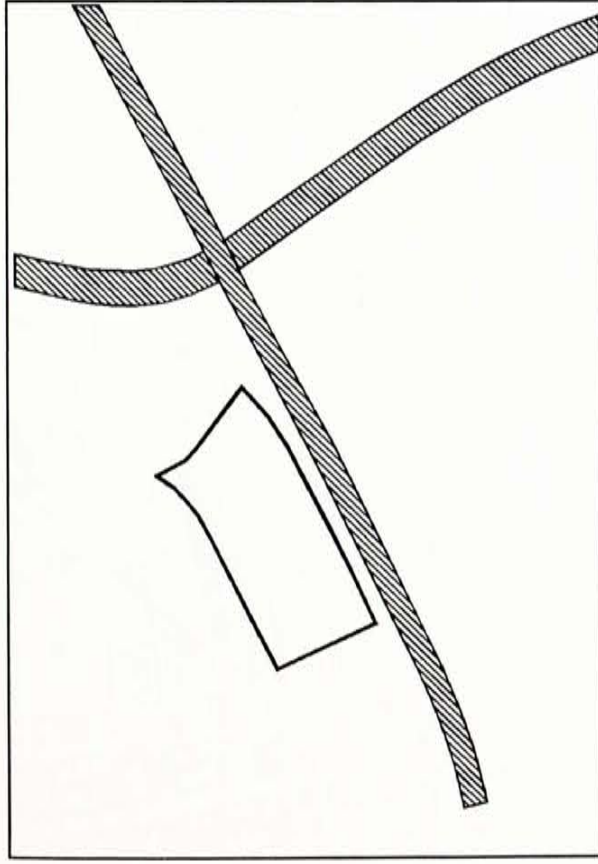
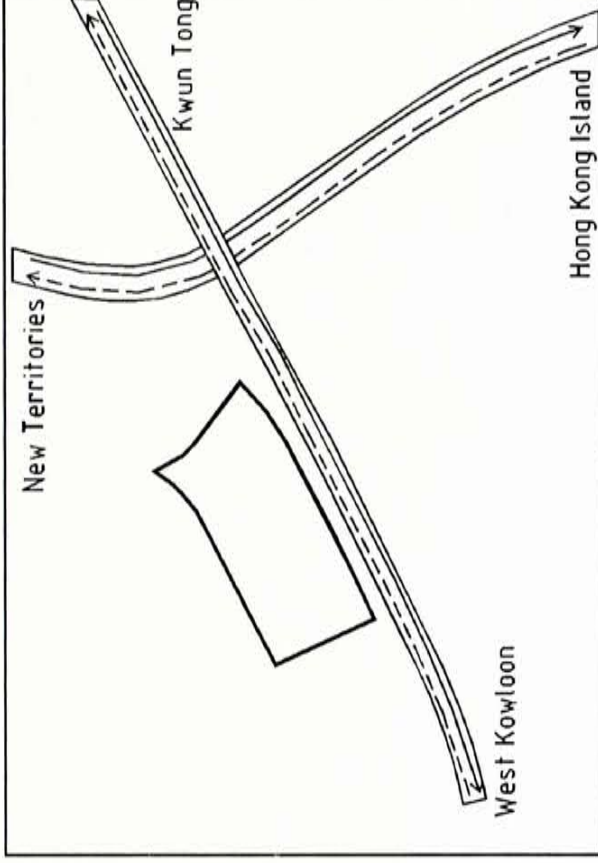


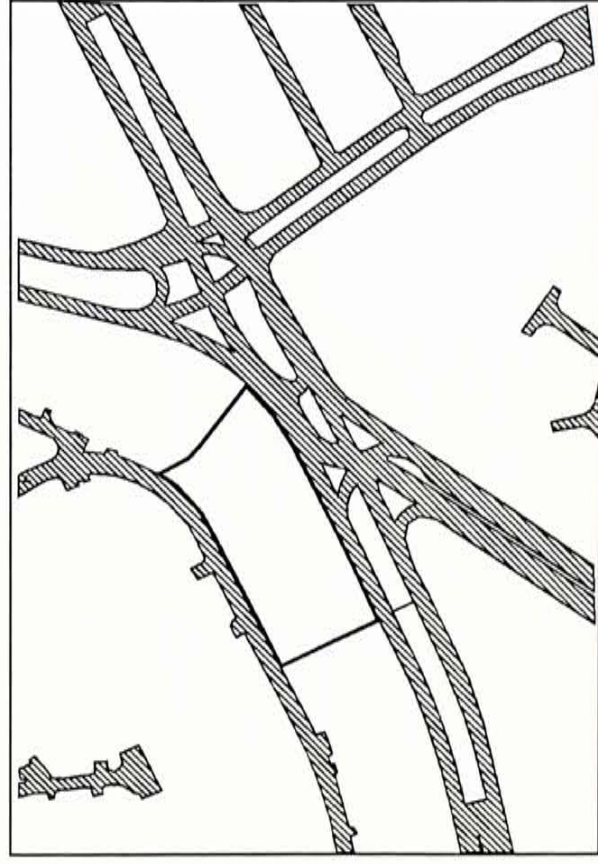
fig 3.7.2 The Argyle Street running toward Mongkok. In far distance, the KCR railway crossing the road



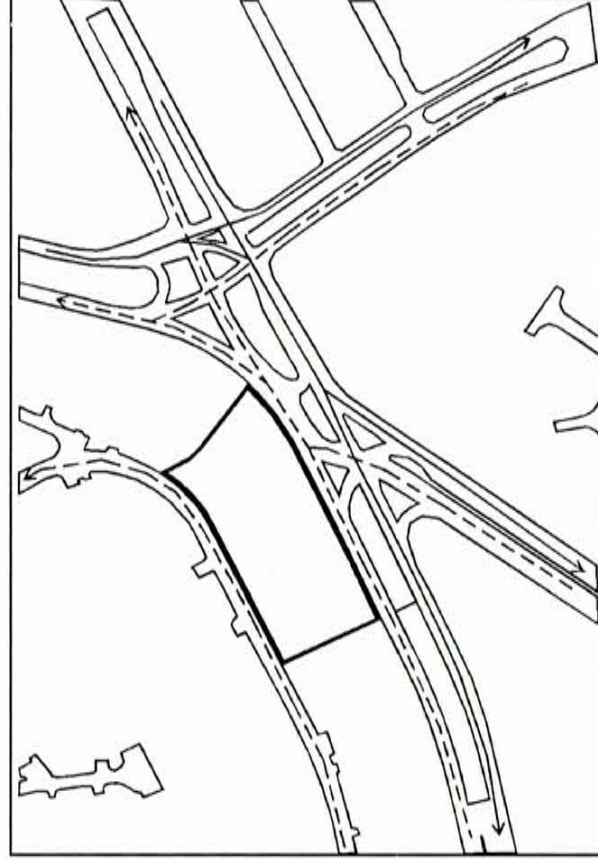
UPPER LEVEL TRAFFIC SPACE



UPPER LEVEL TRAFFIC ROUTE

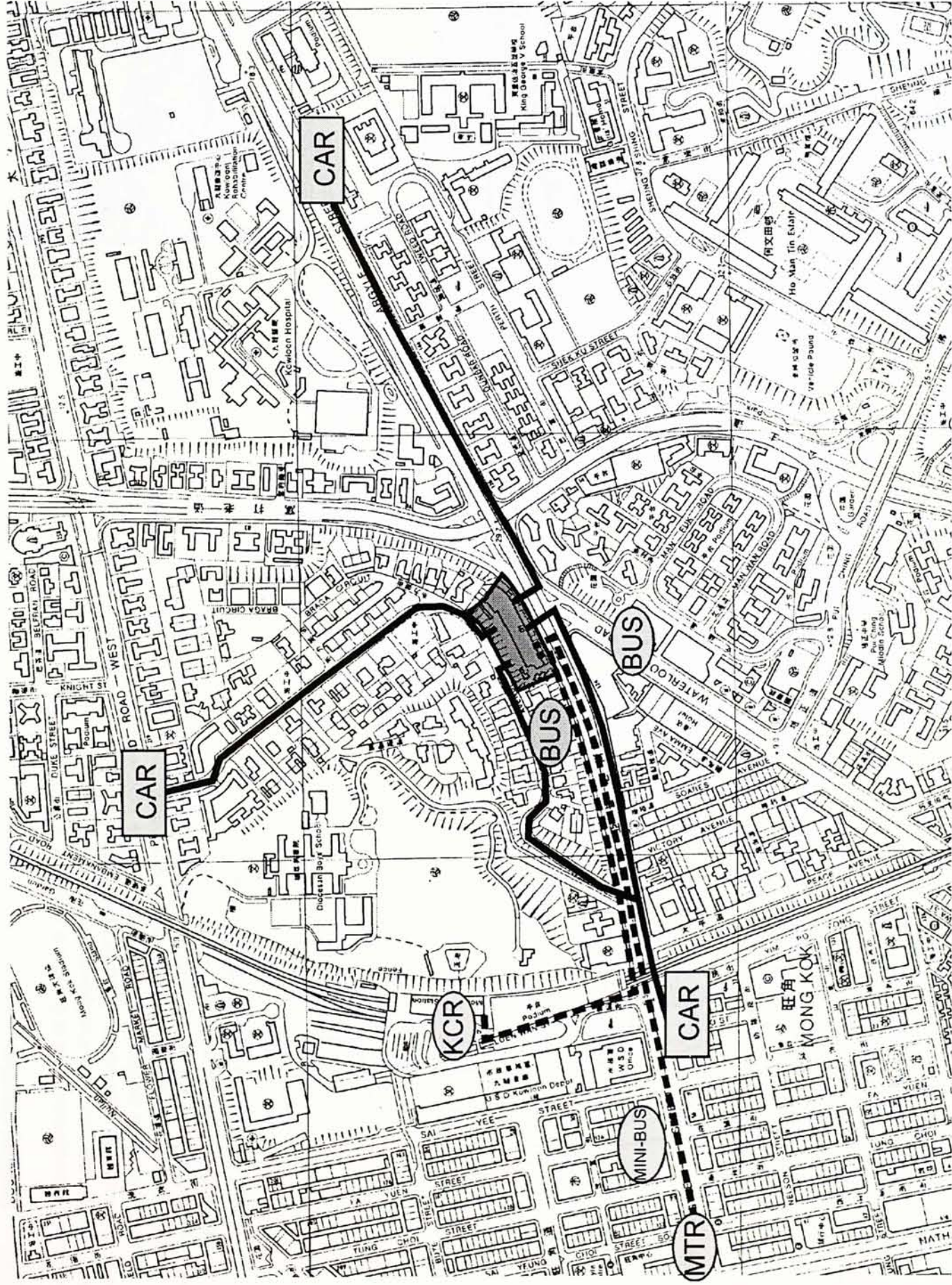


GROUND TRAFFIC SPACE



GROUND TRAFFIC ROUTE

**Traffic Analysis Diagram**

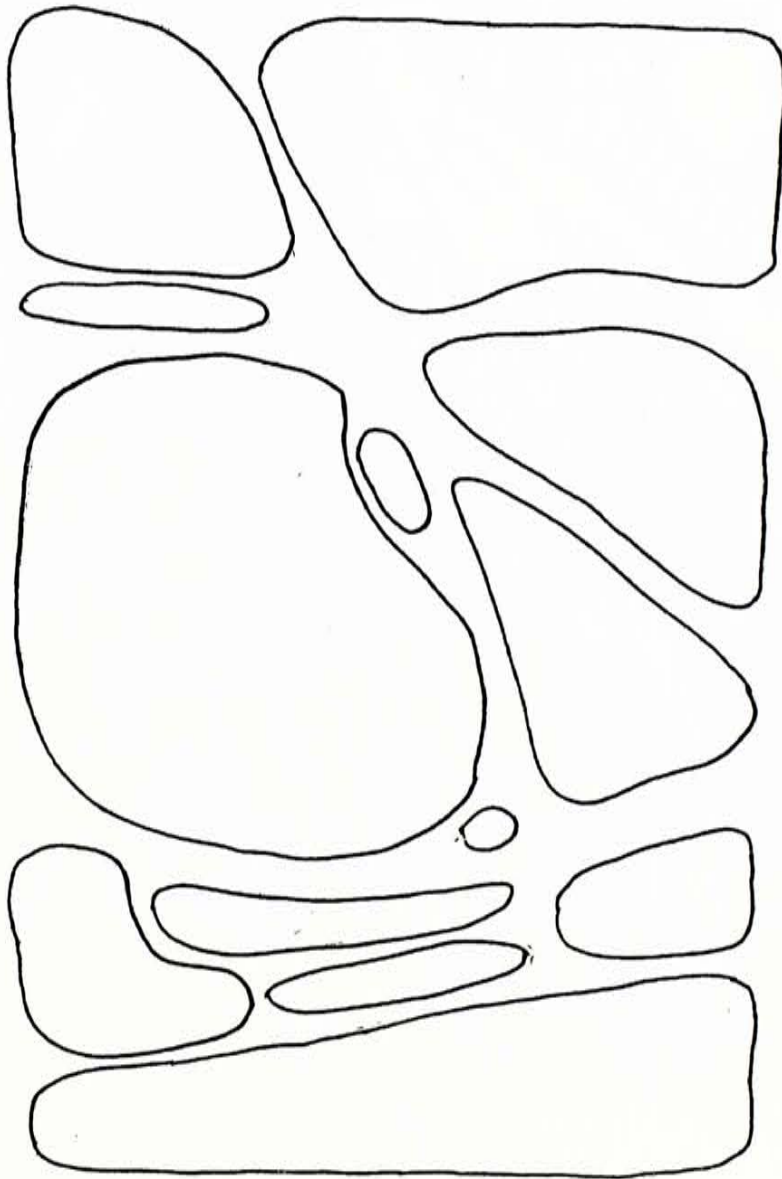


Public Accessibility



### 3.8 Density Studies

- On the south-west side of the site is **densely developed residential towers**.
- On the south crossing the flyover and main road is **residential of ten storey**
- The east and west- north of the site is the **retaining wall** with the two or three storey residential on top of the **plateau** around Kadoorie Avenue. This residential is managed under Kadoorie Management Company and restricted by lease and statutory document to be three storey residential.
- In this region, most of the area is **residential use (45%)** and **Government/Institution/Community use(45%)** approximately.
- There is almost **no commercial use** area in this area.



Site Location  
 Low Dense  
 Medium Dense  
 High Dense

Density Zoning Diagram



fig 3.8.1 The low dense residential on Kadoorie Avenue



fig 3.8.2 GIC use east of the site, Kowloon Hospital



fig 3.8.3 View along Argyle Street, densely residential tower on the south-west side of the site



## **SUMMARY OF ANALYSIS**

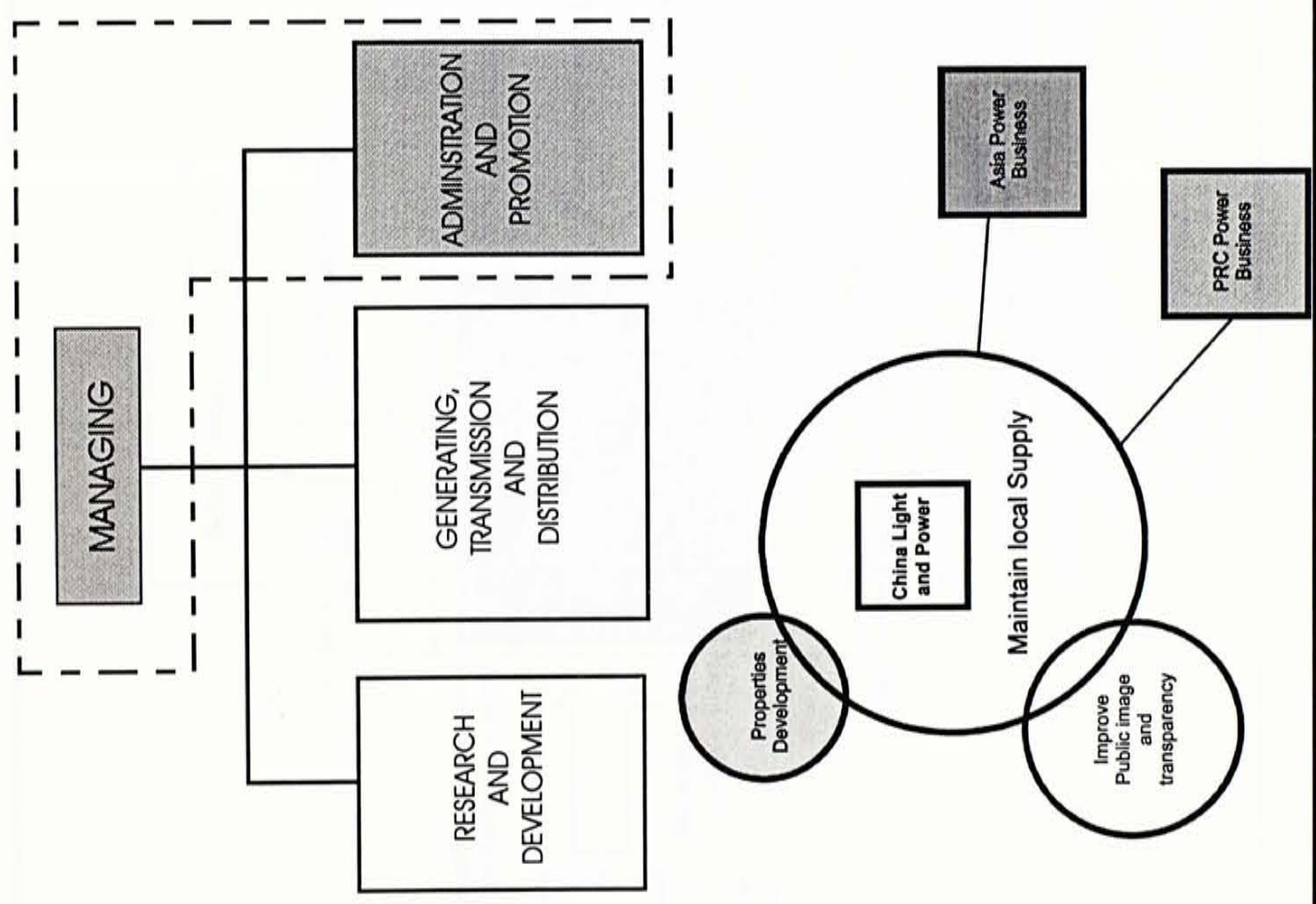
- 4.1 Company Organisation
- 4.2 Future Company's Development
- 4.3 Site Conclusion and Opportunities
- 4.4 Form of the future Workplace
- 4.5 Energy Efficiency Opportunities

### 4.1 Company Organisation

Since the lack of office space in the Headquarters, the office space is now scattering around Hong Kong. However, the company want to re-organize the office in order to enhance the company performance and business in near future. They decided to re-develop the existing site for present Headquarters into a new Headquarters Building.

Present Organization	Basic Organization after Office Centralization
<ul style="list-style-type: none"> <li>• Working area Scattering around Kowloon and New Territories.</li> <li>• There is lack of physical touch with different location.</li> <li>• Some of the facilities may redundancy.</li> <li>• The advantage of locality to close to public.</li> </ul>	<ul style="list-style-type: none"> <li>• Working area share a common communal space</li> <li>• There is a more organized structure for the running of the company.</li> <li>• Human interaction is enhanced.</li> <li>• The facilities can be more efficiency share by everyone.</li> </ul>

## 4.2 Future Company's Development



The main role of the New Headquarters of China Light and Power is **managing, administration, business and public promoting** of the company. There are three major functions of the proposal of the new headquarters:

### Company Operation

The most important objective of the company is to maintain the liable **generation, transmission and distribution** of electricity to the Customer.

**Core Business:** electricity generation and supply business in Hong Kong.

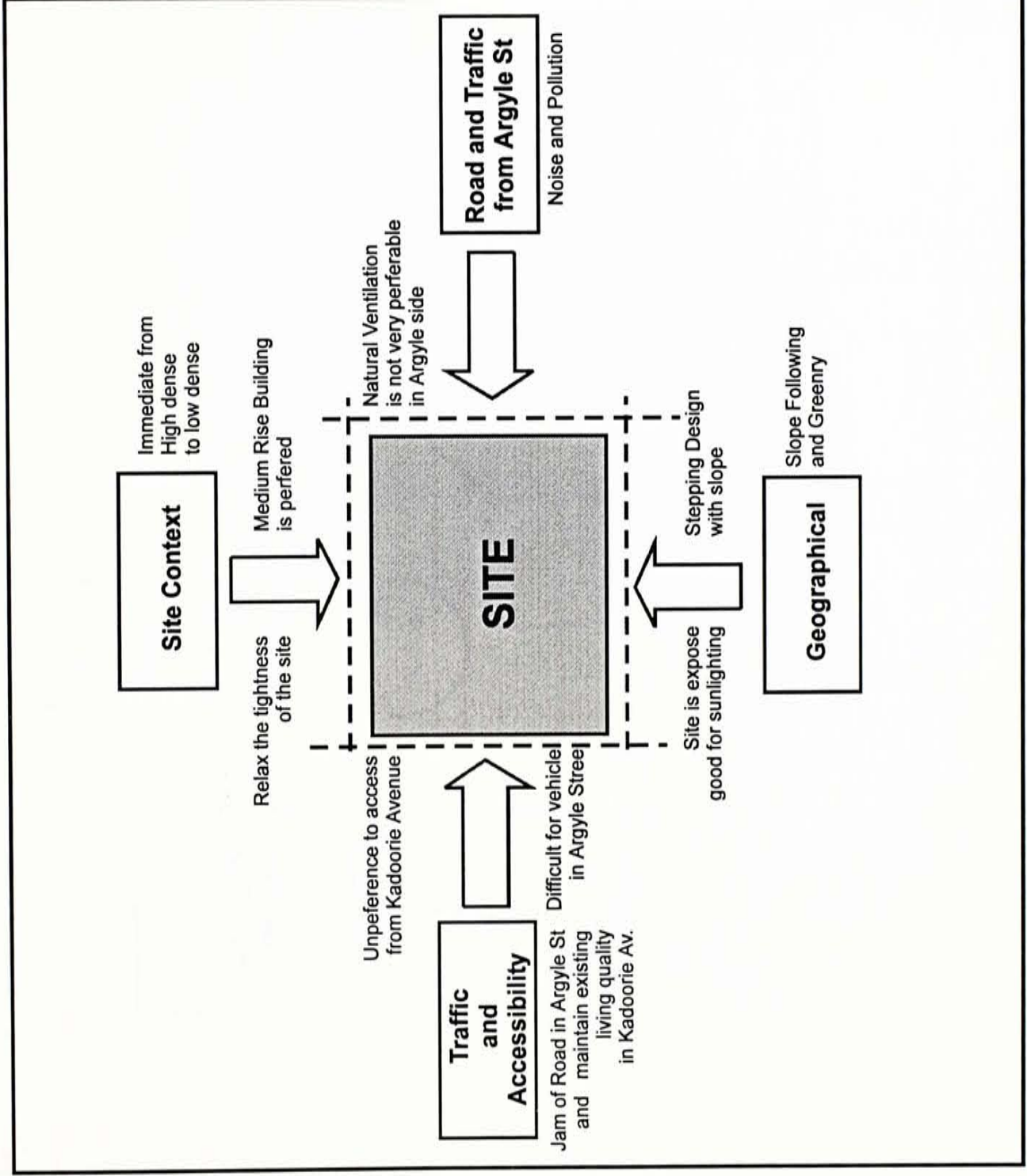
The **development of existing China Light properties** that are no longer useful for electricity purposes also from parts of the company's operation.

**Overseas business,** an business centre is necessary for their future need. The proposed headquarters can provide meeting and conferencing facilities for their business.

### Business and Public Promotion

**Enhance understanding** of the company. China Light and Power has also completed many research project of public concerned and involved many community work. Unfortunately, public has less chance to understand and appreciate their contribution. Promoting the public image of China Light and Power, there should be some better organized exhibition space to exhibit those information for the public. An public accessible and attractive headquarters would increase the **transparency** and improve the **image** of the company.

4.33 Site Conclusion and Opportunities



The site is an a very urban site situated in the border of a high dense zone with a very low dense zone.

The Biggest problem of the site is the vechicle accessibility and the pollution

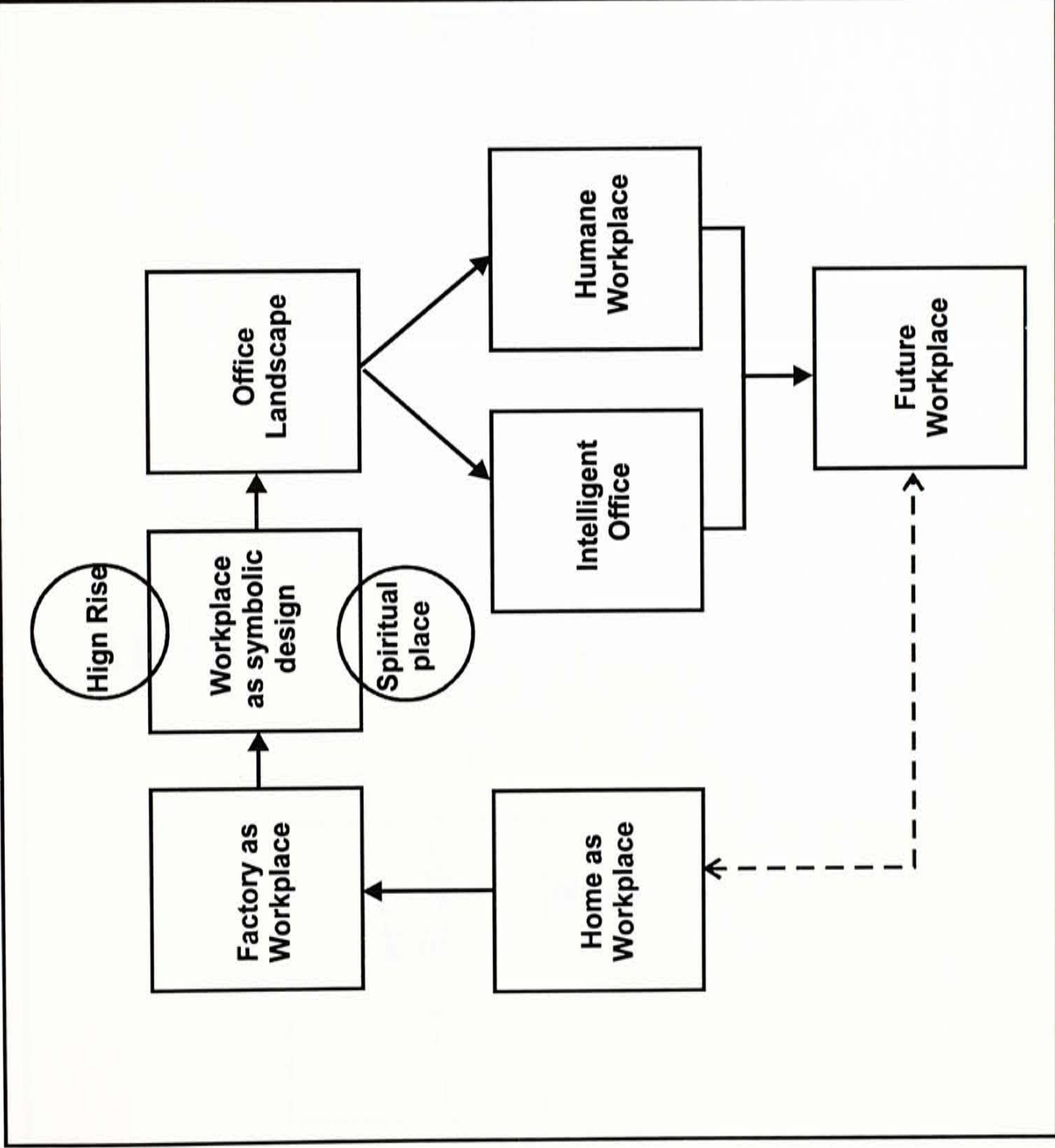
By the way , the site is a very eye catching site which can represent China Light I and Power in a very popular way.

The total site area: 6600 sq.m (approximately)

According to Outline Zoning Plan produced by Building and Lands Department (May 1995)

- It is classified as Residential B.
- It can modify as Utilities Office without much constrict
- Development in these area are subject to a maximum plot ratio of 5.0.

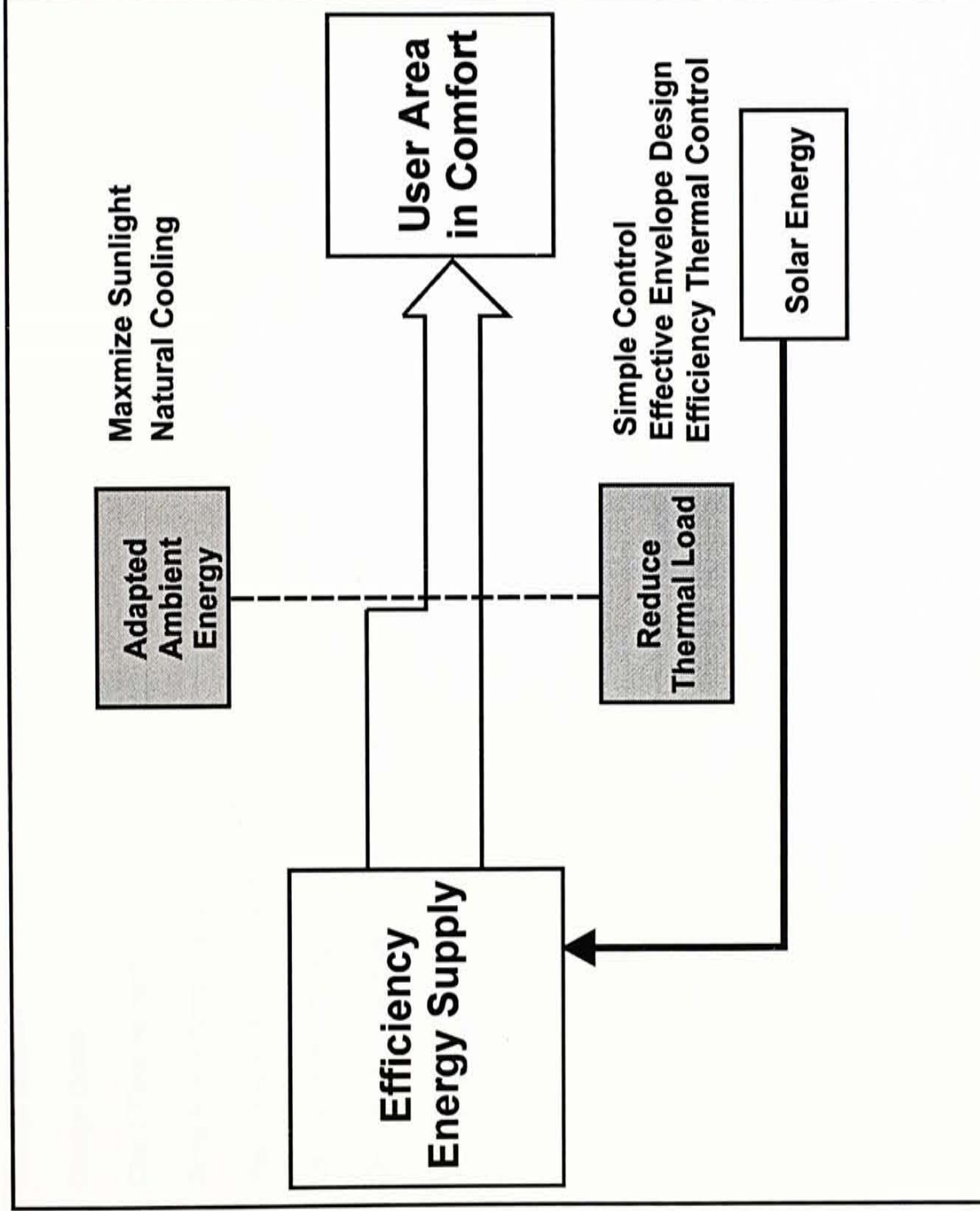
4.4 Form of the future Workplace



Today, the office are entering an era of changes as information networking of the society and urbanization proceed. And the advance of data management system almost reduce most of the routine work. The traditional infra-structure of the office building could no longer encounter the future development.

Form of office building will continue to change as the form of a city and the life of an individual keep changing. Studies on satellite offices, resort offices, and home office are increasing because of the development of information technology and change in individual way and organization, the relationship of employment between a company and its employees.

#### 4.5 Energy Efficiency Opportunities



#### Energy Efficiency

Most of the running cost of an office building is due to artificial lighting and thermal load. However, most of the Office building designers and developers in Hong Kong are still insensitive to the thermal insulation of the exterior skin and to reduce the use of artificial light in the building. Although the use of the reflective glass in commercial office building design is very common, they are more concerned with the status and appearance rather than anything else.

The new headquarters will be a comprehensive designed Energy Efficiency Building type. China Light and Power is one of the most important power company in Asia. Apart from energy generating, environmental technology is one of their major research. This centre will become an important experimental Energy Efficiency Building proposed in Hong Kong. It would demonstrate the most advanced energy efficiency building concept in the region and establish a new criteria for Hong Kong's future development.

Energy crisis, hole of the ozone layer and global temperature rise, all of them is the warning to us to aware our planet. Everyone should contribute to reduce to pollute our planet. Energy Efficiency concept will be one of the most important design consideration in the future headquarters. In the workplace design, we should consider to reduce the energy consumption seriously.



**DESIGN PROGRAMME**

- 5.1 Design Mission
- 5.2 Design Goals
- 5.3 Client Requirement
- 5.4 Schedule of Accommodation
- 5.5 Performance Requirement
- 5.6 Organization Concept
- 5.7 Design Concept: Future Form of Workplace
- 5.8 Conclusion
- 5.8.1 Design Strategy
- 5.8.2 Design Solution

## 5.1 Design Mission

To create an ideal concentrate workplace for our society to cope with the energy crisis and the concern with rapid social revolution.

## 5.2 Design Goals

Three goals of these project is:

- To design a workplace which is energy efficiency.
- To design an suitable physical environment for the future workplace.
- To create an environment which can provide suitable stimulation to the occupants which they can work more creative and effective, improve and enhance social interaction

## 5.3 Client Requirement

To Redevelop the Existing Headquarters of China Light and Power Co. Ltd. in 139-147 Argyle Street.

The proposed headquarters is going to accommodate most 800 Staff of the managing and administration staff of China Light and Power. The building should provide a comfortable working environment for them and increase the productivity of the company.  
By the way, the new headquarters would also set up a new standard for their future concentrated workplace's environment and as Energy Efficiency building design for their future development.

### Client Requirement

- To integrate most of the office space which is scattering around, into the new building.
- To development an healthy working space in term of environmental as well as operational.
- To develop a working space which can encounter the future change of the organization.
- To develop an energy efficient office building which represent the environmental concern of the Company
- To integrate the exhibition space in Western Kowloon and part of exhibition space in Castle Peak
- To develop an well-design customer service centre

## 5.4 Schedule of Accommodation

	occupants	Function	area sq. metre
MANAGER'S OFFICE:	1 Managing Director and 6 General Manager)	Meeting with client Informal meeting with staff Creativity and intelligent working	500
WORKPLACE:	800 staff include part of circulation and equipment	Informal discussion with colleagues Creativity and intelligent working Increase sense of belonging to the company	6000
MEETING SPACE	All Staff	Casual Meeting within a team Relax and interactive exchange	2000
CONFERENCE SPACE	All Staff	Formal Meeting Protective and interactive exchange	1500
COMMUNAL SPACE:	All Staff	Interactive Encourage short discussion Easily accessible	1000
STAFF RECREATION:	Badminton court ,gym ,swimming pool, KTV room, Children play area	Relax, Use after work, Saturday and Sunday also Increase sense of belonging to the company	800
Public and Staff Cafe	Staff and visitor, or customer	Public and Company invisible interchange Encourage formal interchange of company and public. Increase transparency of the company	1000
SUPPORT SPACE:	such as mailing, MSD	Storage, equipment control and office service	300
BUSINESS PROMOTION CENTRE	For major industrial and commercial client. Also for foreign client	Display the technology and powerful of the company Promote the image and new technology of the company	600
DELIGHT CENTRE:	600 public per day exhibition, School visit and public lecture room	Public Relation, relax, comfort. Inspiring, educational purpose	800
CUSTOMER SERVICE:	600 per day for bill payment or customer application	Public Relation, relax, comfort. Increase transparency of the company Should be efficiency in function	200
CARPARK	50 CAR		1500
M/E room	TBE room 0.5%		2000
Total			18000

## 6.9 Performance Requirement

For a Working space, there would be a general level of the performance requirement. Since the Objective of the thesis is concentrated on Energy Efficiency and Physical Environment of a Workplace. Hence, a detail performance requirement after a general is stated as belowed.

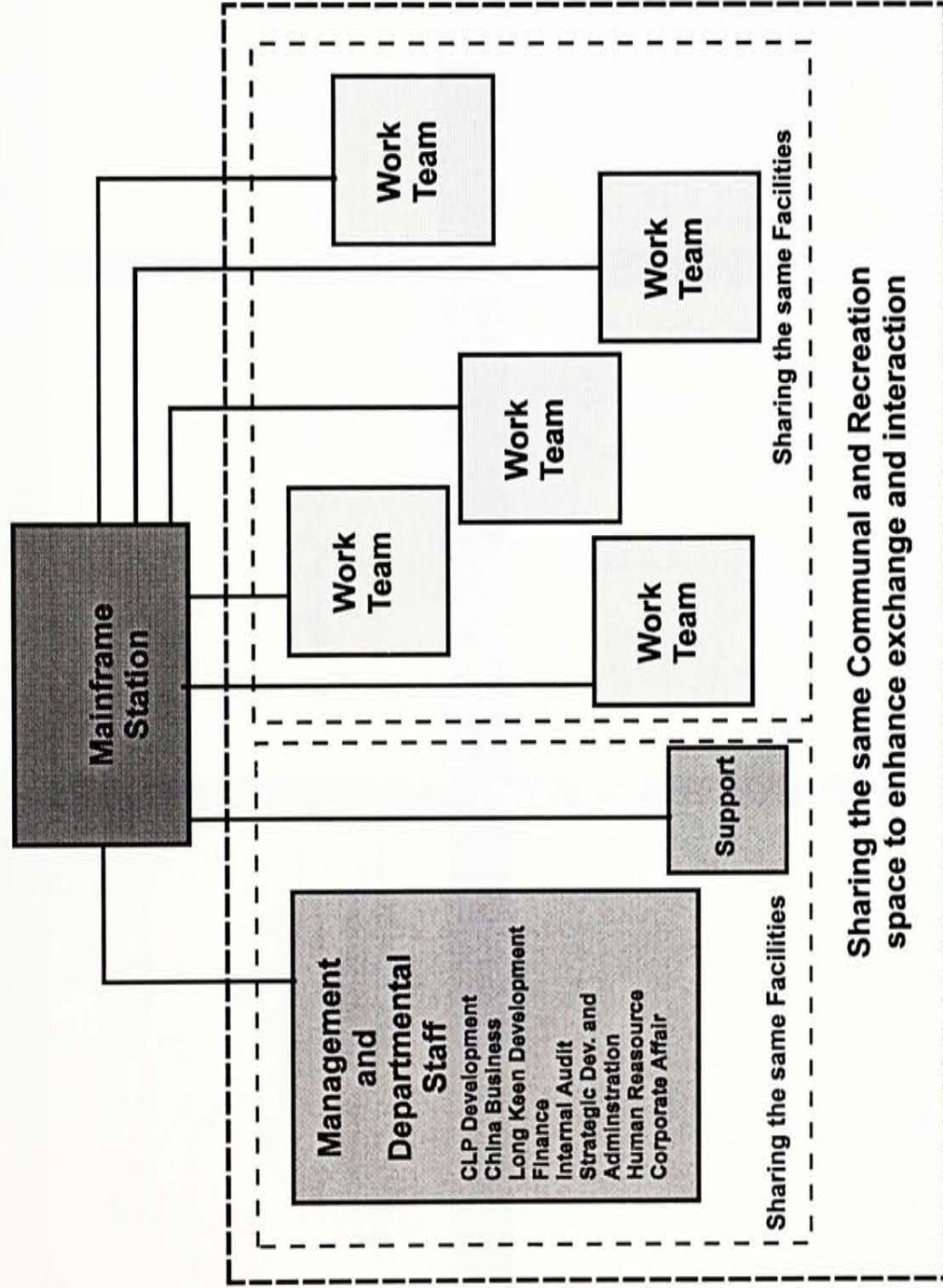
General Performance Requirement:

	Physiological	Psychological	Sociological	Economic
Performance Criteria General to all Human sense	Physical Comfort Health Safety Function Appropriateness	Psychological comfort, Mental Health Psychology Safety Aesthetics Delight	Privacy Security Community Image/status	Time Conservation Energy Conservation Space Conservation
Spatial Quality	Comfort, Disable access	Habitability beauty, view and excitement		Space Conservation
Thermal Quality	Thermal and Humidity comfort with individual Control	Sense of individual control	Flexibility to modify	Energy Conservation
Air Quality	Air Purity	Healthy plant	No irritaion from neighbors' smake and smell	Energy Conservation
Acoustis Quality	No hearing damage, speech clarity	Quite	Privacy, communication	Working undistribute
Visual Quality	No glare, good task illumination	Orientation, intimate, spacious, alive	Status/appearance, Quality of workmanship	Energy Conservation
Building Integrity	Fire Safety, Structural Strength and stability	Durity sense of stability		Material and labour Conservation

Effective Environmental control Requirement:

Effective Thermal Balancing between Envelope and Multiple interior zoning	Reduce Thermal differential between Envelope and inner space. Multi-zoned mechanical systems with local sensor and control. Effective sleective envelope to adapt useful abient and reduce unwanted heat gained.
Effective Balancing of Daylight and Artificical Light	Combining low abient light levels with task light levels determined locally by the time of day and activity. Minimize use of artficial with use of sunlight.
Ventilation Effectiveness: Mechanical or Natural	Concentration of Carbon Dioxide are below 1000 part per million Avid short circulating with air flow before reaching the occupied zone. Enhance air movement with effective delivery to occupants. Avid discomfort draught either due to direct impact on people or to downdraughts caused.
Individual Environment	Control for Temperature, Air, Light, and Sound.. The local environmental control due to variations in activitiesand equipment.
Visual Environment	Good quality lighting with maximum use of daylight to achieve satisfactory visual environment. Some contrast is desirable for visual interest.

## 5.5 Organization Concept



Organization Concept is designed according to the following criteria

The advance of the telecommunication and the digital technology. Communication through Networking and achieving data through networking.

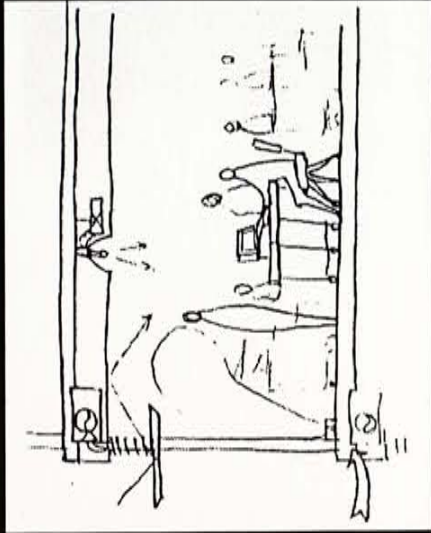
The Concept of **Re-engineering Productive Business (RPB)** adapted by most advance co-operation in the world is also trying to implement in China Light and Power.

Team-working, Multi-task of staff in China Light. The way of working style of the staff will be more flexible and the role of the office will shift to become an more communal space than intensive working space.

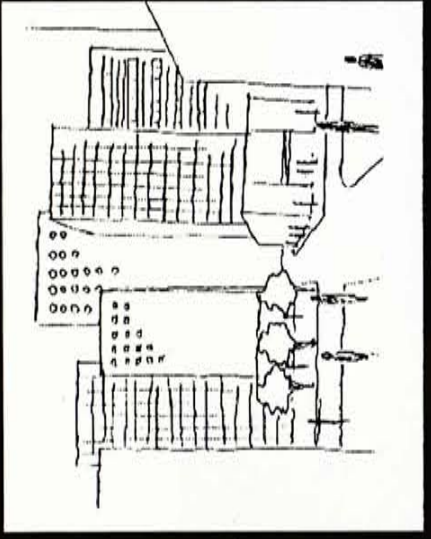
The need of **gathering, communal and conference** facilities for company would increased. The headquarters would become the gathering space for different work team and main body of the company. It will also become a major communal space for the staffs' interaction and exchange.

## 5.6 Design Concept (Future Form of Workplace)

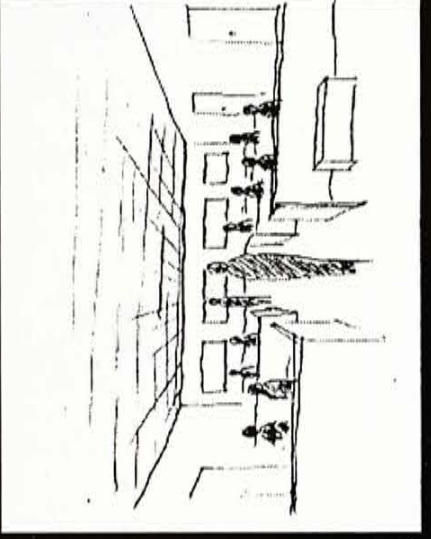
Working Style.....



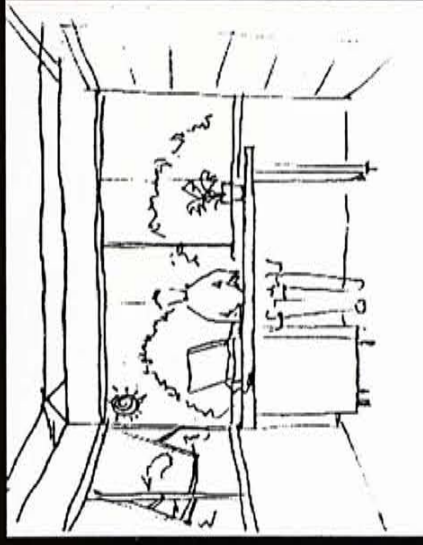
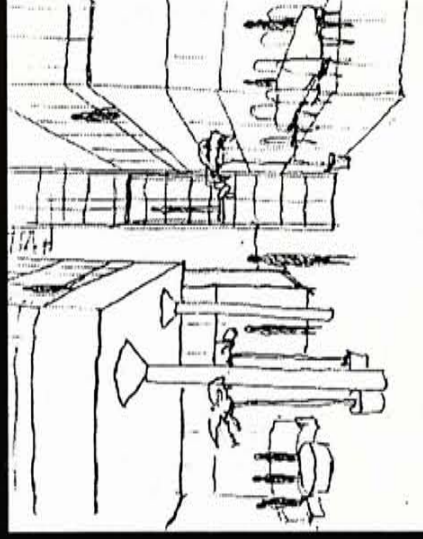
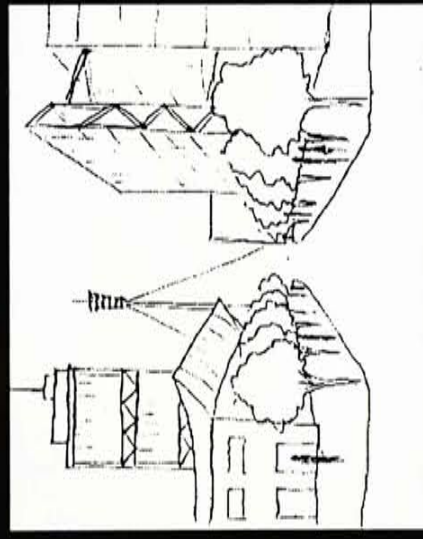
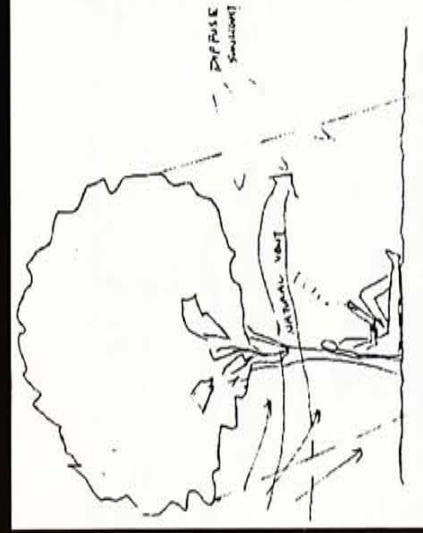
Planning Level.....



Communal Level.....



Individual Level.....



- With the advance of information technology, we can work anywhere.
- Imagine, in a park, there is still shading protection, natural ventilation and require sunlight, which can already support you work.
- The need of an group workplace should be more than working space
- In a office region in Hong Kong, more of the office is located inside an almost identical tower.
- There is almost no personnel touch and human scale at all.
- In future, we are going to habit in an more unique and humane working environment

- The communal space in the most of the modern office is the corridor in between the partition workstation
- The space is so undefined and boring. It never enhance discussion and communal activities which may even arouse distribute to surrounding staff in work.
- In future, there should be a more interactive relation between working space, lounge, conference space and circulation

- One of the headache in modern workplace is the lack of space and well-organized document storage
- The work unit is so boring and pre-controlled, there is also lack of personal taste
- The future workplace should be more personnel control, well organize by the advantage of data management system

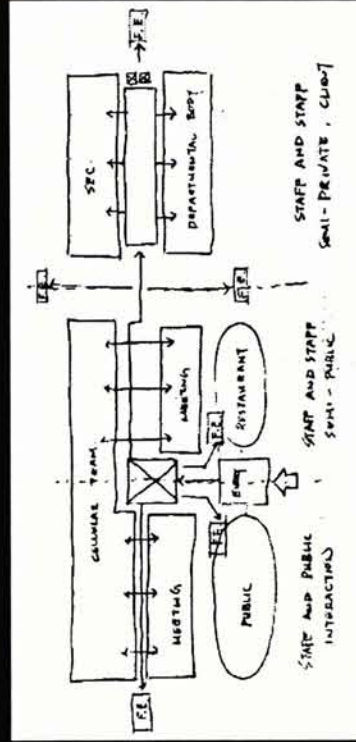
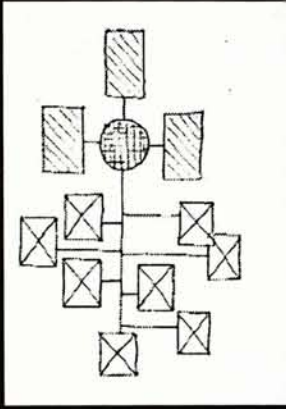
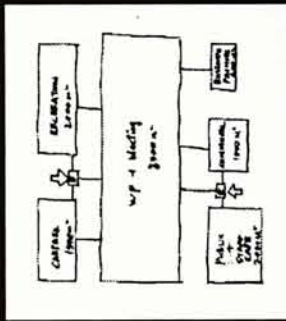
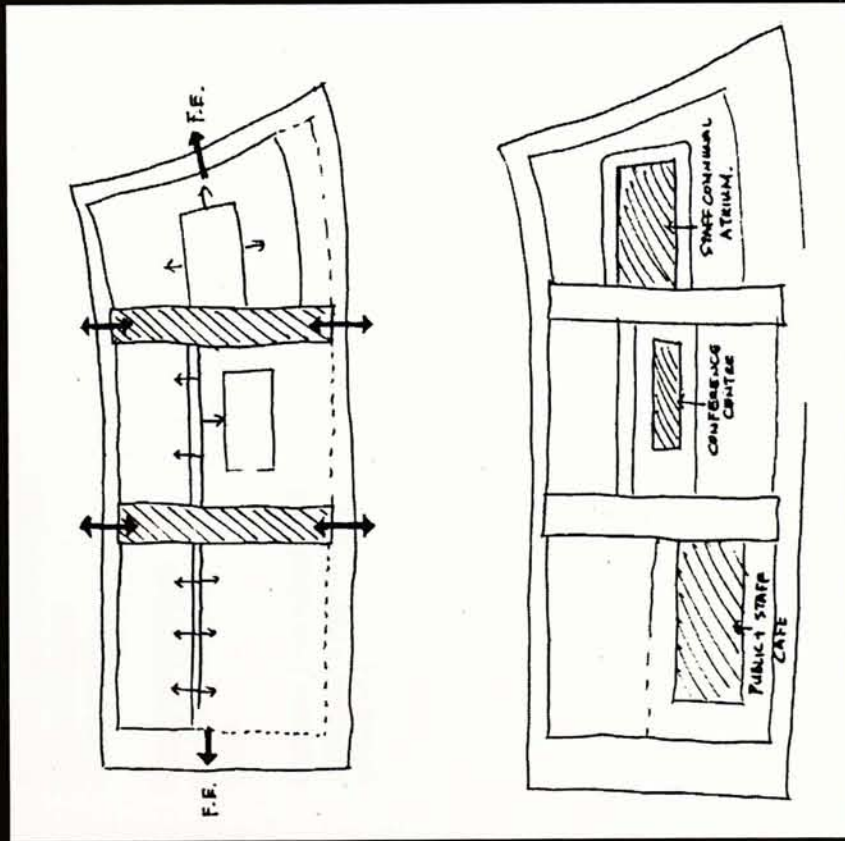
## The Future Working Pattern in the Headquarters

Scenario of a Staff X in China Light and Power, who is member of project team A and assistant of financial manager Y of Financial Department involving Job B,C

<p><b>9:00 am</b> Get up, Clean and Breakfast</p>		<p><b>10:00 am</b> X work in front of portable station connect to CLP's Mainframe for job B</p>	<p><b>11:00 am</b> Received instruction from Y to modify job B as there is some problem discovered when Manager retrieve the work of X through Network half hour before.</p>
<p><b>12:30 pm</b> X drive back to headquarters with his portable.</p>	<p><b>1:00 pm</b> X have lunch with the manager Y in the Canteen</p>		<p><b>2:00 pm</b> X have new reading in communal space in headquarters.</p>
	<p><b>3:00 pm</b> X go to project team A with portable and plug in the network to exchange the data with other team member and have a meeting with them.</p>		<p><b>4:45 pm</b> X go back to his own working station for a while.</p>
<p><b>5:00 pm</b> X have some innovative idea with job C and go to discuss with Y. Y invite several members brain storm in the terrace in the headquarters..</p>		<p><b>6:00 pm</b> X finished the brain storm and get back to Team A. X go to swim and Gym with members of Team A.</p>	
<p><b>7:00 pm</b> They go to dinner together.</p>	<p><b>8:00 pm</b> X go back to his own working space and plug the portable to download anything he need in the mainframe and go back to his home.</p>		<p><b>9:00 pm</b> X drive back home</p>
	<p><b>10:00 pm</b> After X have a shower, he look at the Internet though CLP's network to update himself</p>		<p><b>12:30 pm</b> X look at the TV and go to sleep.</p>

## 5.8 Conclusion

### 5.8.1 Design Strategy



### Progressive Zoning

- 3 Function under one roof**
- Public: Public interaction
  - Semi-public: public and company interaction
  - Private: Staff interaction

### Servicing zone inbetween

### Team work and Departmental work

### Escaping Strategy



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## RESEARCH OF HISTORY OF CHINA LIGHT AND POWER CO. Ltd.

- 6.1 History of Company
  - 6.1.1 Background
  - 6.1.2 Origin
  - 6.1.3 The start
  - 6.1.4 Difficult Year
  - 6.1.5 New Generation Station
  - 6.1.6 Reconstitution
  - 6.1.7 Great Need
- 6.2 Redevelopment
  - 6.2.1 Kadoorie Family
  - 6.2.2 Esso
- 6.3 Recent Development
  - 6.3.1 Industrial Explosion
  - 6.3.2 Milestone

## 6.1 History of Company<sup>1</sup>

The story of China Light and Power Co. Ltd is almost the history of the development of Kowloon. China Light acts as a backup support to Hong Kong for her healthily growth. Mr. Lawrence Kadoorie, chairman of China Light and Power Co. said "There are those who well remember the days when Kowloon went lightness by night. In the course of time its few suburban road-if narrow pathway could be dignified by term roads- were lighted by kerosene lamps."<sup>2</sup>

### 6.1.1 Background

There is no doubt about the date of the **first production** of light by electricity. In 1880, Sir Humphry Davy demonstrated an arc-light to the Royal Institution in London; and the first mechanical arc-light, regulating itself as long as the carbon electrodes burned, was made in 1847.

### 6.1.2 Origin

It was this -at first sight- distinctly unpromising region of Kowloon and in due course the New Territories that a bold man, Robert Gordon Shewan, partner in the firm of Shewan, Tomes & Company, decided to supply with electric light. Enterprise had indeed characterized the businessman of Hong Kong from its very inception, but it is tempting, considering the actual circumstances of 1900 in Kowloon and New Territories, to credit Shewan with Chairvoyant powers when he registered The China Light and Power Syndicate Ltd. on **April 23rd of 1900.**<sup>3</sup>

We do not know whether the first ideas of starting an electric power company in Kowloon was in some way the result of Shewan's mind of his knowledge that the compradore of Shewan Tomes - Fung Wa Chuen- was already engaged in producing **electricity in Canton**. It may have been. The Canton Electric & Fire Extinguishing Company, founded by Fung Wa Chuen and a few Chinese friends in 1898, gained the concession from the Viceroy of Guangdong Province for lighting Canton and its surrounding area. The company later approached Shewan Tomes for help in financial difficulties, with the result that the China Light and Power Syndicate took over the compradore's company in 1900.

Thus China Light acquired the Canton Power station. In the same year the company also acquired the land on which Kowloon's **first power station** was to be built a little later.

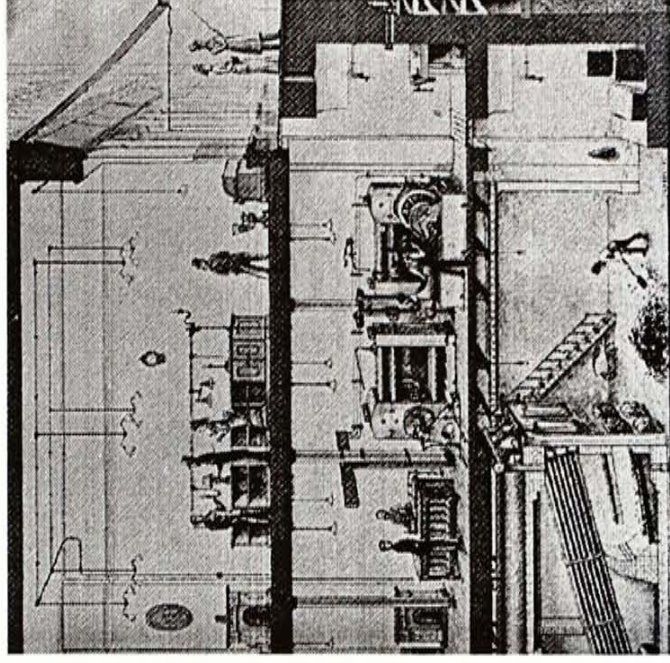


fig 6.1.1 The Holborn Viaduct Station in London, 1880

### 6.1.3 The start

The new power station in Kowloon had begun to produce electricity on 2 April 1903 and a somewhat tardy description of it appeared in the Hong Kong Weekly Press toward the end of the month.<sup>3</sup> The station is situated on the sea front of the main road leading to Hung Hom, and covers an area which leaves room for a considerable extension of the works should increasing business necessitate it.<sup>4</sup> The "power house" is described somewhat as a "Large airy building", which is hardly the impression given by the admittedly poor extant photographs of it which show a rather lonely structure with a modified classical facade topped by a pediment with a circular window, one modestly diminutive chimney rising behind.<sup>4</sup>

### 6.1.4 Difficult Year

In 1910s, the population of Kowloon, a mere 68000, had not yet shown much enthusiasm for electric light in their homes, shops, or places of entertainment. The price of a kilowatt hour for lighting at the time was possibly higher in Kowloon than 30 cents charged by the Hong Kong Electric Company on the island. The chairman of Hong Kong Electric was undoubtedly correct to state: "Kowloon does not seem to have reached a sufficient degree of affluence yet to induce a demand for electricity."<sup>5</sup> At first, the main line was connected to Green Island Cement Co's works at Hok Un in one direction, and to the Kowloon Hotel in another.

In 1910, The chairman announced a contract to supply the Kowloon-Canton Railway. The major engineering undertaking had been actively encouraged by the governor, Sir Matthew Nathan. He noted that there was an encouraging growth in the number of lamps in used by customers, but that the demand for electricity did not show a corresponding increase. This was due to the introduction of the more economical metallic filament lamp which gave much more light than the old carbon filament type, without a corresponding increase in current consumption. In phraseology characteristic of Mr. Shewan said: "*On the other hand, what is our loss is our customers' gain. We must content ourselves with the hope that the lower cost will increase the demand all round, and thus in time more than offset the present reduction in our bills.*"<sup>6</sup>

### 6.1.5 New Generation Station

In 1917, negotiations between the company and the government, which had been taking place, resulted in the acquisition of the new site for a new power station on Marine Lot 93, which was situated at Hok Un between Cement Works and Kowloon Docks, right on the edge of the reclamation in Kowloon Bay. The new lots was about the same size as the old one, but since it was once again on the waterfront, access to sea water for cooling and to boats bringing coal of filling in the new site. The company could remove from the old anything useful to them in the new station.

The story of construction is told by Mr. C. F. Wood, engineer from London firm. He was assigned to Yau Ma Tei area as his district. "You had no office, just a chair and a table in some substation. Walking from the Peninsula Hotel to Hok Un station in those days, about 1930."<sup>7</sup>

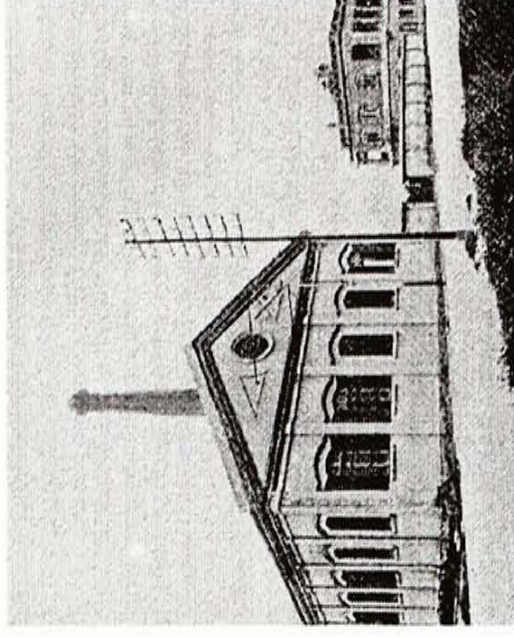


fig 6.1.2 The company's power station at Chatan Road, Kowloon, about 1908

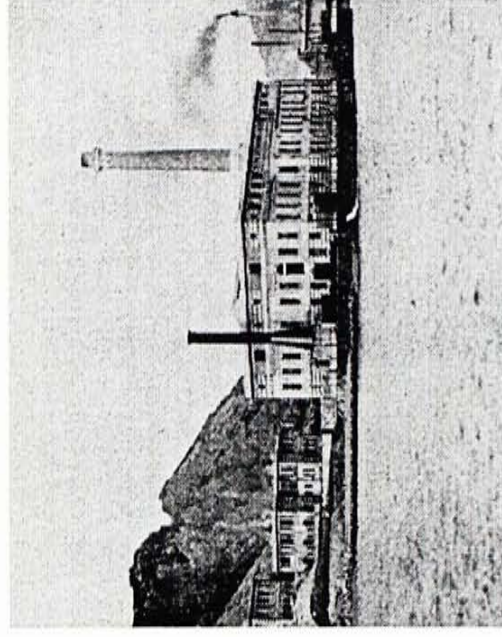


fig 6.1.3 The old Hok Un Station about 1925

### 6.1.6 Reconstitution

An extraordinary general meeting convened on 11 December 1918, it was decided that the company should be voluntarily wound up and at once reconstituted under the name: The China Light and Power Company (1918) Ltd. Shewan, Tomes & Co. or the successors would continue as the new Company's General Managers.

The newly reconstituted Company, in tune it seemed with the spurt in the growth of the population and industry of Kowloon just after the War was over, did extremely well in the first full year of the operation in its new form.

### 6.1.7 Great Need

When the demand increased drastically in 1924, in Yau Ma Tei and Mong Kok districts, the existing underground feeder system was extended substantially. Simultaneously the Company developed new substations, new sites being bought for these in Kau Pui Shek and Kowloon Tong for building in 1925, while additions were made to the existing substation at Yau Ma Tei and another was in the process of erection at Sham Shui Po. By 1926, work was in hand on the first two consumer substation to serve Kowloon Docks and the Peninsula Hotel.<sup>8</sup>

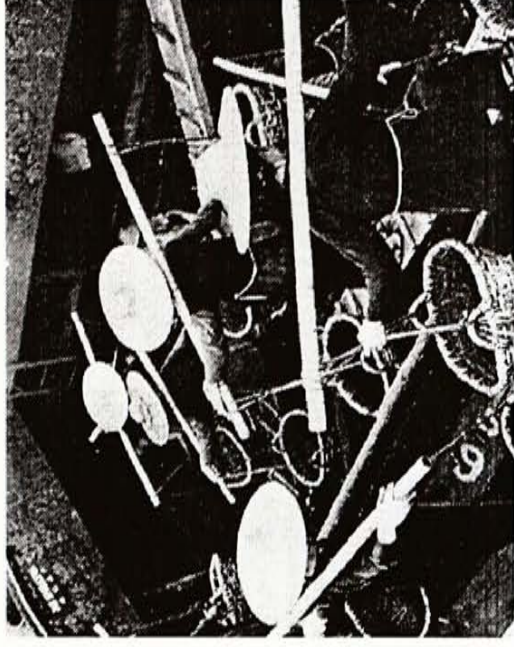


fig 6.1.4 Hakka woman unloading coal barges in the traditional way, about 1950

## 6.2 Redevelopment

### 6.2.1 Kadoorie Family

The real significant was that Kadoorie family for the first time began a direct interest in the affairs of China Light with consequences that certainly could not even have been imagined in the late 1920s. The firm establishment of the company as the sole supplier of electricity to Kowloon, consolidated over the years of troubles and problems and in face of considerable difficulties both financial and other, was now to come under the scrutiny and be given the assistance of the first member of a family of immense commercial acumen and vision.

Later, the exchange share between the Hong Kong Electric and China Light

From 1925 to 1930, under the rule of one of the finest governors Sir Cecil Clementi, Kowloon progressed rapidly, with new reclamation's at Sham Shui Po, Lai Chi Kok, and at Kai Tak where the Colony first airport was opened on 1928. The effect also bring to New territories. The government received the suggestions from China Light on how a supply of electricity could best be brought to the countryside in order to encourage progress in these small towns of the area.

The island of Hong Kong was recognized by the Hong Kong to have both geographical and size limitations. The fortunate coincidence of a forward looking and power governor with ideas for the New Territories, and Mr. Shewan.

### 6.2.2 Esso

Esso, former Standard Oil Company is a strong power company in US. The involvement of Esso into China Light Business have been started in 1963 when Lawrence Kadoorie as the chairman of the company.

China Light want to search a strong partner to share the profits and losses but the Americans are conflict with the Communist country which the largest Communist country is situated twelve miles from the border.

Later, Esso became the partner and share holder which involved numerous of project such as Castle Peal Generator Station with China Light and Power.

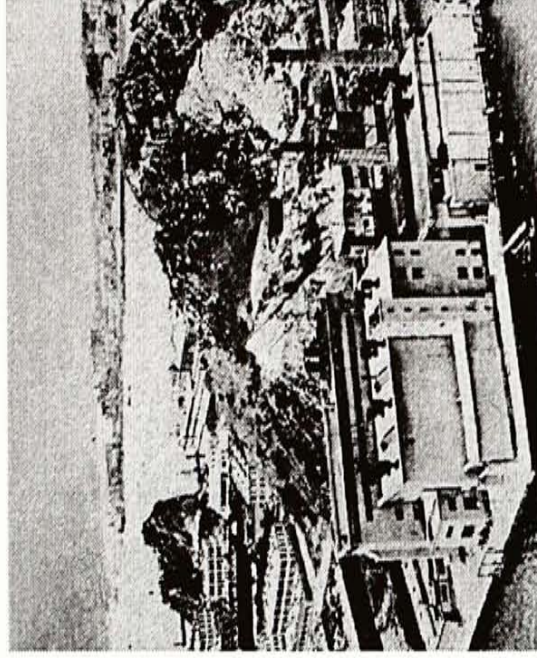


fig 6.2.1 The Kowloon Peninsula in late 1946. At Hok Un no. 12 boiler chimney in position. In distance, the peninsula hotel is the tallest building near the ferry pier

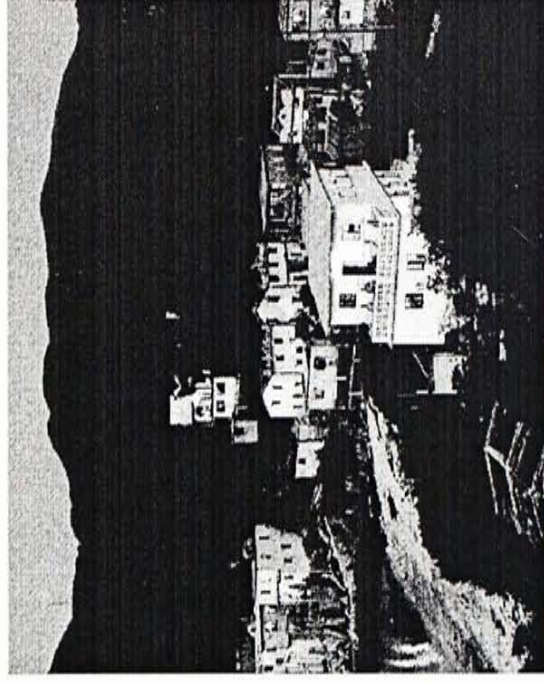


fig 6.2.2 In a remote part of Sai Kung Peninsula, benefit from quite extensive networks of power lines.

## 6.3 Recent Development

### 6.3.1 Industrial Explosion

During the Second World War, the lights of Hong Kong, Kowloon and the New Territories were effectively dimmed by the Japanese occupation, and gradually most of them went out. It seemed, in the general hopelessness of the situation, that all the Company had worked for and achieved over forty years of its existence was effectively negated. Against this backdrop of a ruined city, its utilities and industries virtually at a standstill, surviving staff and employees of China Light went back to work when the war finished.

Few power companies in the world can have experienced a **rise in sales** of electricity of the order experienced by China Light between 1948 and 1951 when the output grew no less than **five times**.<sup>10</sup>

The overwhelming majority of the new and expanded industries were located in Kowloon and the New Territories, and challenge to produce enough power for them therefore fell largely on the China Light's shoulder.

Thinking back to those early days of the century when lighting was generally reckoned by the number of lamps- those hot little properties that produced quite as much as heat as yellow light, and looked like the twentieth century's answer to the common firefly. The day of the charcoal cooking fire has gone. It was replaced by the rice cooker from Japan, possibly to be counted one of the fundamental domestic inventions along with electric itself, and perhaps the telephone. Electrical appliance become the **necessity** for every family in Hong Kong.

### 6.3.2 Milestone

A milestone in Company history was passed in April 1966 when the first 132 kV underground cables from Hok Un to Tsun Yip Land substation were put into service. In the same year the change-over from 6.6 kV to 11 kV was effected in the distribution network of all urban areas, as well as at Tsuen Wan and Sha Tin districts. New 132 kV overhead lines were put up between the Kwai Chung control center and Sha Tin, Hammer Hill, and Castle Peak Road, reinforcing the system for the New Territories.

Nowadays, the generating process is controlled by a computer-based data acquisition and supervisory control system. Data are received at the central processor from, and commands issued to, the remote terminal unite, mainly via the company's micro-wave system. Nowadays, in the remote part of New Territories a handful of village is also **benefit from quite extensive networks** of power lines.

- <sup>1</sup> Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982
- <sup>2</sup> Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982
- <sup>3</sup> Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982
- <sup>4</sup> Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982
- <sup>5</sup> Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982
- <sup>6</sup> Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982
- <sup>7</sup> Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982
- <sup>8</sup> Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982
- <sup>9</sup> Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982
- <sup>10</sup> Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982

**RESEARCH OF WORKPLACE**

- 7.1 A History of Office
  - 7.1.1 Early Form of Office
  - 7.1.2 Factory Office
  - 7.1.3 New Type Office
  - 7.1.4 High-rise Office
  - 7.1.5 Office Landscaping
- 7.2 Revolution of Office
  - 7.2.1 Individualism
  - 7.2.2 Humane Working Environments
- 7.3 Intelligence Building
  - 7.3.1 Definition
  - 7.3.2 Characteristic
- 7.4 Physical Environment of Workplace
  - 7.4.1 Standard of Physical Criteria of Workplace
  - 7.4.2 Economic Reason
  - 7.4.3 Change to be Considered
  - 7.4.4 Health and comfort
- 7.5 Rethink of Workplace
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- 7.6 Case Studies of Contemporary Examples
  - 7.6.1 Hennepin Country Government Center
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  - 7.6.5 Cite Technique et Administrative
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  - 7.6.7 Western Morning News
  - 7.6.8 Regional Government Headquarters, Marseilles
  - 7.6.9 Foundation of Cartier
  - 7.6.10 West Wing of Cite de La Musique



## 7.1 A History of Office<sup>1</sup>

Office Building have changed our cities, and office work has revolutionized our society. Manhattan or Frankfurt or the City of London are evidence of the enormous impact the office has upon our lives. Yet the history of the office building as a reflection of changing office organizations has hardly been attempted. Neither has a history of development of the office as a social system.

Throughout its history, the organization of the workspace has been based not just on considerations of efficiency and productivity, but on the desire to establish, and sometimes control, relationships between individuals. It is only natural, then that the history of office building should closely follow the evolution of office work and its social status. The history of work space is closely linked with that of cities where it took root, concentrated and grew; buildings not only created premises for work to be carried out, they determined the social structure of the city at work and social ideas about relationships in office organization.

Obviously office building have changed in many ways during the past 100 years; each generation of new enterprise seems to have had its own organizations and technological problem to solve.

The greatest change came with the Industrial Revolution, which was well under way by the 1840s. Britain led the world in industrialization, and by this time less than a quarter of its population was depend on agriculture. In the newly industrialized society, the idea of office space was considered seriously, as the population gradually shifted to move urban pursuits and as industry grew in size and complexity.

As markets opened up, the banking systems were developed, the organization of work became more structured. The rationalization of administrative activities in the new, larger companies, was accompanied by a formal, hierarchical system of organizing offices which engendered the concept of the "white-collar" worker. After first invading the home, or imitating its layout, office space subsequently developed according to the industrial model of production units: rationalization, standardization of operations, and task distribution.

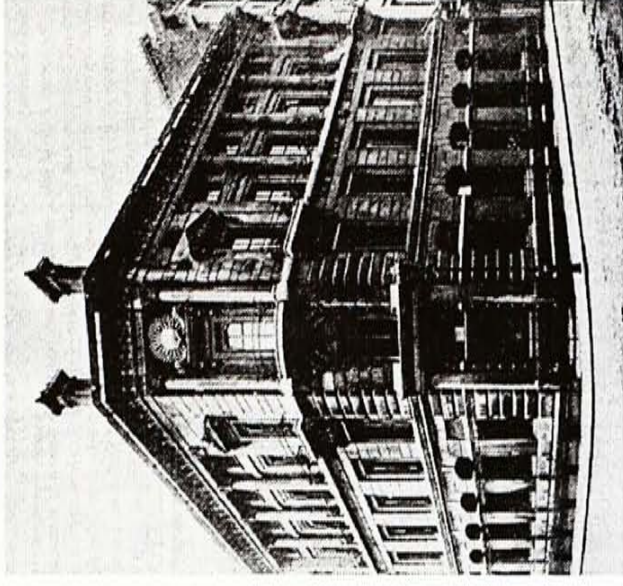


fig 7.1.1 Sun life Assurance Company

### 7.1.1 Early Form of Office

In 1849 the Sun life Assurance Company, founded in the early eighteenth century and the world's largest insurance office, move into new premises purpose-designed by architect C. R. Cockerell. It was relatively unusual and therefore a sign of some prosperity for a company to built its own offices.

The Sun building fitted its "small household" organization of groups of six to ten clerks into a plan not far removed from that of a fine house with its sequence of great rooms and robust classical detailing, through it was unnecessary to slip in two unclassical detailing, though it which were scare and hard to replace, clerks enjoyed a high statues in the early nineteenth century. Their workplaces revealed little functional differentiation between home and office. Only the sitting hinted at office use.

The Oriol Chambers design by Peter Ellis in Liverpool in 1864. Differs from the Sun Building in that it was designed to let out as several small suites of accommodation suitable for small two- or three- person firms. Architect provided the idea setting for a Dickensian world of small entrepreneurs and professionals, supported by one or two indispensable clerks. His design offered a modular plan of neat, tiny units that created a stylistic precedent for countless office building.

### 7.1.2 Factory Office

Forty year later, The Larkin building, designed by Frank Lloyd Wright, was built for a mail order company in 1904. The organization was typical of the new kinds of enterprise that sprang up at the end of the nineteenth century, and depended for successful operation upon three vital coordinated purchasing could achieve; excellent communications for ordering and distribution; and a large, malleable, well-organized and, cheap workforce capable of handling thousands of minute transactions quickly and efficiently.

The Larkin office, built by a corporation to accommodate hundreds of clerks was entirely different in scale to what had been usual in the nineteenth century. The technology was far more routine and factory like; the employees were low in status; the corporate owner was more dominant.

### 7.1.3 New Type Office

When, in the mid-1930s, the chairman of the Johnson Wax Company asked Wright to design the company's new administrative head office in Racine. Wisconsin-both the building envelope and the internal fittings-he was asked to design no less than a modern cathedral. Wright had previously undertaken the Larkin Building in Buffalo, where he design metal office furniture as well as the building itself. The completed work was strongly allied to its religious metaphor, with a large nave-shaped hall containing gigantic columns which fanned out into a corolla. Wright's concern for brightness within the building led to top lighting, with Pyrex tubing forming a series of strips and translucent beams.

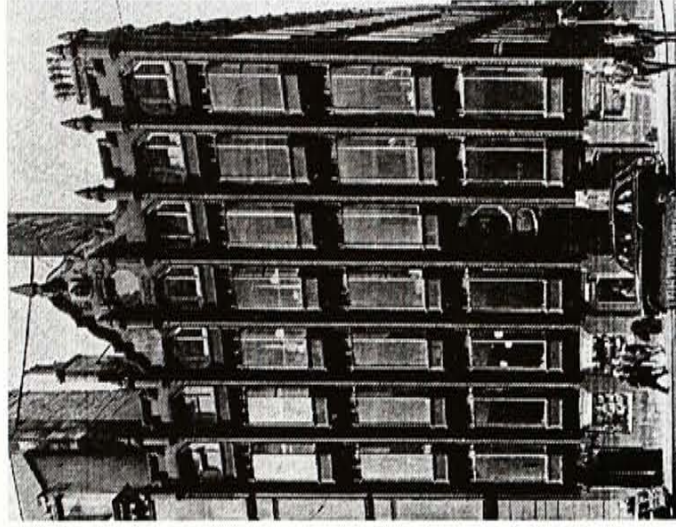


fig 7.1.2a Oriol Chambers

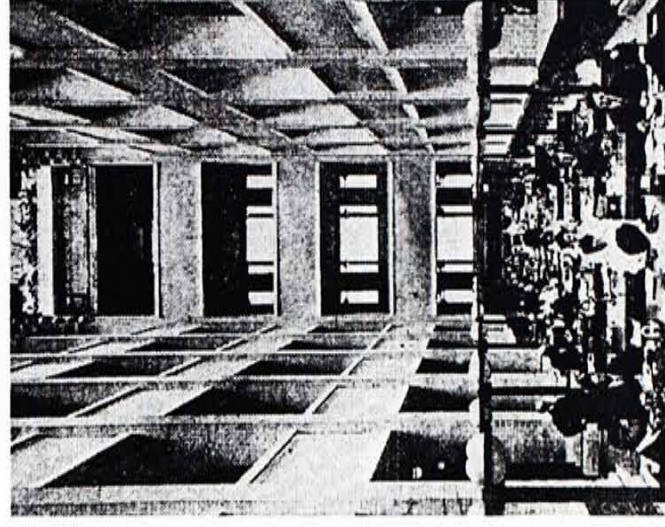


fig 7.1.2b Larkin building

### 7.1.4 High-rise Office

In 1954, the Seagram Building was designed by Mies van der Rohe and Philip Johnson in New York. It shows few advances from the Guaranty in terms of meeting real organizational requirements. Through it is much more refined and has the benefit of full air-conditioning, it shares the same vision of the office as one building, with one entrance, which is capable of being subdivided and leased in small units. Moving from floor to floor in the Seagram Building is a surreal experience: there are as many as 20 different firms, each tenant acting within the normal conventions of New York real estate practice by decorating in its own way. One is therefore confronted with several wildly differing corporate worlds coexisting within one structure.

### 7.1.5 Office Landscaping

But even as the Seagram Building was being constructed, a far more spectacular development in office design was taking place in West Germany. This was the invention of "office Landscaping" an attempt to achieve an organic freedom both in organizational and building form. The Ninoflax office designed by Nordhorn in West Germany in 1963. It was the administration building for a textile company, is a typical early example of "office landscape". Most activities are clerical, and the offices are entirely open plan. The building form breaks the modular discipline that marks the Seagram Building. Unlike Seagram, with its variety of tenants, the building is the product of a large clerical organization run with a certain corporate management and building forms were moulded to express the intentions of the client.

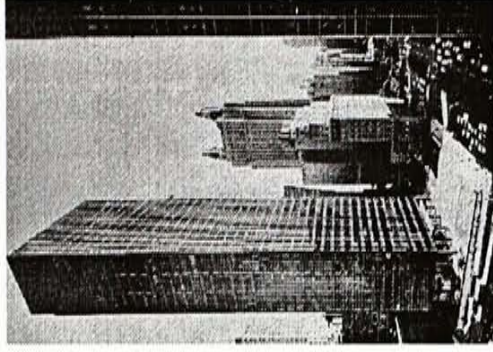


fig 7.1.5 Seagram Building fig 7.1.4 Johnson Wax Coy

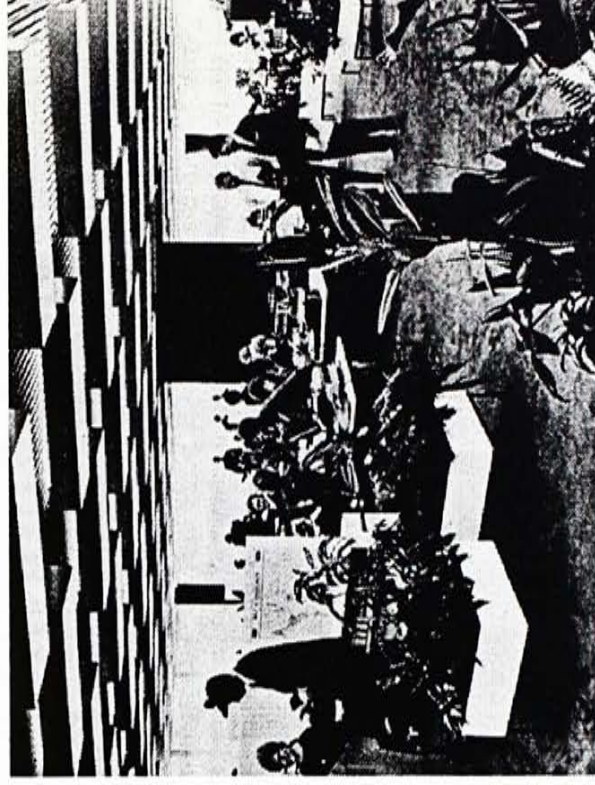
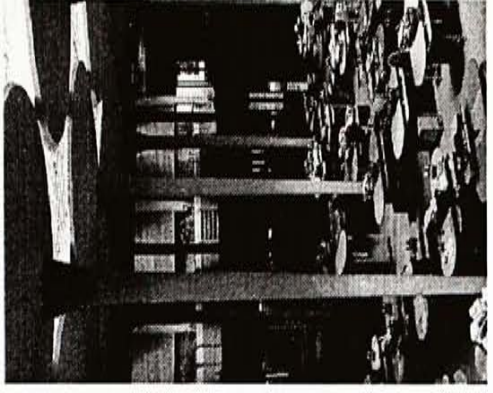


fig 7.1.6 Ninoflax office

## 7.2 Revolution of Office<sup>2</sup>

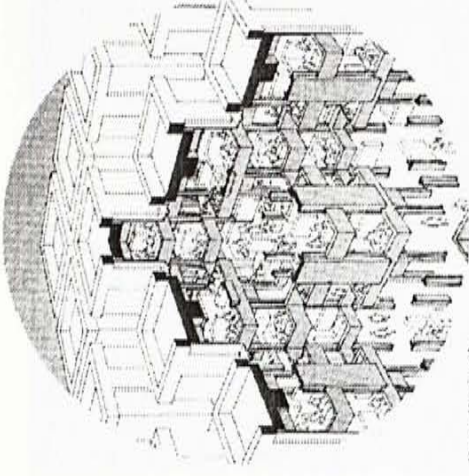
Against a background in which powerful centralized management thinking could no longer be reconciled with growing white collar industrial democracy, Centraal Beheer, an insurance office designed in Holland by Herman Hertzberger in 1973, has become famous for the involvement of staff in its design. They have been encouraged to paint their own walls, put up posters, invite their families in for lunch and even bring in their pets.

### 7.2.1 Individualism

The office layout of Centraal Beheer is a radical departure from most conventional forms—both open plan and traditional. Floors are not stacked up of each other in time-honored fashion. Instead a series of modules link together to form a friendly, ambiguous network of workspaces in which staff enjoy both privacy and sense of belonging to the communal life of the office. The building has several approaches and entrances, not just one, and the spatial variety inside allows personal expression and well-being to flourish.

### 7.2.2 Humane Working Environments

The search for humane working environments that balance corporate efficiency against personal choice and dignity is taken even further with the new four-story Union Carbide headquarters in Danbury, Connecticut, designed by Kevin Roche, John Dinkeloo & Associate. The building provides no less than 2,358 private offices, all a standard modular size, all with windows and a view out to a wooded parkland. Fifteen different office interiors were designed, ranging from traditional to modern, and employees were invited to choose exactly what they wanted from 15 full-size mock-up models.



*Herman Hertzberger*  
fig 7.2.1 Axonometric of Centraal Beheer

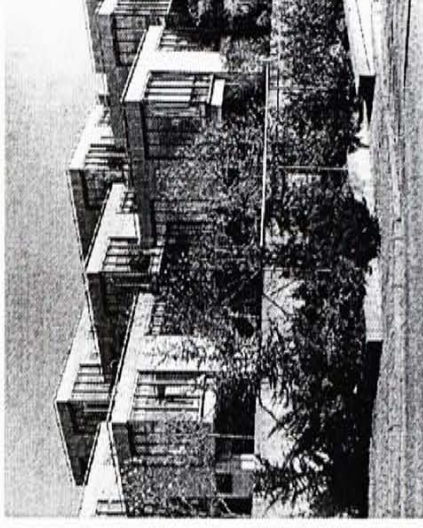


fig 7.2.2 Centraal Beheer

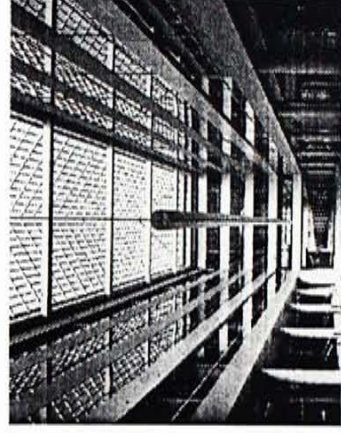
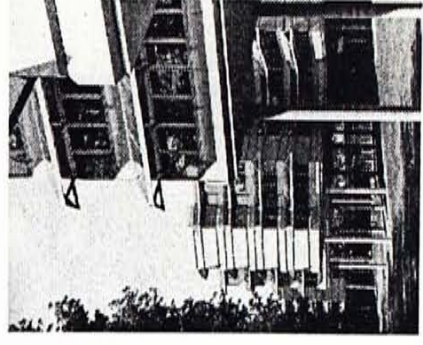


fig 7.2.3,4 Union Carbide headquarters



### 7.3 Intelligent Building

Intelligent building most probably first evolved in the USA in early 1980s. City Place in Hartford Connecticut (1986), was the first building in the world to have used the term Intelligent Building. With the new concept of building with brains and nerves, it was introduced as a high-value building.

The "intelligence office building" traditionally has been defined by a long list of new products in telecommunications, electronics, security, automation, and building control systems.

A better definition for the intelligent office building would be one that provides for the unique and changing assemblies of recent technologies in appropriate physical, environment and organizational settings to enhance worker speed, understanding, communication, and overall productivity.

NEC Head Office Building in Tokyo is an typical example of intelligent building. Towering 180 meters into the Tokyo skyline, it is an earthquake resistant, cross-braced structure with a wide base and tapered top. Long north/south faces enable workplaces to be daylight without excessive glare, while the east and west are dominated by mechanical and elevator systems. The advanced energy management system that controls floor zone temperatures, ventilation, lighting, and security can reviewed and modified at individual touch-screen control panels found in the elevator lobby of each floor. Each worker has an individual telephone workstation called the "Super Alladin System" which provides a wide range of office automation such as electronic mailing and filing, an electronic system for telephone directories, telephone communication.

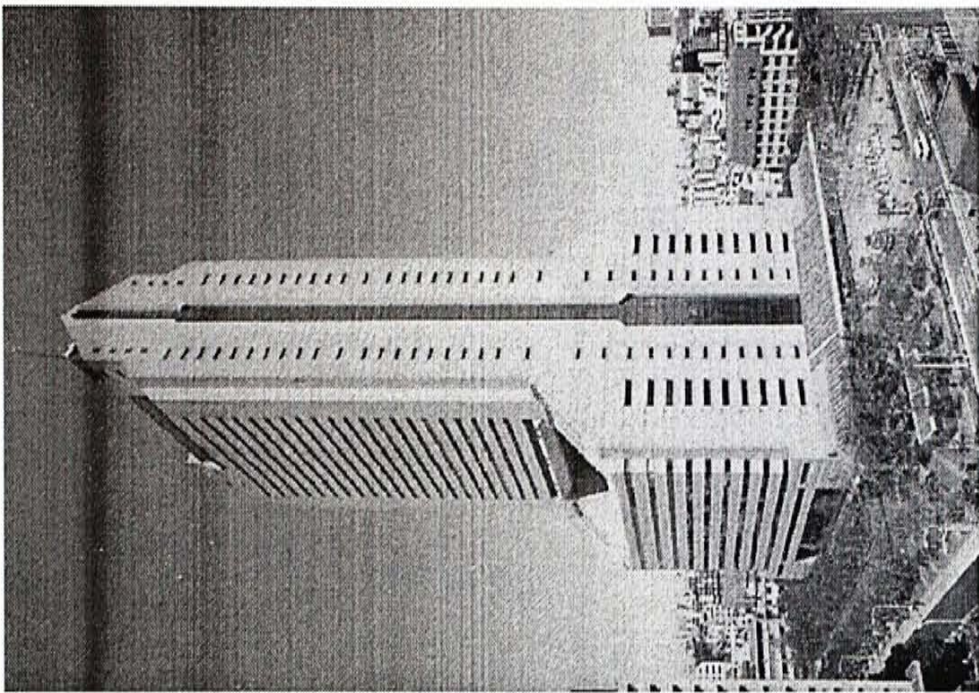


fig 7.3.1a NEC Head Office Building

### 7.3.1 Definition<sup>4</sup>

The definition of an "intelligence office building":

#### Appropriate Physical and Environmental Settings:

This involves the design of structure; enclosure; building geometry, including massing, orientation, horizontal and vertical plenum space, and overall spatial organization; major conditioning services such as heating, ventilation, and air conditioning; major support services such as data, voice, power, lighting, and fire protection; and interior elements such as ceiling, partitions, floors, and furniture. (DOF)

#### Quality Environmental:

The conditions such as spatial quality, thermal quality, air quality, acoustic quality, visual quality, and building integrity versus rapid degradation. The "high-tech" building must provide the appropriate setting to accommodate immediate electronic enhancements, as well as future technologies and anticipate level of long term user requirements.

#### Office Automation:

A high level of office automation is provided by the building owners, either for their own organization's use or for tenants. Such features include built-in local networks together with a wide selection of high-tech office equipment to provide word processing, large volume printing, electronic filing, electronic diaries, credit card access for timekeeping or for access to cafeteria and common office service, software support, and even assembled and manipulated in electronic form for big decision makers.

#### Advanced Telecommunications:

Tenants or user organizations are offered ready access to a far more up-to-date and wider range of telecommunication services than they would customarily expect. This wider range, which is achieved through digital switching and fiber optic cabling, leads not only to considerable advantages in volume and cost but also to particular services such as facsimile transmission; voice mail; and computer graphics; as well as voice, video, and computer conferencing.

#### Building Automation:

The oldest and most reliable form of building intelligence is automation based upon the integration, through electronics, of various subsystems useful for running buildings, such as power management, security of people, and data, as well as energy. Environmental management systems; personnel management systems; building management system, including diagnostics and maintenance automation; and command centers.

#### Flexibility:

An advance building should reserve the possibility for the tenant to make alternation and improvement as easy as possible. Flexibility is very important for the constantly developing companies. It was recorded that in USA, an enterprise would have a internal change of about 20% each year.

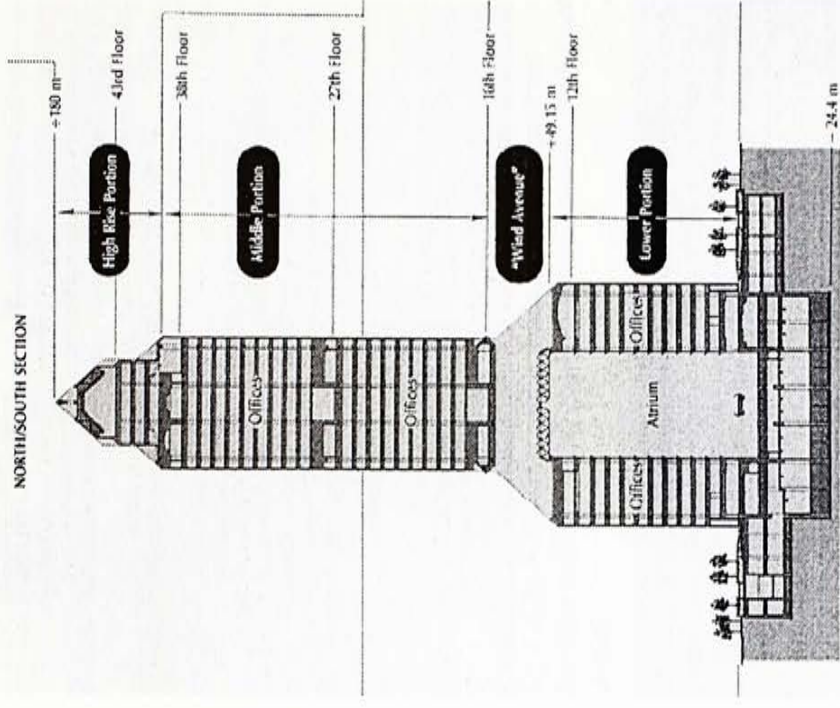


fig 7.3.1b Section of NEC Head Office Building

### 7.3.2 Advantages:

The intelligent Building would enhance our life in various way:

#### Efficiency

The brain of the intelligent building could operate the building system in the most moderate way, that mean the energy saving without excess and unnecessary loading on the energy consumption. In term of financial, it reduce the building operation cost. The intelligent lift system can make the lift running more effectively without blank waiting, etc.

#### Comfortableness

High quality environmental system can make sure the habitation environment is in the most suitable state without over cooling or heating. It will even more efficient when it work with the individual preference control system.

#### Convenience

The advance data managing system let we access the useful information by pushing a button. Information technology even break down any distance restriction.

#### Safety

Smoke and fire detection system and security system enhance the personal safety as well as information and properties security

#### Flexibility

The advance perform provide the convenient way to make alternation and expansion.



fig 7.3.2a A modern office incorporates innovation furniture system, local environmental control. NTT Twin, Japan

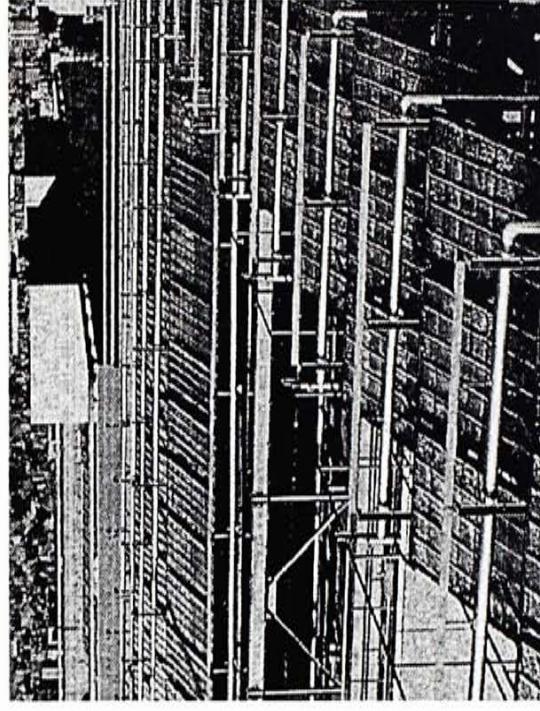


fig 7.3.2b Solar hot water, NTT Twin, Japan

### 7.3.3 Difficulty:

#### Maintenance

Since most of the device of the intelligent is in the more advance and sophistic design. Maintenance need specific skill and components.

#### Operation

To operate such complicated advance system need special skill, some of these complicated system is just switch off when there is no experience people operate.

#### Installation/Flexibility

High initial cost is the main consideration in designing the intelligent. Some design of the intelligent system is lack of flexibility. When tenant want to rearrange their layout, which will involved huge amount of investment.

### 7.3.4 Humanity

The emphasis on technology is slowly changing. The building would be perceived as clever with more computer systems inside in the past, but now people require more than technology. They ask for more service provided an even more comfortable environment. Consequently, more 'human' and 'social' factors are added in addition to advanced technology.

Well-designed space helps the building evoke creativeness and imagination. which make the place a much more interesting working environment.

The internal environment of the offices are automatically adjusted to match the optimal standard. There should be separate individual controls to be operated according to different people's needs. Although all these sound like restriction to a building's design, they help much in conserving energy.

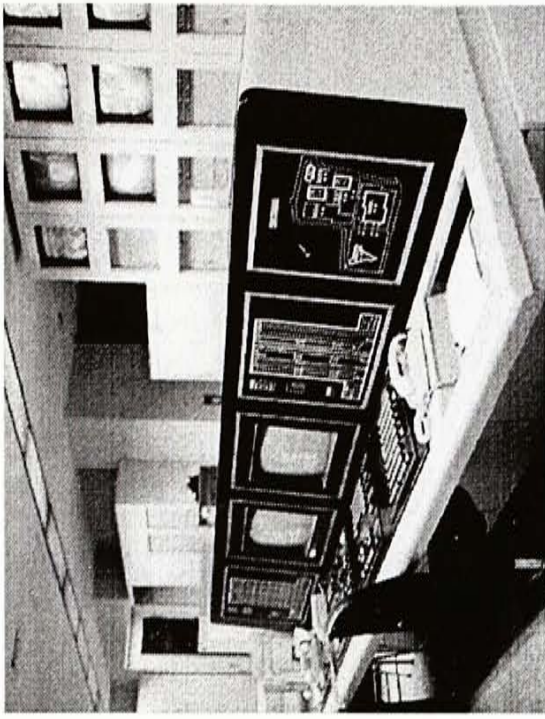


fig 7.3.3 Complicated Office Management System



## 7.4 Physical Environment of Workplace

### 7.4.1 Standard of Physical Criteria of Workplace<sup>5</sup>

Codes and standards are the traditional guarantee of environmental quality in the workplace, embracing certain aspects of spatial, thermal, air, visual, and acoustic quality, as well as building integrity. However, there is numerous shortcomings of too depending such standard alone:

- Primarily on physiological limits of acceptability.
- Set, measures, and assessed for one performance quality at a time, whereas the occupant senses all environment qualities simultaneously.
- Lack of understanding of spatial quality, thermal quality, visual quality, acoustic quality and building integrity. Standards should be set for these key building performance qualities to address the physiological, psychological, sociological and economic needs of the occupants.

Extracted from *The Building System Integration Handbook*. AIA

Organizing Performance Criteria for Evaluating the Integration of Systems			
	Physiological Needs	Psychological Needs	Sociological Needs
Performance Criteria Specific to certain human sense, in the integration system			
Spatial Quality	Ergonomic comfort handicap access functional serving	Habitability beauty, clam excitement, view	Wayfinding, functional adjacencies
Thermal Quality	No numbness, frostbite, no drowsiness, heat stroke	Sense of warmth, individual control	Flexibility to dress with the custom
Air Quality	Air purity; no lung problem, no rashes, no outgassing	Healthy plants, not closed in or stuffy, no synthetics	No irritation from neighbors, smoke, smells
Acoustic Quality	No hearing damage, music enjoyment speech clarity	Quiet, soothing, or active, exciting "alive"	Privacy, communication
Visual Quality	No glare, good task illumination, way finding, no fatigue	Orientation, cheerfulness, calm, intimate/spacious, alive	Status/appearance quality of construction "craftsmanship"
Building Integrity	Fire safety; structural strength and Stability	Durability sense of stability, image	Material/labor conservation
Performance Criteria General to all Human sense, in the Integrated System			
	Physical comfort Health Safety Function Appropriateness	Psychological comfort Mental health Psychological safety Aesthetics Delight	Privacy Security Community Image/status
			Space conservation Material Conservation Time conservation Energy conservation Money conservation



fig 7.4.1 Office space, CEGB Building, Bristol, England

There is five major components in integrate building system's for total building performance:

- Structural systems
- Envelope or enclosure systems
- Interior system
- Mechanical/electrical system
- Telecommunication system

Total building performance is affected by the integration of these subsystem components and assembles.

The mechanical and interior system interface is shown in the below table:  
Extract from The System Integration Handbook. AIA

SPATIAL QUALITY	service module for present use and flexibility space volume and ceiling height, functional identity individual space layout, compartmentalization & flexibility suitable servicing to individual space and aggregated space expansion and change potential individual control/space management
THERMAL QUALITY	balanced mean radiant temperatures air distribution, heating and cooling effectiveness, convert humidity impact on interior components volume to be heated, stratification mechanical efficiency from source to task
AIR QUALITY	fresh air distribution effectiveness, flushing vs. outgassing protection from radiant pollution individual control, compartmentalization vs. pollution migration
ACOUSTICAL QUALITY	background noise coordinated with appropriate room absorption minimization of mechanical noise disturbance minimization of vibration disturbance effective acoustical compartmentalization around mechanical components
VISUAL QUALITY	adequate light distribution balance mechanical components for lighting dispersion, reflection integration for space/function identity lighting efficiency from source to task flexibility potential individual control, compartmentalization
BUILDING QUALITY	humidity and temperature controls to support components, machines and comfort staining and dirt buildup on interior from mechanical vibration disturbance/destruction mechanical accessibility, maintenance and repair fire safety

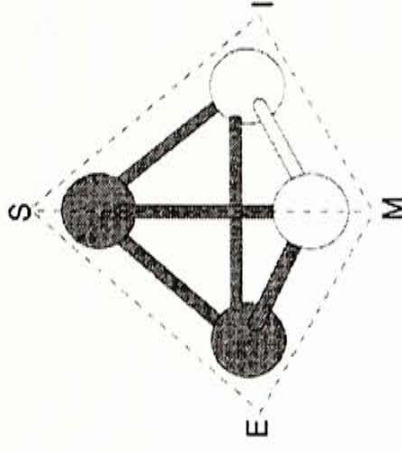


fig 7.4.2 Integration of different parameters

**7.4.2 Economic Reason**

There is a concept for the people that the building cost is mainly talking about the initial construction of the building. However, we should also consider the performance of the building after it finished. The super Energy Conservation Building by Ohbayashi Corporation Technical Research Institute consumes 50 % of the **Life cycle energy** needed by a conventional building.<sup>6</sup>

On the other hand, a comparison of the **cost of personnel** with the costs of buildings shows that over a ten-year period, of all the costs of accomplishing an organization's mission, more than 90 percent goes for people, 7 percent goes to maintain and operate the building, and 2 percent goes for a newly built, fully furnished and equipped office.<sup>7</sup>

**7.4.3 Change to be Considered**

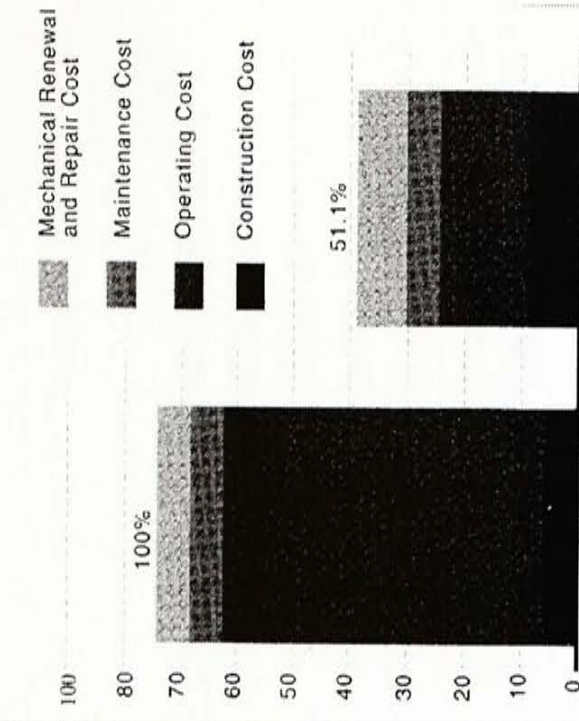
According to the two reason above mentioned, major Design Changes for the future workplace should be considered.

**Service Space**

Distributed Cores over Central Cores for Vertical Distribution of services	Multiple vertical cores to support accessible and efficient distribution of environmental conditioning, power and data.
Open Horizontal Distribution Plenums: Floor or Ceiling	There are some misconception about the costs of raised floors with mechanical systems can actually reduce the amount of horizontal plenum space needed.
Flexibility	Complexity of space and complexity of service and their interaction with organizational change make it difficult to operate and maintain buildings within accepted standard. Spatial simplicity and flexibility, and adaptability of services, should in most case provide more controllable environments.

**Life Cycle Cost**

Life cycle cost in 65 years (100 million yen)



Conventional building similar in size to the energy-efficient building

The Super Energy Conservation Building

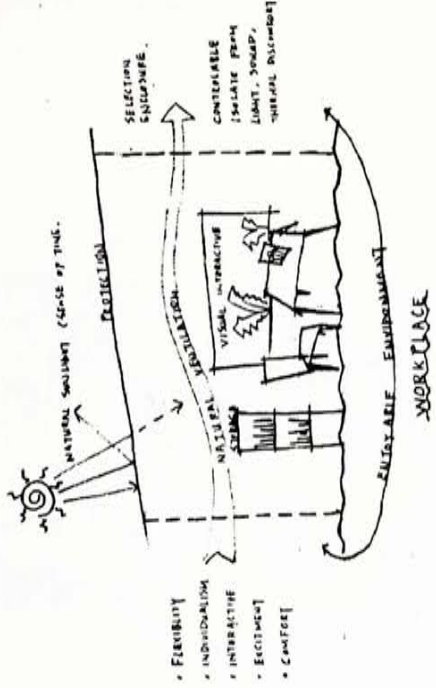
© 1987 Center for Strategic Studies in Construction, University of Reading, U.K.

fig 7.4.3 Life cycle chart for energy concern building

## Building Performance

Effective Thermal Balancing between Envelope and Multiple Interior Zones	<p>The thermal balancing in a office where one work group may have extensive heat-generating equipment, another main equipment, and third serious losses from envelope locations. To compound the problem, the location of these work groups could change on a monthly basis. As a result, the office of their future demands developments in load balancing technologies, toward reducing load variations and developing adaptable, multi-zoned mechanical systems, with local sensor and control.</p> <p>The load balancing concepts such as air flow windows, routing return air through the envelope; multiple heat pumps fed by closed water loops, etc.</p>
Effective Balancing of Daylight and Artificial Light	<p>New lighting concepts are needed, combining low ambient light levels (from daylight and artificial light sources) with task light levels determined locally by the time of day and activity. Lighting system innovation include continuous dimming fixtures, etc.</p>
Ventilation Effectiveness mechanical or natural	<p>It is indicated by concentration of Carbon dioxide in the room air, it is considered satisfactory if Carbon dioxide are below 1000 PPM(part per million).</p> <p>For ceiling and perimeter mixing system, short-circulating with air flow between supply and extract and low levels of supply air reaching the occupied zone.</p> <p>Displacement ventilation through the floor should in theory be able to supply a higher ventilation effectiveness, with the polluted air being displaced towards the extract.</p>
Natural ventilation or air-conditioning	<p>Discomfort such as draught either due to direct impact on people or to downdraughts caused.</p> <p>Occupants will often turn off air supply diffusers if they feel a draught and are prepared to suffer the subsequent poor air quality.</p> <p>SBS were more prevalent in air-conditioned offices than naturally ventilated offices.</p> <p>Poorly maintained and operated air-conditioned buildings also tended to have a greater incidence of sickness.</p> <p>Air-conditioned buildings are more likely to be deep-plan, have low levels of natural light, higher level of artificial light and noise.</p>

<p><b>Psychological Change</b> Nature and Architecture</p>	<p>Human require for environmental contact, ranging from the need for fresh air, sunshine, and view, to the need for a sense of time, season, and place.</p>
<p>Introduction of Individual Environmental</p>	<p>Controls for Temperature, Air, Light, and Sound. Today's advanced office has a growing need for more local environmental control, due to the significant variations in activities and equipment found between workstations. Specifically, the local control of conditioned air and task/ambient light has become very important, to cope with the rapid introduction of office automation equipment.</p>
<p>Visual Environment</p>	<p>Good quality lighting, with maximum use of daylight, is important in achieving a satisfactory visual environment. Some contrast is desirable for visual interest. Excess uniformity and glare from electric lights, reflective surfaces and solar radiation should be avoided. Avoid direct sunlight and may offer the appropriate daylighting strategy for modern offices.</p>



7.4.4 Physical and Psychological Need of a Workplace

**7.4.4 Health and comfort**

Modern people typically spent 90 per cent or more in indoor, a large part of this in the workplace. Sick building syndrome (SBS) is a term used to describe a commonly occurring set of health complaints. SBS symptoms include headache, lethargy, dry eyes, blocked nose, runny nose, chest tightness and difficulty in breathing. Symptoms occurs while a person is at work but disappear shortly after they leave. Frequently workspace are found to be too cool or too hot (rather than neutral) with low humidities, poor visual condition, and air movement.

## 7.5 Rethink of Workplace

Today, most of the design of the workplace is still the same as the mid nineteenth century, were usually open, drafty, noisy, dim, smelly. People usually sat at identical desks in identical chairs arranged in identical rows, doing nearly identical work, coming and going in concert. Bosses had private offices to indicate their status and, incidentally, to help them think more easily. German revolutionized rectilinear office layouts with an "office landscape" approach to efficient performance. Although still functioning in large open spaces, people were now organized in clumps according to the way their work flowed through the organization.<sup>8</sup>

### 7.5.1 Nature of Work<sup>9</sup>

#### The physical work

Limits on the ability of the body muscles to deliver.

We are familiar with visible physical workloads and their effects on our own performance

#### Mental Work

Limits on the mind's ability to deliver.

Being invisible, mental workloads are harder to recognize and understand than visible physical workloads are harder to recognize and understand.

Among the mental there are two basic categories:

#### Routine work

Linear and straight-ahead, routine work uses prescribed, repetitive procedures to reach a clear and well-defined goals. Routine work has very low needs for new information, attention, and further processing. A working memory of well-practiced skills may be all that's needed to interrupted, it's usually possible to resume easily right at same place. Because so little attention is needed, more than one routine task can often be performed at the same time.

#### Complex work

Lateral and exploratory, complex mental work requires that new information be combined with existing information. The goals and procedures of complex work are often unclear. after seeking new information primarily through sight and hearing, people must pay a lot of attention to hold it in their working and long-term memories, combining it with other information already there to create new decisions about what to do.



fig 7.5.1a Routine work



fig 7.5.1b Complex work

### The screen of workplace

The screener effect is the ability to screen out the external influence.

#### High screeners and complex work

Involved in complex work demanding much of their attention, high screeners can provide some sensory protection for themselves and select the stimuli they need. They are able to use their attention capacity more fully for deliberative work and probably don't need the most quiet workplace to avoid a mental workload.

#### Low screeners and routine work

If people tend to be low screeners, they usually take in enough random stimuli to keep their unused attention occupied and to avoid feeling bored even in a quiet workspace. If their workspace is too quiet, however, they could find the random stimuli inadequate. Compensation for people with this mental workload might be self-created auditory stimuli such as headphone music or visual stimuli such as plants, photographs, or artwork.

#### The shift of nature work

For the office today, there is almost no need to carry out physical work anymore. Most of the worker, or we can call "White Collar" are more delicate to mental work.

As the advance of data management and information technology is going into the new century, most of meaningless, redundancy and labor intensive office work would be easily eliminate. The proportion of the routine work and complex will shift. The work of the office worker will shift from the routine to more complex.

It could be predicted that the major task of the work of most staff will be delicate to complex or intelligent.

The **expectation** of workers will be an main issue to design the working space to them. Hence, in the design of the future office should be more concentrated on the develop the environmental which could enhance the effective and creative of the intelligent work

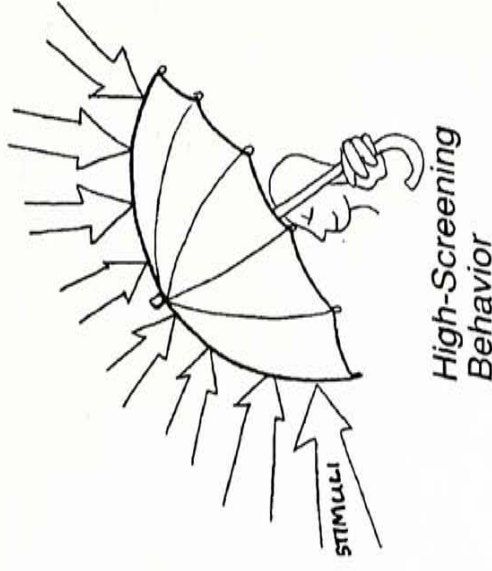


fig 7.5.1c High-Screening Behavior

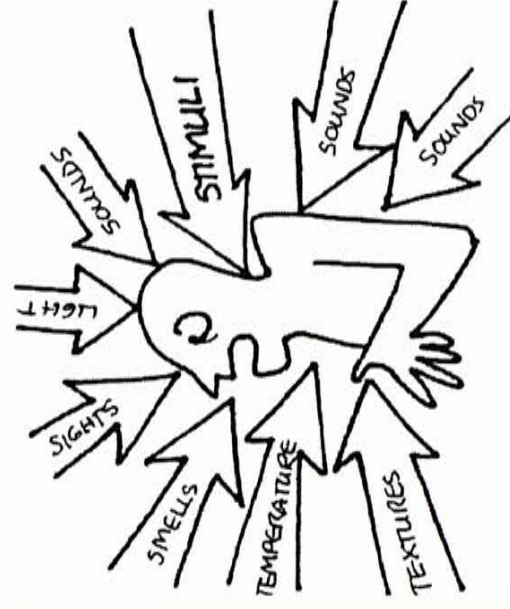


fig 7.5.1d Low-Screening Behavior

**7.5.2 Individual Working<sup>10</sup>**

"The revolution has begun to take place, today an office is a place where an employee must be between specified times to suffer a variety of interruptions.....tomorrow an office will be a system, accessible via the terminal from any place at any time". A quote from CALUS in 1983.<sup>11</sup>

In 1985, The Chicago Tribune has reported that 10 million Americans give home addresses as their places of business on their tax returns, a 50 percent increase over 10 years ago. AT&T has estimated that 23 million people in the United States call home their principal place of work. Of course, while not all of these are telecommuters, this figure indicates that the increase in business done at home is quite substantial.

A survey by Modern Office Technology (MOT) revealed that more than 37 percent of its readers have specific home office areas for work in addition to what they do at their regular offices, and almost 77 percent of these people say that their companies pay for products and equipment that make it possible for them to work at home.

Apart from home, there is many possibility for a workplace:

1. Small closed office(caves for personalization and permanent possessions)	Can achieve most individualism and privacy.
2. Workstation on wheels where permanent possessions are housed within a mobile unit	Wheeled to the most appropriate location for a specific project.
3. Unassigned workstation and shared workstations	in manageably sized work areas servicing large sales forces that spend a majority of time on road.
4. Virtual workplace, physical environment is not essential anymore	Could be possible, be unpredictable
5. Acceptability of home offices and on-line-road office	Which could arranged a significant percentage of work week to be carry out at home.

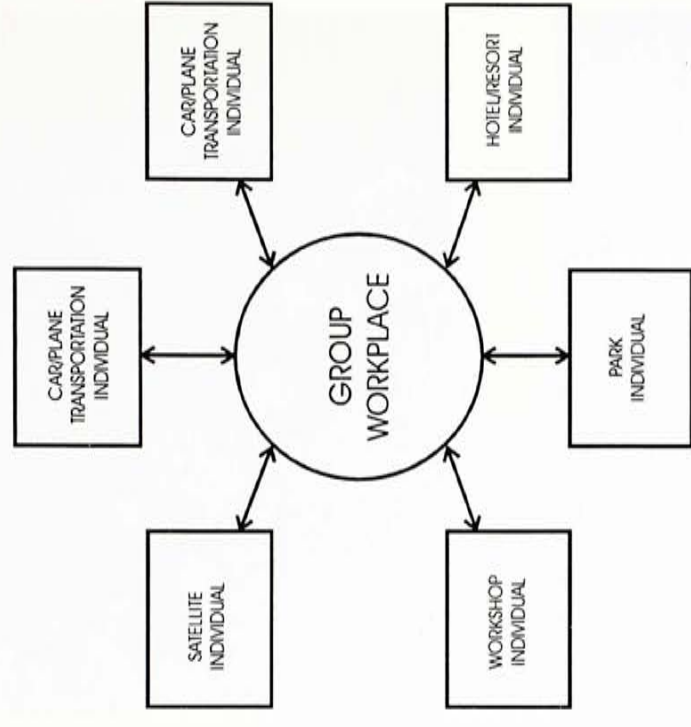


fig 7.5.2a Individual Workplace vs Group Workplace

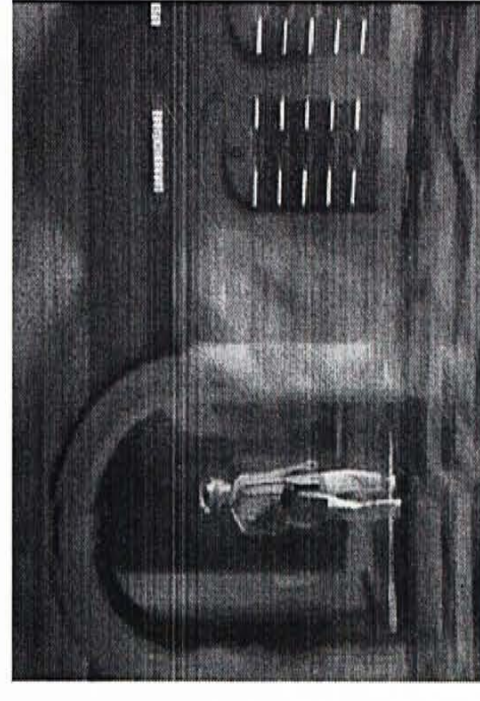


fig 4.5.2b Virtual Workplace in Movie "Discourse"



**7.5.3 Group Workplace**

The need of group working place will not be terminate. It is rather change into an unique space for the worker to carry out their task. By all mean, the role of the group workplace shift. It can easily image the component of the future workplace will be shift to social and interaction orientated. Part of the office hour, the worker can work in their individual workplace. Another part of their office hour, they will spent in the group workplace.

workplaces under score the belief in human adaptability and ignore the fact that while work, equipment, furnishings, environments and people may change, the human body and its performance needs do not.

There is three possibility for the group workplace

1. Task-base:	workplace to house necessary equipment for specific task, staff which should carry out similar job will work together	Effective in facilities and people on same type of work can interchange.
2. Project base:	workplace to group staff from different special field work. All of them can work as a temporary team to tackle a job.	Most effective in human communication.
3. Team base	Staff of same team work together, which is also most typical working organization now.	More easy to manage the staff.



fig 7.5.3a Gathering in Movie "Discourse"

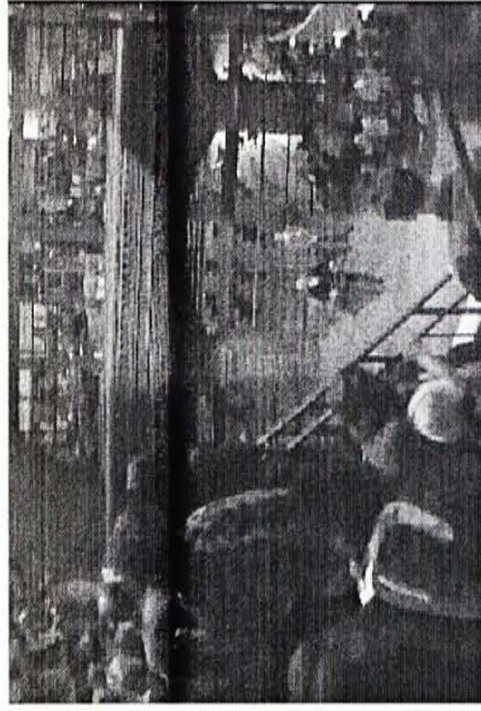


fig 7.5.3b Open presentation space in Movie "Discourse"

**7.5.4 Office as a system**<sup>12</sup>

Some analysis said that the growing trend to telecommuting will lead to need for more conference spaces in the office, since telecommuters will need to come into the office from time to time to discuss work completed and new assignments. They also note that the advent of more group work will add to this need.

The form of office buildings and office interior reveal changes in office technology and office organization, the machines needed to carry out the flow of work, and pattern of communications; office organization refer to the office as a complex of relationships between people. Office buildings and their interior arrangements depend upon available construction materials and methods as well as existing real estate practice.

In time of rapid organization and technological change, buildings cannot continue to be regarded as large, heavy, permanent entities-slow to build and expensive to run. Office buildings in particular, are contrived by weaving together four major factors:

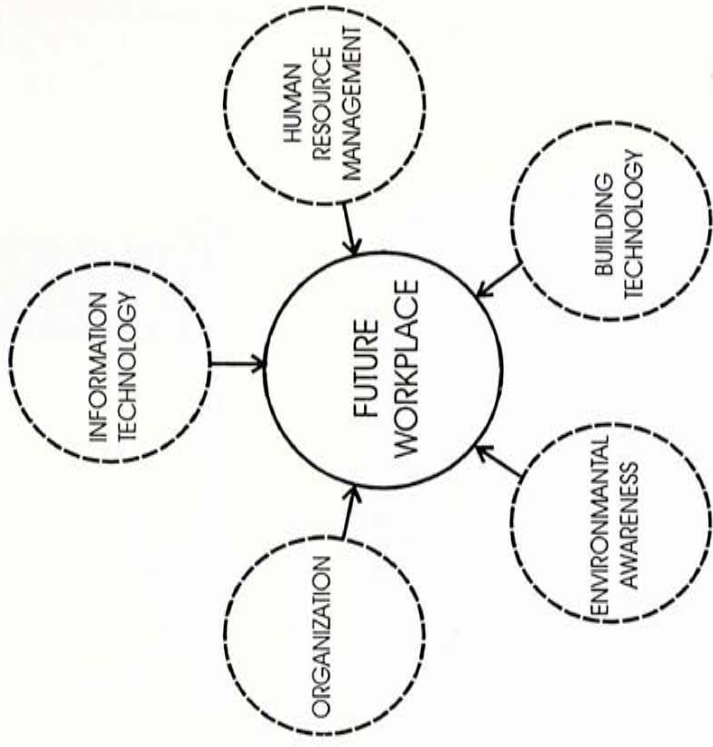


fig 7.5.4 Office as a system

1. Information technology:	The storage, processing and transmittal of information, primarily by electronic media.
2. Organization:	the social structure that holds people together to carry out office tasks
3. Human Resource management	the role of the employer and employee in the office
4. Building technology:	the means available for constructing and servicing the building fabric
5. Environmental awareness	Concern with the environmental comfort and reduce interruption in the nature.

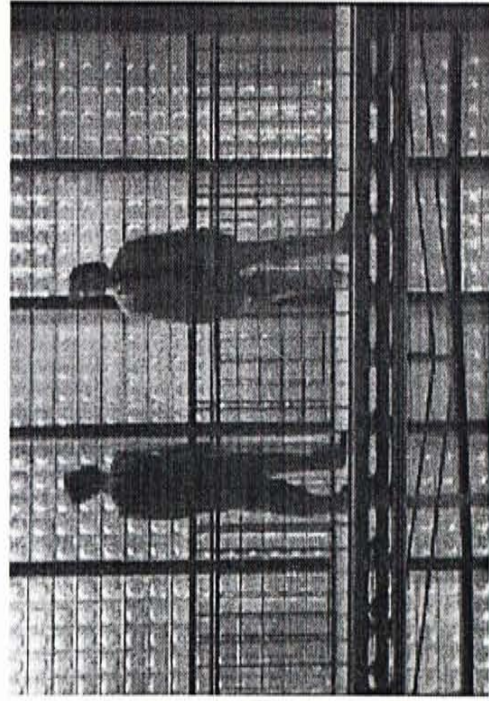


fig 7.5.3c Circulation space in Movie "Discourse"

## 7.6 Case Studies of Contemporary Examples

### 7.6.1 Hennepin Country Government Center

Location: Minneapolis, Minnesota USA

Year: 1976

Architects: John Carl Warnecke & Associates

#### Social

- The building became a focal point of the area. It works as a monument as well as informality. The separation of the administrative office with other functional area by the two tower.

#### Spatial

- Visual relationship to the exiting historical element.
- The highlighted centre, as interior court, formed by the enclosing space between two towers.

#### Structural

- Efficiency of the bracing system reduce the required of less steel and fewer complicated connection of the members.

#### Reference:

Public Municipal and Community Buildings, by Charles King Hoyt. An Architectural Record Book McGraw-Hill Book Company 1980

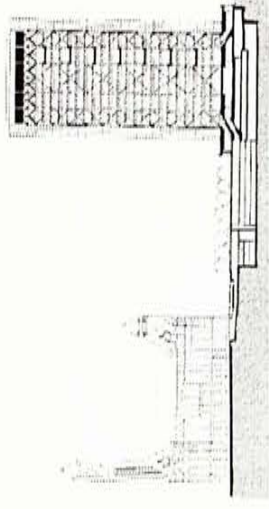


fig 7.6.1a Section

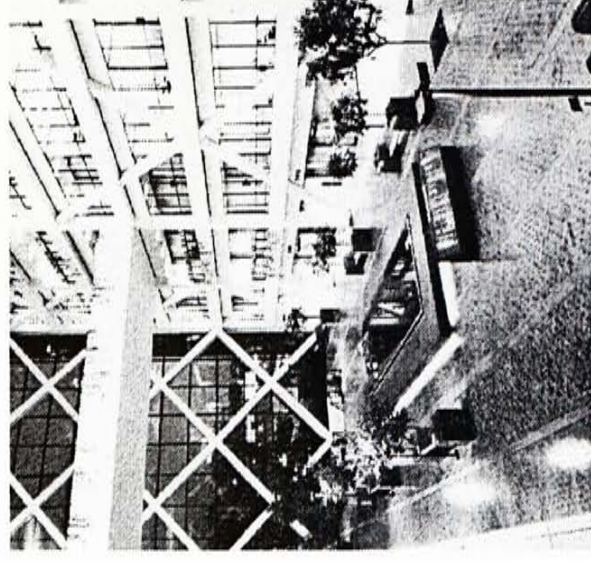


fig 7.6.1b Interior View

### 7.6.2 Marylebone Gate

Location: London commissioned  
 Year: 1989  
 Architects: Michael Hopkins & Partners

#### Economical

- An office building sited adjacent to the Marylebone train station close to one of the main routes into the city from the west.
- It was conceived during the commercial development boom of the 1980s but the project was postponed when the market for office rentals collapsed.
- The office is divided into rental purpose with several main entrance for public access.

#### Spatial

- The building was designed on a square plan with a large, circular, top-lit atrium in the centre providing the perimeter offices with daylight on both sides.
- The circular atrium almost like a Hakka House in China.

#### Social

- The wide proportion of the atrium can enhance the interaction between floors.
- The corridor space facing the atrium become an important chattering space for the staff inside the office.

#### Service

- Service cores are located in the four corners.
- Large amount of light can penetrate into the heart of the building, which can reduce the energy consumption for artificial lighting.

#### Reference:

Contemporary British Architects, Prestel-Verlag, 1994. P98-99

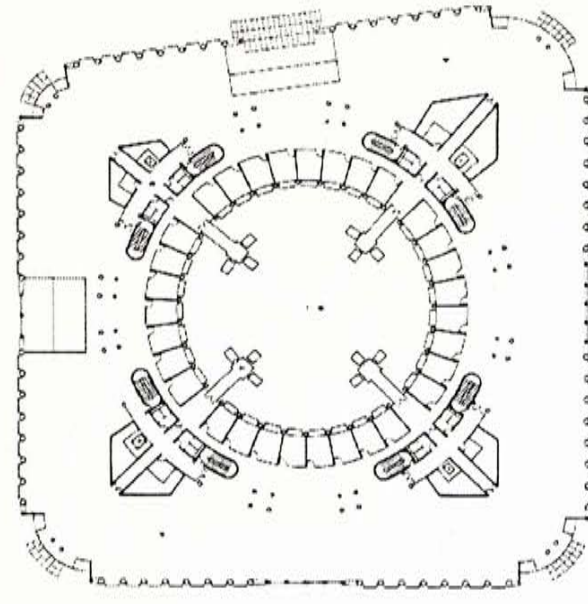


fig 7.6.2a Plan of Marylebone Gate

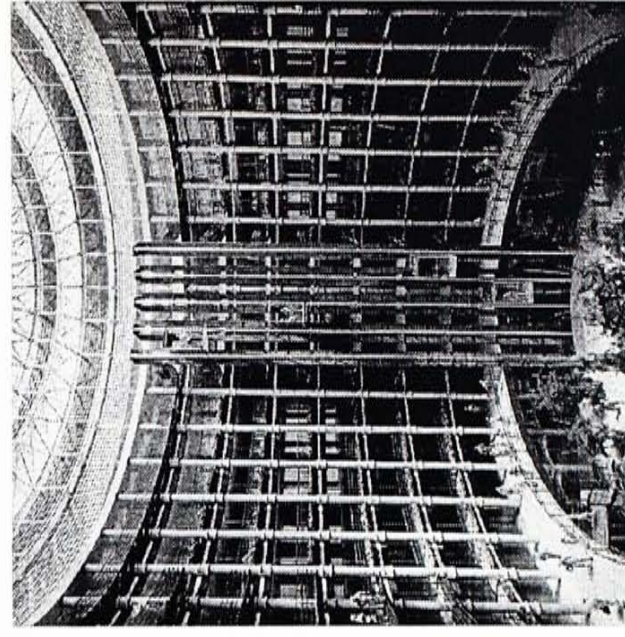


fig 7.6.2b Interior Atrium view

### 7.6.3 Century Tower

Location: Tokyo, Japan

Year: 1991

Architects: Foster Associates.

#### Economical

- It sets a new standard for speculative office development and changing the skyline of Tokyo. The tower is a rich mix of uses, a health club and restaurant

#### Spatial

- Century Tower consist of two linked tower with 19 and 21 storey high respectively.
- The open atriums is the result of extensive testing of negotiation with the Disaster Prevention Committee of Japan which brings natural daylight pouring into the very heart of the building.

#### Social

- Restaurant under a curve roof inspired by a Japanese temple provide varying amenities for users of the building.

#### Structural

- The elevation is the braced frame as a visual strike.
- It is structurally expressive and has the practical benefit of keeping the office space free of columns and other interruption.

#### Environmental

- The interlayer of curtain wall system work with ventilation system reduce the discomfort of the perimeter of the office space and help to reduce energy loss.
- The circulation on both side of the towers make the central space clear and help to shade the sunny side.

#### Reference:

Office buildings: New concepts in Architecture & Design Meisei Publication 1995  
Century Tower, Tokyo, Japan 1991 Foster Associates.

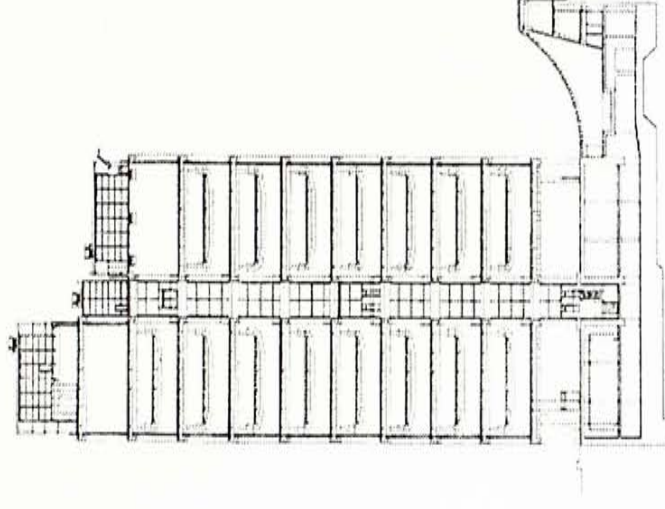


fig 7.6.3a Section of Century Tower

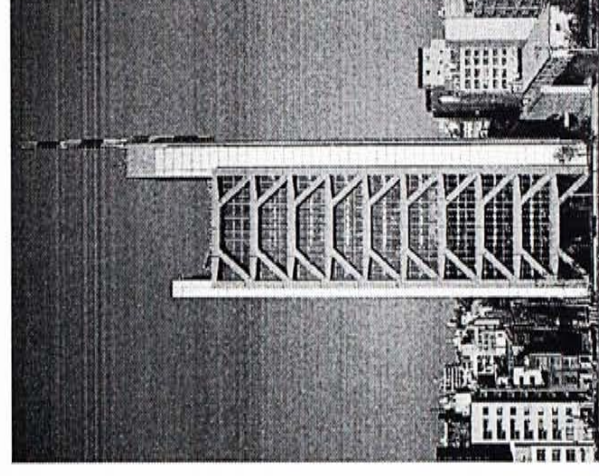


fig 7.6.3b Century Tower

#### 7.6.4 Customer Hall of the L-Bank Landeskreditbank Baden-Wurtemberg

Location: Karlsruhe Germany  
 Year: 1991  
 Architects: Heninz Mohl

##### Spatial

- The new customer hall fills the courtyard of a rectangular building designed by Konstanz architect Hermann Blomeier after the Second World War.
- The working environment inside the hall is stimulating working in the plaza surrounding by the building.
- Working on the surrounding building can also enjoy the courtyard view which work as a whole space.

##### Social

- The complex is an attempt to tie the place into the continuity of the Karlsruhe building tradition.

##### Environmental

- However, such a outdoor environment can have suitable environmental control.

##### Reference:

Heinz Mohl: Building and Projects, Axel Menges 1994

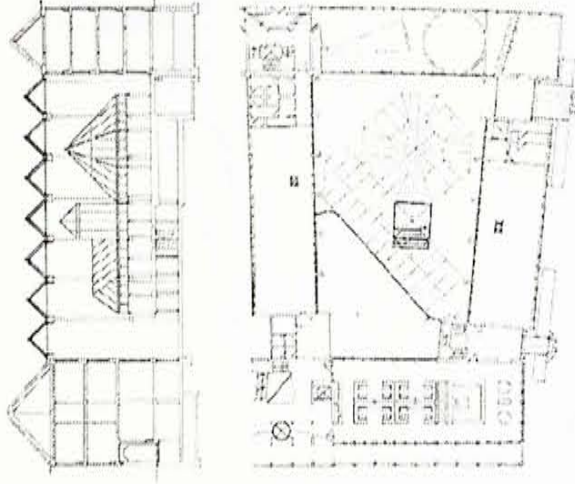


fig 7.5.4a Section and Plan of the Bank

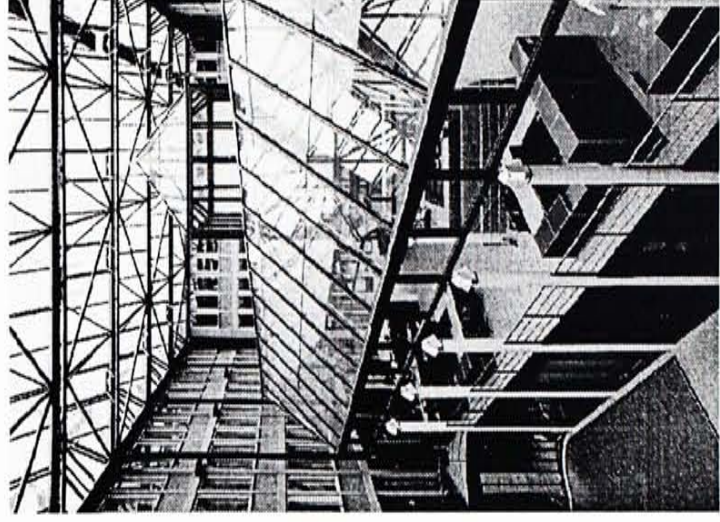


fig 7.5.4b Interior View of the Bank

## 7.6.5 Cite Technique et Administrative

Location: Paris, France  
 Year: 1991  
 Architects: Michel W. Kagan.

### Spatial

- The floating and shading plane design, the movement of the staircase and the canopy give the facades an energy which permeates the entire scheme.

### Social

- The building with white Le Corbusier's Modernism shaping with landscape and open space.
- The variety of space and the pleasure environment mixed with the office space create an comfortable office space

### Structural

- The simple architecture with simple reinforce concrete technology on the university in its appreciate.

### Environmental

- The floating roof which separate the building help to insulate the heat gained.

### Reference:

The Best in Industrial Architecture, Rotovision SA 1992

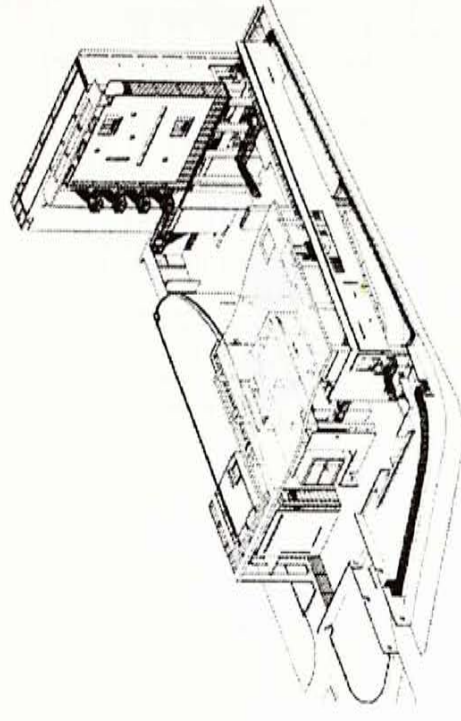


fig 7.5.5a Axonometric of Block

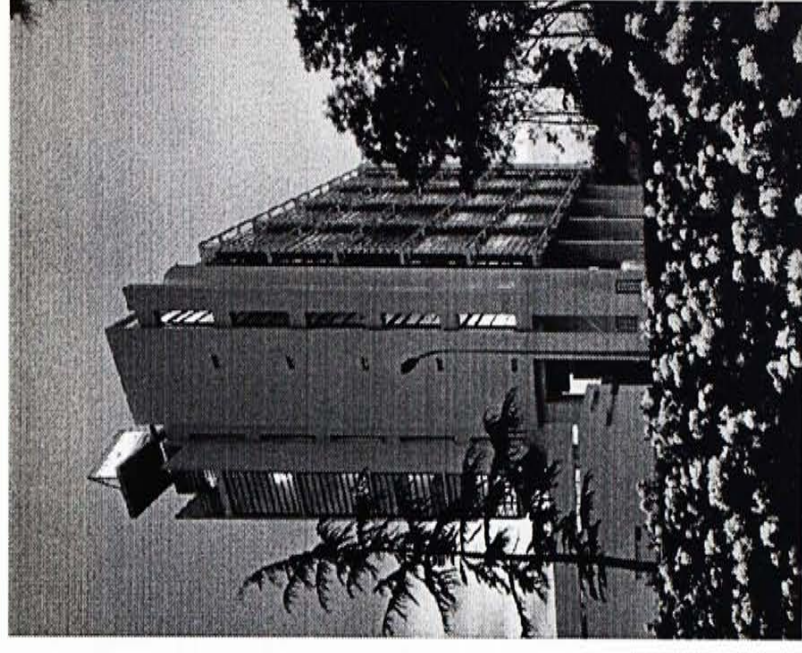


fig 7.5.5b Night view of the Administration Block

### 7.6.6 YKK R & D Center

Location: Tokyo, Japan  
 Year: 1993  
 Architects: Maki and Associates.

#### Spatial

- The atrium, courtyard filled with greenery and void spaces created between the articulation of the building served as important factors
- The inter-relationship of the solid and void create comfortable environment for the staff inside the building.

#### Social

- A medium-rise office development. The essence of the design intent was to express urbanity in the architecture.

#### Reference:

Office buildings: New concepts in Architecture & Design Meisei Publication 1995

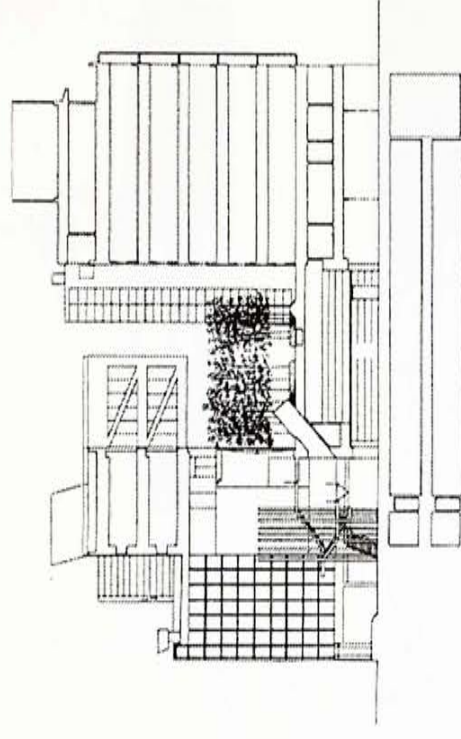


fig 7.6.6a Section of Center

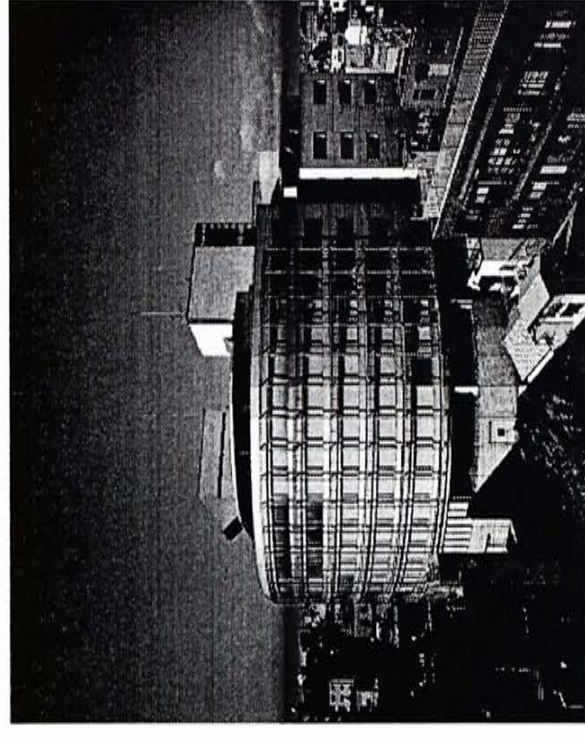


fig 7.6.6b View of the Centre



**7.6.7 Western Morning News**

Location: Plymouth, U.K.  
 Year: 1993  
 Architects: Nicholas Grimshaw & Partners.

**Spatial**

- Open-plan offices are situated on the upper deck immediately behind the glass facade
- Workstations are arranged radially to the curved floor plates and each have a view

**Social**

- The design is to abolish the usual hierarchic division between production and administration.
- The proximity of the journalists to their printers as a traditional characteristic of the newspaper world but one which become obsolete in the age of digital data transmission.

Reference:  
 Designer Offices, Otto Riewoldt, Laurence King Publishing 1994

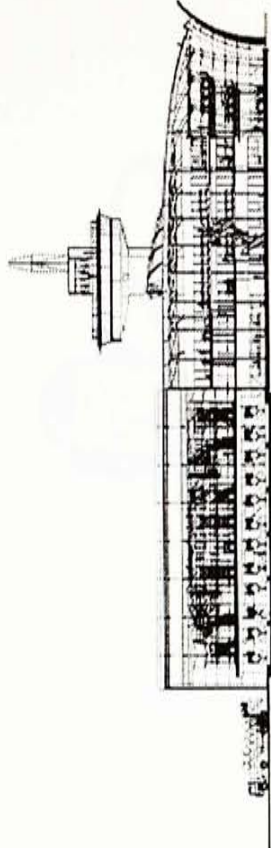


fig 7.6.7a Section of office

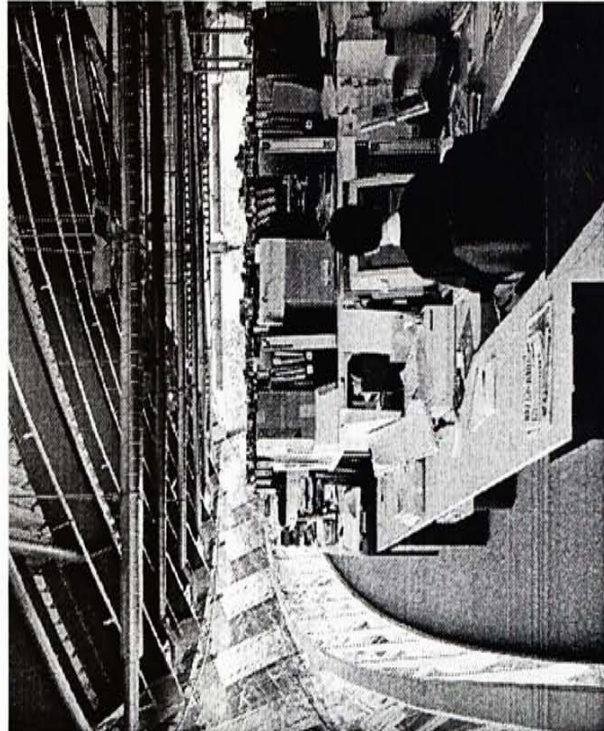


fig 7.6.7b Interior office sapce

**Information technology:**

- Internet provide unlimited source of information which benefit is still undetermined.
  - The **portable work platform** and modem link help to break through any geographical border.
  - Setting up **satellite office** at different district and project based site offices within an organization.
  - Video conferencing also enhance the idea of linking up different office. reduce a lot of traveling time and unnecessary meeting time.
  - Home-working concept integrating people and work with larger flexibility in terms of job sharing flexitime, part-time work and self employment.
  - **Reduce of storage space:** the microfilm and computer backup reduce a lot of information which especially important in the high land cost of Hong Kong. When compare with manual office data management, there is advantage of reduce physical place. Reduce paper and need for file cabinet stage space
  - *Reduce of redundancy:* the advantage of the auto-sorting and reducing redundancy in the database structural can help the staff and secretaries free up from meaningless clerical searching and typing.
- Organization:**
- **Conference area:** More conference area should be designed for face to face interaction.
  - **Communal space:** The social distant of the people will be totally change. The printing, fax machine space will be another important communal space. There is also necessary provide more communal centre to balance the future independent situation.
  - **Individualism:** The workplace of the staff would be quite individual which should provide certain degree of sense of individual freedom to the staff. An self taste of space would enhance the creativity and productivity of a person.

**Human Resource management**

- **Intelligent staff:** most of the labor intensity work is replaced by the computer technology. Most of the staff will involved into intelligent work.
- **Staff as properties:** education level and quality of Staff will be rise, they will become the most valuable properties of Company.
- **Require quality workplace:** the quality will direct affect the motivation and creativity of the staffs.
- **New management style:** management level need another field of new concept and experience for such environment.

**Building technology:**

- **Automatic and personal control** of the building operation such as lighting and ventilation.
- The software by which the use of buildings is programmed and managed through time.
- Environmental management systems; personnel management systems; building management system

**Environmental awareness**

- **Environmental comfort:** the comfort of the workplace should be control automatically as well as suiting personal taste.
- **Energy concern:** as the energy is going into crisis, take advantage of the natural saucer and reduce of mechanical consumption should be careful designed.



fig 7.5.4b Remove Meaningless Work

### 7.6.8 Regional Government Headquarters, Marseilles

Location: Marseilles, France

Year: 1993

Architects: William Alsop Architects

#### Spatial

- The office blocks have ordinary double corridor plans with mainly cellular offices.
- Even the elegant, painterly V- and X-shaped pilots, the latter extending over two floors, conform to a regular rhythm and have clear conventional precedents in the Modernist tradition.
- The well-light atrium provide exciting experience with interior view toward the exterior appreciation.

#### Social

- The strangeness of the form, its animal quality, making the site as a special place like a tribal totem.

#### Reference:

The Architectural Review 1172, October 1994 p10-35

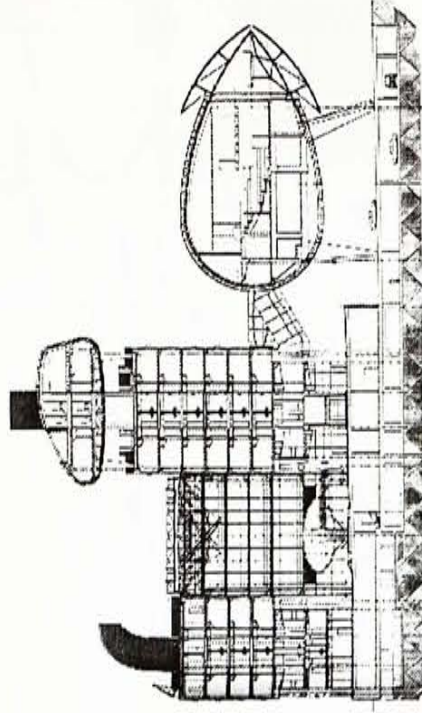


fig 7.6.8a Section of the Complex

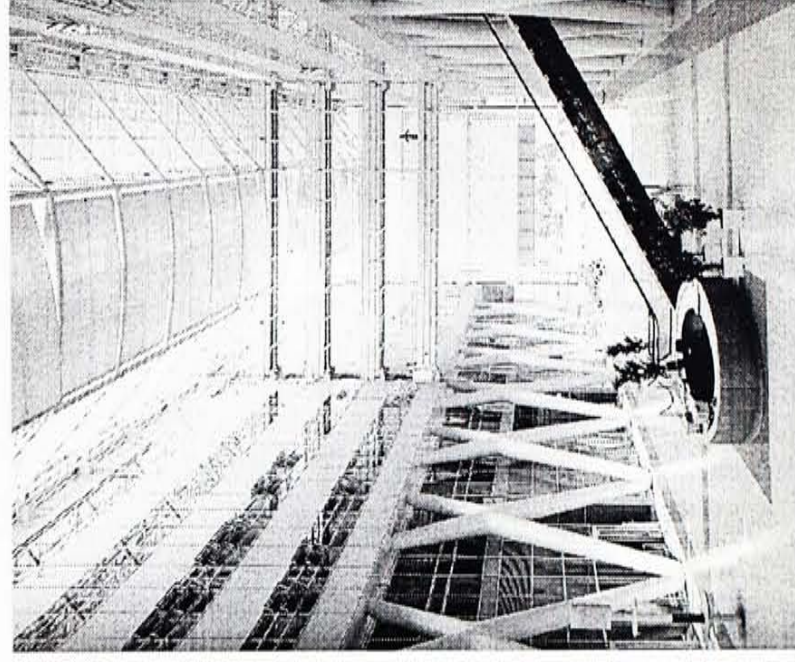


fig 7.6.8b Atrium of the complex

### 7.6.9 Foundation of Cartier

Location: Paris France  
 Year: 1994/1993  
 Architects: Jean Nouvel.

#### Economical

- The company Cartier built this building to house the creative designer of the firm. It also acts as an advertisement of the company.

#### Spatial

- The Jean Nouvel's approach with simple geometry repetitive and with function express on the appearance.
- This is an architecture of lightness, of finely interwoven glass and steel.
- The architecture play consist of blurring the edges of building and impeding an immediate reading of a solid volume.

#### Social

- He try to explore advance technology and express in term of detail and also facade treatment.
- The transparency of the design provide an openness feeling for the staff working inside the building.
- The garden merge with the volume provide picturesque view for the public view outside and the staff inside.

#### Reference:

EL Croquis 65/66 1994 Jean Nouvel

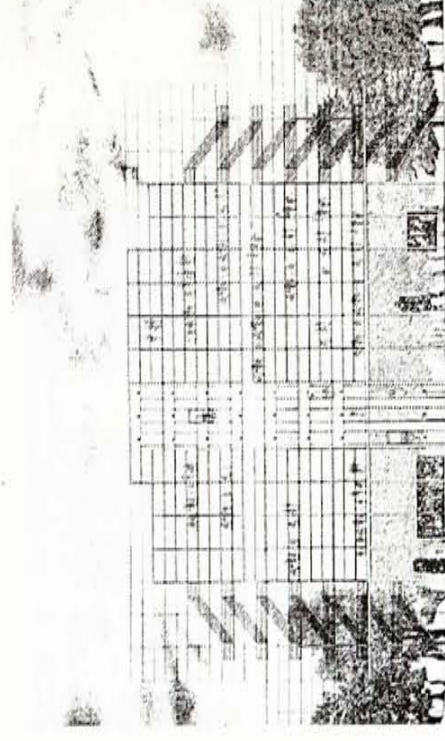


fig 7.6.9a Elevation of the Office

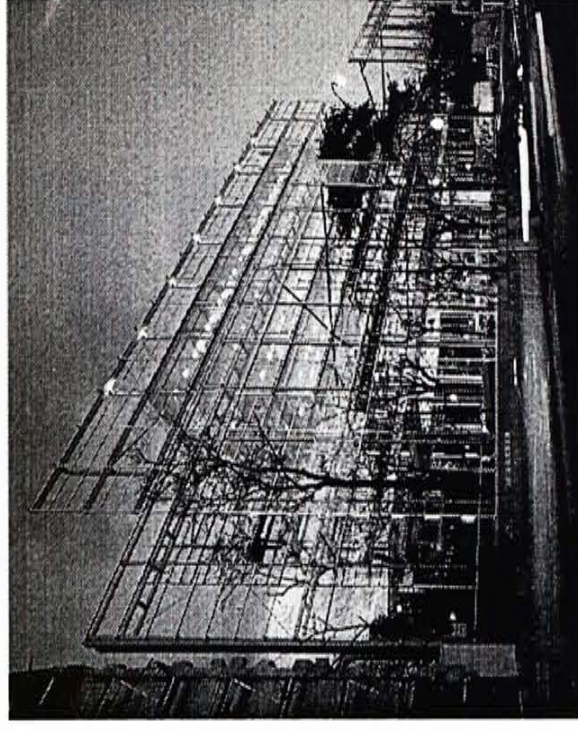


fig 7.6.9b Night View of the Office

### 7.6.10 West Wing of Cite de La Musique

Location: Paris, France  
 Year: 1995  
 Architects: Christian De Portzamparc.

#### Spatial

- It have one entrance which all spaces had to be organized into precise relationship between the various part that had to accommodate the various types of musical activity: dance, jazz, classical, electronic, and so on.
- All the spaces where people walk and meet are completely open, space like street with light and view.
- Instead you have a sense of intimacy, and the sense that this is a large and great space in which you can breathe and see things.
- The sense of everyday discovery, that is helps them to understand the importance of space, shape, form and architecture, as something that makes their lives different.

#### Social

- The ideas of the facilities of music, with each family having its own home inside.
- About two thousand people living and working inside.
- The program was developed in close collaboration with the teachers and administration.
- It is a university, with a large number of studios, many types of auditorium and many kinds of music room.
- The ability to determine one's own position, one's own relationship to the whole, the group, represents an important psychological comfort.
- You can isolate yourself or you can meet people. To achieve this, I made the in-between spaces-a spatial network of transparencies, sounds, and light-larger then the program required.

#### Reference:

GA Document Extra 04 Christian De Portzamparc

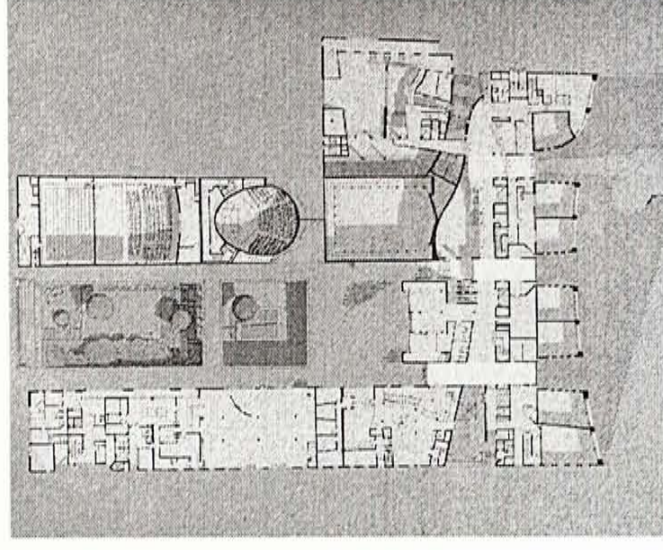


fig 7.6.10a Master Plan of the Complex

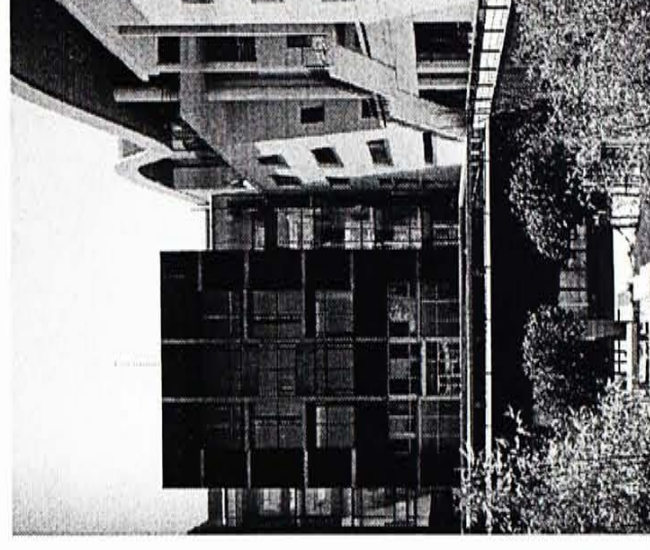


fig 7.6.10b View from the courtyard

- <sup>1</sup> Walter B. Kleeman, *Interior Design of the Electronic Office*, Jr. Van Nostrand Reinhold 1991  
Steelcase Strafor, *The Responsive Office: People and Change*, Polymath Publishing 1989  
William Dudley Hunt, *Office Buildings: Architectural Record Book*, Jr.An, F. W. Doge Corporation 1961
- <sup>2</sup> Walter B. Kleeman, *Interior Design of the Electronic Office*, Jr. Van Nostrand Reinhold 1991
- <sup>3</sup> Volker Hartkopf, John Wiley & Sons, *Designing the Office of the Future: The Japanese Approach to Tomorrow's Workplace*, INC New York 1993
- <sup>4</sup> Volker Hartkopf, John Wiley & Sons, *Designing the Office of the Future: The Japanese Approach to Tomorrow's Workplace*, INC New York 1993
- <sup>5</sup> Volker Hartkopf, John Wiley & Sons, *Designing the Office of the Future: The Japanese Approach to Tomorrow's Workplace*, INC New York 1993
- <sup>6</sup> Volker Hartkopf, John Wiley & Sons, *Designing the Office of the Future: The Japanese Approach to Tomorrow's Workplace*, INC New York 1993
- <sup>7</sup> Phyl Smith & Lynn Kearny, *Creating Workplaces Where People can Think*, Jossey-Bass Publishers San Francisco 1994
- <sup>8</sup> Phyl Smith & Lynn Kearny, *Creating Workplaces Where People can Think*, Jossey-Bass Publishers San Francisco 1994
- <sup>9</sup> Phyl Smith & Lynn Kearny, *Creating Workplaces Where People can Think*, Jossey-Bass Publishers San Francisco 1994
- <sup>10</sup> Walter B. Kleeman, *Interior Design of the Electronic Office*, Jr. Van Nostrand Reinhold 1991
- <sup>11</sup> Phyl Smith & Lynn Kearny, *Creating Workplaces Where People can Think*, Jossey-Bass Publishers San Francisco 1994
- <sup>12</sup> Walter B. Kleeman, *Interior Design of the Electronic Office*, Jr. Van Nostrand Reinhold 1991

**RESEARCH OF ENERGY EFFICIENCY DESIGN**

- 8.1 Selective vs. Exclusive
- 8.2 Environmental origin
- 8.3 Natural ventilation
- 8.4 Sunlight Design
- 8.5 Mixed modes ventilation
- 8.6 Space for services
- 8.7 Solar Power
- 8.8 Building Envelope Design
- 8.9 Human perception
- 8.10 Planning Strategy
- 8.11 Common Architectural Problems
- 8.12 Case Studies
  - 8.12.1 Business Promotion Centre
  - 8.12.2 Inland Revenue offices
  - 8.12.3 Office and workshop complex, Ettlingen
  - 8.12.4 Office complex, New Delhi
  - 8.12.5 Mixed development, Norway

### 8.1 Selective vs. Exclusive<sup>1</sup>

In "The Architecture of the well-tempered Environment", Banham suggested that historic buildings fall into three distinct "modes" of environment control: the "conservative", the "selective" and the "regenerative". In his book, he continues to make clear the difference between buildings that use ambient energy sources in creating natural environments and those that rely on mechanical plants to create controlled, artificial environments.

"Exclusive", to isolate the internal environment from the exterior, to restrict the form and nature of building envelope. The ultimate building is a squat, deep plan form with a highly insulated exterior with minimal opening.

"Selective", It admits and controls ambient energy sources. A more complex form and its envelope has greater transparency and complexity.

	Exclusive mode	Selective mode
Environment	Automatically controlled and is predominantly artificial	Controlled by a combination of automatic and manual means and is a variable mixture of natural and artificial
Shape	Compact, seeking to minimize the interaction between exterior and interior environments.	Dispersed, seeking to maximize the use of ambient energy.
Orientation	Relatively unimportant	Crucial factor
Windows	Restricted in size	Large on southerly facade and restricted to north. Solar controls are required to avoid summer heat
Energy	Primarily from generated sources and is used throughout the year in a relatively constant quantity	Combination of ambient and generated. The use is variable free running throughout the year with a peak in the year



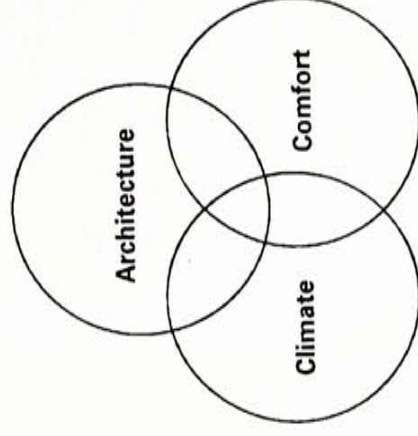
fig 8.1.1 Primitive hut



## 8.2 Environmental origin<sup>2</sup>

Primitive humanity's adoption of clothing and shelter. the primitive hut beloved of architectural theoreticians.

The earliest extensive account of environmental design in architecture is to be found in Vitruvius' *Ten Books on Architecture*, 1960. In Book I, Chapter IV, on "The site of a city", and Chapter VI, on "The direction of the streets", both emphasize the importance of environmental factors. Later in Book VI, Vitruvius discussed "The proper exposure of the different rooms" and, by implication, defines expectations of comfort when he speaks of the purposes of bedrooms and libraries requiring the morning light and hence, an eastern exposure. These fundamental relationships between climate, comfort and role of architecture may be described by the "Vitruvian tri-partite model of environment"



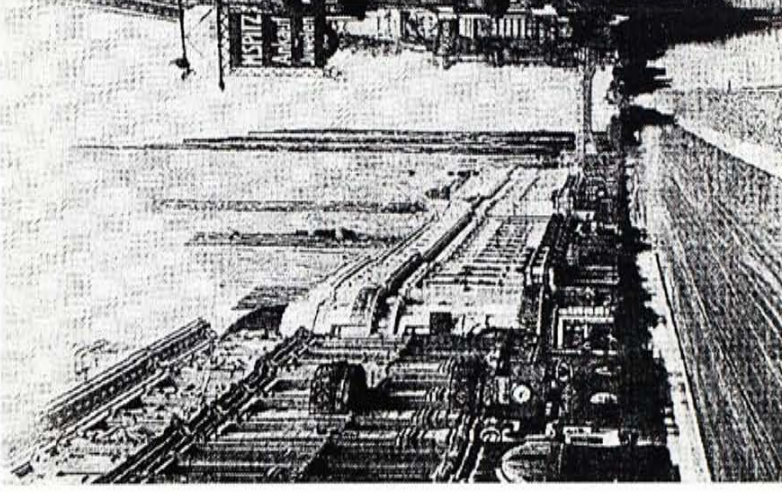
Throughout recent history the office building has been at the centre of developments in environmental design. In its transformation from the counting house to modern business centre it has consistently exploited the latest technologies of mechanical servicing to sustain the goal of efficiency. In one sense it may be argued that the air-conditioned glass skyscraper is the most successful production of the construction industry in the twentieth century. Following the inspiration and ideology of Mies van der Rohe's prospects for glass skyscrapers in Berlin of 1919 and 1922, its very presence in every city of the developed world, regardless of the climate, symbolizes the ability of technology to overcome nature.

In the 1970s, the Electricity Council in Britain promoted an approach to environmental design that it labeled "Integrated Environmental Design". Squat, deep-plan buildings had highly insulated, minimally glazed exterior walls and the mechanical plant recovered heat from the permanently used artificial lighting to eliminate the need for a heating system. The buildings have cooling plants to deal with overheating on all but the coldest days.

IN Gateway Two at Basingstoke of 1983, Arup Associates made important contribution to the evaluation of office buildings. They adapted the general idea that the building should be a complete system in which building envelope and mechanical system work in harmonious relationship. Arup redefined and refined the nature and function of the envelope so that natural light was restored and it became possible to use natural ventilation by opening windows. Before Gateway Two, the idea also implemented in regional headquarters building for the Central Electricity Generating Board at Bedminster Down near Bristol in 1979 by them.

fig 8.2.1 Vitruvian tri-partite model of environment

fig 8.2.2 Mies glass skyscrapers in Berlin



The concern with climate with the architectural design could be dated back to early time. The difference between the climate of the Vento and that of southern England was clearly expressed in the nature of the transformations which Andrea Palladio's great models underwent in the hands of the English neo-Palladians. A comparison the Villa Rotonda, Vicenza, 1550 and Colen Campbell's Mereworth Castle, 1725 show how the dominant preoccupation with summer heat in Italy is replaced by the northern European concern for warmth in Winter. This is most clearly revealed by the greater subdivision of Campbell's interior and the provision of no fewer than 24 fireplaces, all located in the masonry core of the rotunda.

A comparison between Kahn's Mellon Center at Yale University, New Haven and Robert Venturi's Sainsbury Wing extension to the National Gallery in London suggests a further development of the distinction between the "selective" and "exclusive" modes. Kahn's building, even through they, of necessity, incorporate sophisticated mechanical systems, retain a fundamental connection between the internal and external environments. It was Kahn, after all, who wrote that "a room is not a room without natural light". In this respect they are "selective" designs. Venturi's building achieves an almost complete isolation of the two environments and is thus, "exclusive".

An evolutionary tale of building

The early twentieth century the central urban office building in Britain

A significant landmark in the development of the office building was the London Passenger Transport Board Building in Westminster of 1929

After 1939-1945 war, the increasing importance of daylighting and sunlighting considerations in town planning practice and legislation led to further development

SOM's lever house in New York of 1952, led directly to next stereotype, the slab on podium form of latter half of the 1950s.

In response to the environmental shortcomings of the early slab on podium building, growing interest in deeper plans with a high degree of artificial control.

Further refinement follow until the concept of "thermal balance" developed.

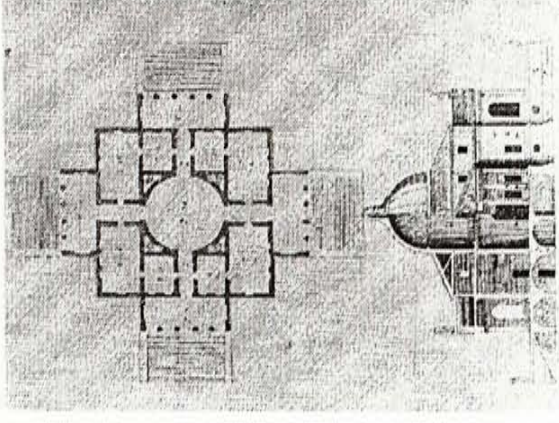


fig 8.2.3 Villa Rotonda, Vicenza, 1550

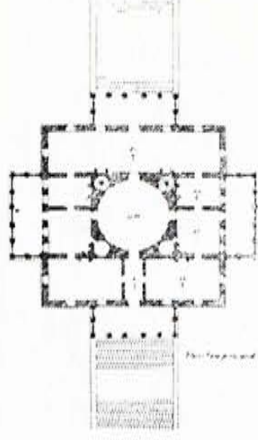


fig 8.2.4 Colen Campbell's Mereworth Castle, 1725

### 8.3 Natural ventilation

#### Get natural ventilation to work

Ventilation routes, likely driving forces (stack effect and wind pressure), resistance to flow and means of control must be considered carefully. When natural ventilation is the prime cooling source, careful window design is essential, especially choice of opening element and perhaps some automatic control.

#### Ventilation and cooling

High-level and low-level window provide cross-ventilation seasonally and diurnally. Wind towers assist ventilation in some buildings.

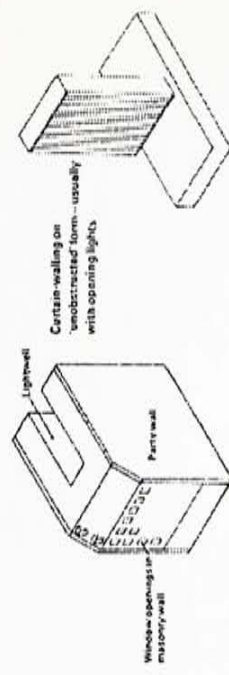
#### Use of outdoor air

The relatively high temperature indoor air allows filtered outdoor air to be used to supply free cooling for cool season.

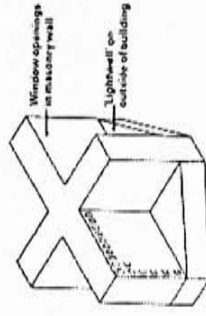
#### Landscape and wind:

Create court space between building. Use of trees for shelter belts close to building.

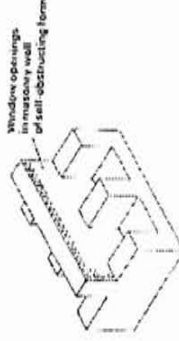
### An evolutionary tale of building



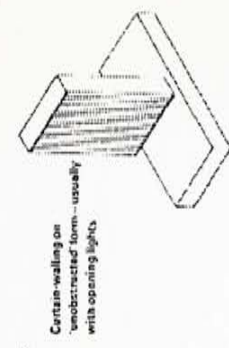
3.1 Stereotype 1, c. 1900: London Building Acts approval forms.



3.2 Stereotype 2, c. 1930: 'lightwells on the outside'.



3.3 Stereotype 3, c. 1945: post-war daylighting standards.



3.4 Stereotype 4, c. 1955: slab-corridor system.



3.5 Stereotype 5, c. 1970: deep-plan, air-conditioned.



3.6 Stereotype 6, c. 1975: Integrated Environmental Design (IED).

## 8.4 Sunlight Design<sup>3</sup>

Use of moderate level of high-quality ambient light supplemented by local task lighting where desired. Maximum utilization of daylight in combination with good passive solar practice. Taking advantage of building orientation, fixed architectural elements such as lightshelves, and high ceiling achieved through integrated building system.

Use of dynamic controls to supplement fixed design and optimize energy performance

Furthermore, sunlight can improve the psychological atmosphere of a working environment:

- Delight of seeing direct sunlight spilling onto the litrium floor regardless of the sun's actual location in the sky.
- Delight of seeing and feeling direct in full intensity.
- Delight of seeing slowly changing patterns of sun on the ceiling deep in the space through sunny day.
- Litria would be the focal point of the building and would be brighter than, rather than a fraction as bright as, the external scene.

High-quality diffuse natural lighting can make great inroads. Solar and glare control are important, but there are greater opportunities with new glazing and shading technologies to increase the admission of diffuse natural light.

However, we could aware the use of daylight in various way. Otherwise unwanted daylight would make occupants uncomfortable. Contrast can give an impression of darkness and lights are more likely to be switched on. For most space daylight is from at least two-sides.

The possibility to exploiting the sun, reducing the use of artificial light can decrease the power consumption.

There is various way of using sunlight:

Multiple reflection skylight:<sup>4</sup>

The architect collaboration with Christian Bartenbach's office, new kind of light-grid system that could be integrated into large glass panel which can reflect the daylight into diffuse light into the space. The new glass roof of the exhibition and congress centre can prevent the solar heat gain in the building during the summer months, even with the changing angle of inclination of the sun and different roof slopes. At the same time, high levels of natural daylight from the northern hemisphere of the sky are channeled in to provide brilliant lighting conditions in the interior of the hall.

Example: Design Center, Linz, Austria by Thomas Herzog

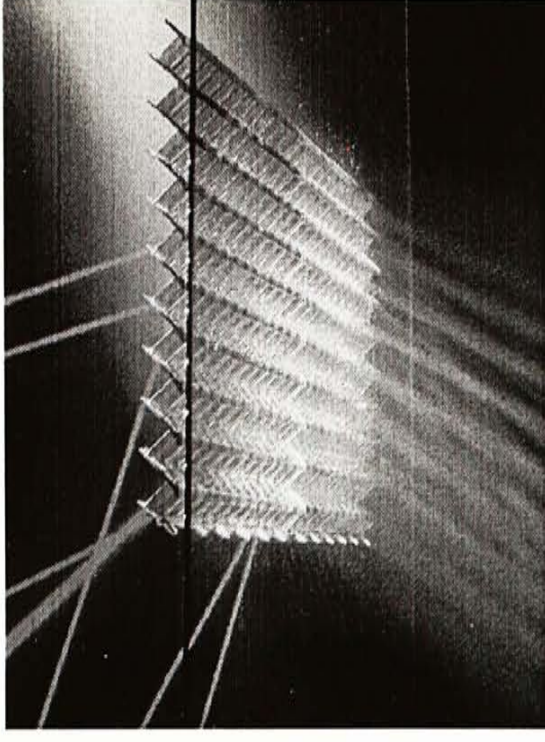


fig 8.4.1 Lighting studies of roof glazing of Design Center, Linz

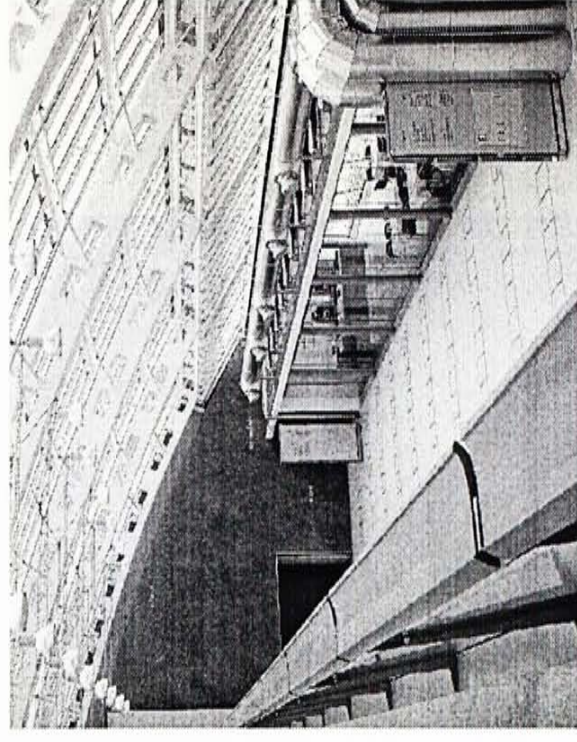


fig 8.4.2 Design Center, Linz

**Single Reflection Light shelves: Internal or external**

Inland Revenue offices, Norttingham, England by Michael Hopkins & Partners

The building use high-level windows and incorporate system of bouncing natural light off ceiling. The light coloured concrete ceiling improve the reflectivity.

Example: Inland Revenue offices, Norttingham, England. Michael Hopkin

**Fibre-optic<sup>5</sup>**

The Himawari system used in ARK MORI building in Japan. It uses fiber-optic light transmission devices to filter ultraviolet and infra-red rays while transmitting daylight with a high color temperature. In ARK Mori complex, a roof Himawari collector brings daylight to plants in the hotel lobby and parking complex, as well as to chandeliers in lobby, conference, and Lounge spaces.

*Sunlight as Formgiver for Architecture* by William M.C. Lam, Van Nostrand Reinhold Co, New York, 1986

Example: ARK MORI complex Akasaka, Tokyo by Irie Miyake Architects and Engineers.

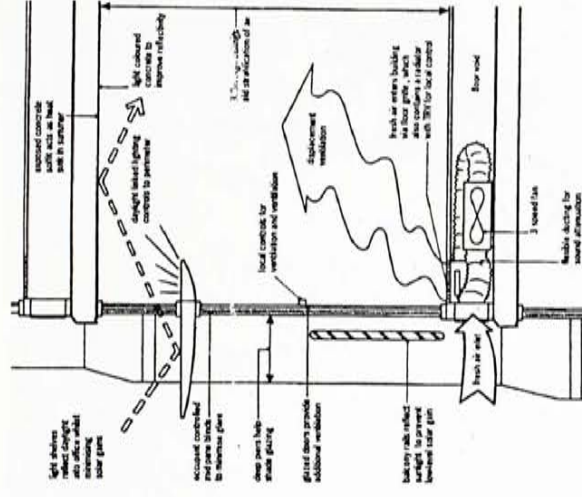


fig 8.4.3 Inland Revenue offices, Norttingham, England

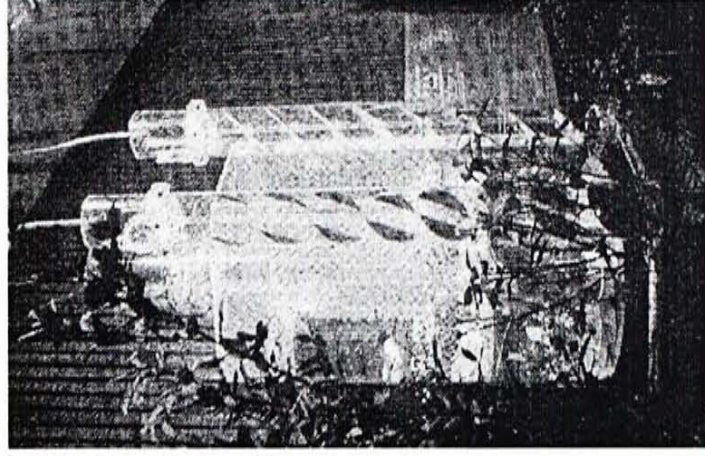


fig 8.4.4 ARK MORI complex Akasaka, Tokyo

### 8.5 Mixed modes ventilation<sup>6</sup>

Recently, many lower-energy office is use show ways to avoid or reduce the energy use and cost of air-conditioning. Sometimes they rely on natural buoyancy, sometimes they are mixed-mode, they include power-assistance. Sometime the proposed operation is very complex, changing with season, time of day, cloud cover and winter speed and direction. There are problems of unnecessary complication. The simpler and more intuitively obvious in operation the environmental design, the greater the chance of success.

Mixed modes, can stretch the performance of natural ventilation by using mechanical boosting only when and where necessary. The approach fits in with occupant preferences for greater outside awareness and potentially offers a low-risk route to longer-term sustainability of building performance. Four main mixed mode categories have been identified:

#### Contingency

Not mechanically ventilated or cooled, but with service routes, voids and plant space available, either physically or potentially.

#### Concurrent

Operable windows and mechanical systems are both available, either all year or in selected places and times. Often low-capacity mechanical ventilation provides fresh air in winter, some cooling and air movement in summer and night ventilation if required.

#### Zoned

Different parts of the building have different systems which operate independently as required.

Naturally ventilated buildings with localized mechanical cooling, such as in conference rooms and computer rooms. This often happens anyway.

Zoning is particularly efficient where problems can be grouped; for example, when an office with high occupancy and high equipment levels is in a part of building with relatively high solar gains which is poorly located for passive cooling. There local air-conditioning can do several jobs. However, may be cooled areas acquire higher status

#### Changeover

Design treat the building differently at different times, possibly using different systems. Often they have low-capacity background ventilation with readily switchable local top-up cooling using fan-coils, unit heat pumps or chilled beam.



fig 8.6.1 Richard Rogers' Lloyd's Building

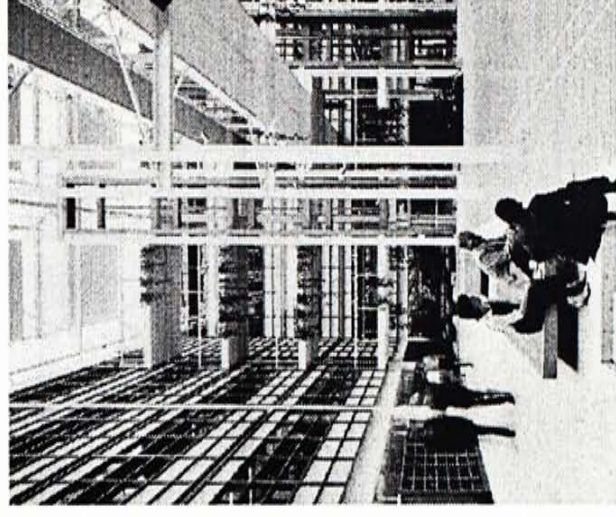


fig 8.6.2 Arup Associates' Gateway Two office building



## 8.7 Solar Power<sup>8</sup>

Photovoltaics -turning light into electricity-has hitherto been used most commonly in light meters. For some types of Photovoltaics, the technology is proven. Panels of cells are expected to last for 30 years or more outdoors.

Their spread application is prevented by its cost.

There is possibility to integrate photovoltaic into building-envelope elements such as cladding, thus getting components to fulfill more than one function.

Today applications are experimental, supported by subsidies from research founders and from some governments, such as in Switzerland, Germany, the Netherlands and Japan.

Recent built examples of Photovoltaics, include Nicholas Grimshaw's Seville Expo pavilion, which had its pumps for the water wall powered by Photovoltaics located on the roof shading. Sir Norman Foster's Business Promotion Centre at Duisburg is to have rooftop Photovoltaics to help power the cooling.

One of the options is to have external shading louvers incorporate photovoltaic cells.

Photovoltaic panels are typically made of an array of cells in a clear encapsulant substance, all retained between a glass front panel and a structural back panel. As cell costs fall, so panel manufacturing cost will become more critical.

There are all the usual concerns of cladding to be met, such as structural strength, weather tightness, insulation, thermal movement, fire and sound resistance, interstitial condensation.

For Photovoltaics in particular, dirt build-up is likely to cut incident sunlight by less than 5 per cent at worst. And panel temperature rises, efficiency falls, by about one-200th per degree over 25°C. In extremis, if panels get near 100°C some encapsulants may go cloudy. One way to guard against this is to use panels as rainscreen overcladding with its back-ventilation rather than as cladding panels.



fig 8.7.1 Nicholas Grimshaw's Seville Expo pavilion



## 8.8 Building Envelope Design

Most of the heat gain or loss by the building is also through the perimeter envelope. In order to reduce energy loss and get advantage of the ambient energy, envelope design would be the most important. Put necessary insulation on the envelope of building would help to control the incident energy in a lot sense. Thermal insulation panel and careful concrete envelope would be an possible without any doubt.

Apart from weather protection, another major function of the envelope is to provide interior and exterior interaction of a building.

Glass Facade is a major trend of office design. In past, the major problem of the glass facade is the unwanted heat loss or gain. With the development of the technology, it is possible to achieve a balance between the light transmission and comfort control to create a building which functions well as well as contributing to energy saving.

- Attempted solution to solar control have been particularly successful with integration of architectural control strategies such as screens, shades, louvers and films.
- The computerized control shading integration would be an very positive statement in facade design
- Tinted and reflective glazing can reduce gain in commercial building application which is most common adapted but the effect is doubtful
- Later development of systems with selective transmittance low-emissivity coatings and low-convention gas fills in the double glazing unit have solved the problem and seem to be more and more popular.
- Recent developing in optical sensitive glazing system such as electrochromic, photochromic, thermochromic, physio-optic and electro-optic switching mechanisms seem to be a very promising solution in energy efficiency for thermal control of a building.

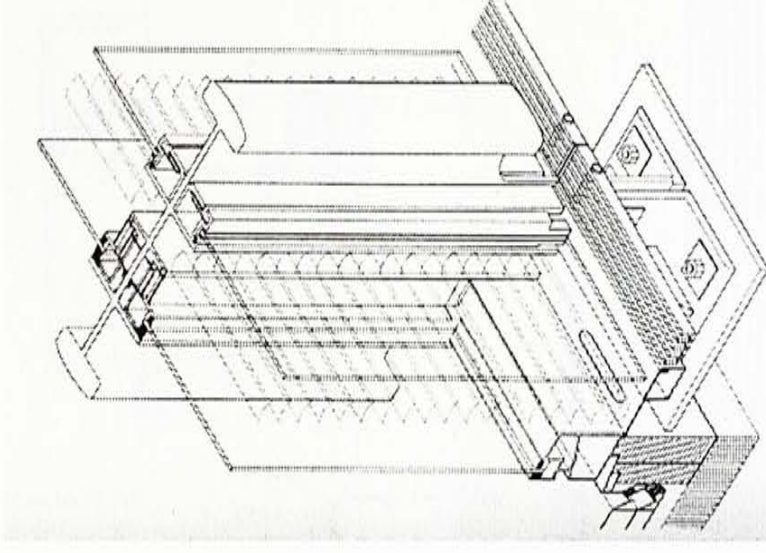


fig 8.8.1 Full height curtain wall system, Century Tower

### 8.9 Human perception<sup>9</sup>

According to research by Bill Bordass, "Occupants who feel that they are privileged to work in a high quality environment, where they feel that their needs have been considered and where they have a certain degree of control over environmental parameters, are likely to tolerate more extreme conditions than those who works in anonymous surroundings where the environments is controlled for them."

- The potential for variation of environmental conditions which is offered by buildings of different types.
- The extent of the occupants of buildings take active steps to modify the environment and to what point.
- The range of conditions which is tolerated
- The toleration demand changes in activity pattern.

Logic suggest that in small rooms, such as private offices, the occupants would readily understand the purpose of the environmental control devices. But perhaps because we are all accustomed to centralized controls in the workplace, we are reluctant to temper. However, in the common area, the responsibility to control this device would be a question. Hence, the degree of control in private and common area should be a lot different.

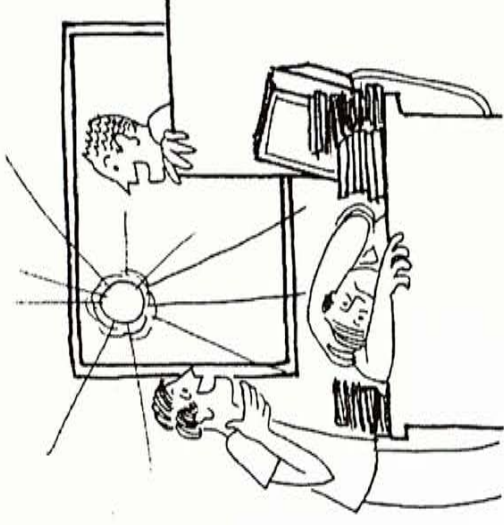


fig 8.9.1 Environment with control

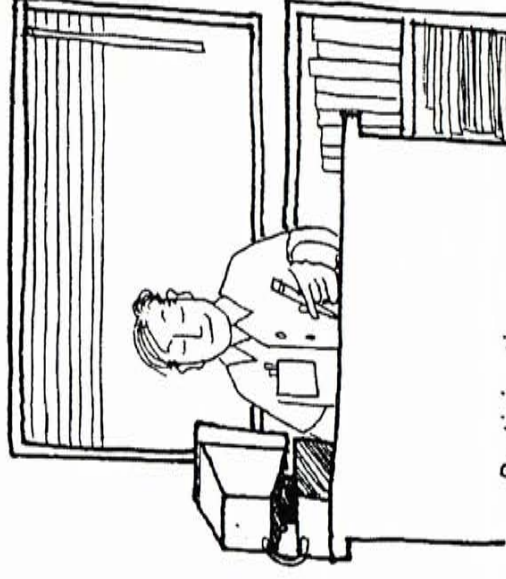


fig 8.9.2 Environment without control

## 8.10 Planning Strategy<sup>10</sup>

In term of user need, a building can be grouped into at least three zone,

- High internal heat gain
- Medium internal heat gain
- Low internal heat gain

According to pattern of use, facilities inside and duration of occupancy, We can adapt the various measurement:

- Maximizing winter solar gain by making window south facing
- Minimizing summer temperature by Shading windows
- Minimizing unwanted heat loss or gain by internal shutter, thermal insulation
- Heavyweight structure, Night time pre-cooling of the structure.
- Minimizing the need for artificial light by achieving even daylighting through the use of skylights.
- Ventilation assisted stack effect and wind pressure such as by wind towers
- Different mechanical support

Arup Associates won a limited competition run by Stockly Park Consortium In June 1994.

The brief prompted Arup to question the nature of an environmentally-sensitive building might be for tenant today and predict these requirement might change by the year 2010. It concluded that the building should be designed to minimize the running costs associate with fully air-conditioned building-heating, cooling and ventilation, but also be capable of mixed-mode operation.

The ensuring design has a cruci-form office floor-plate set within a square glass envelope. This creates four conservatory spaces around the perimeter of the building which form wind breaks to the opening windows in the office walls. the arrangement provide additional solar-collecting and security zones to building.

There is more consideration should we implemented in early stage of design:

Heating an insulation:

Passive solar gain supplemented by heat from occupants and perimeter room heating.

Make use of the thermal capacity

The mass already in the floor slabs can provide useful diurnal stabilization of temperature, but the heat must be ventilated out at light. The thermal mass can pre-cooled overnight by natural ventilation.

The shape and size of buildings is already affect the ratio of the interior space to the perimeter exposure of a building. In case of exclusive mode, the ultimate form will approach to more compact ratio.

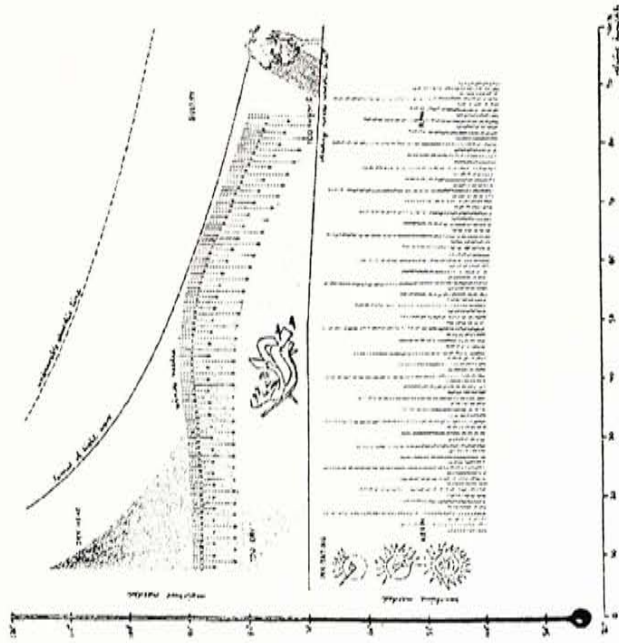


fig 8.10.1 Thermal Comfort Diagram

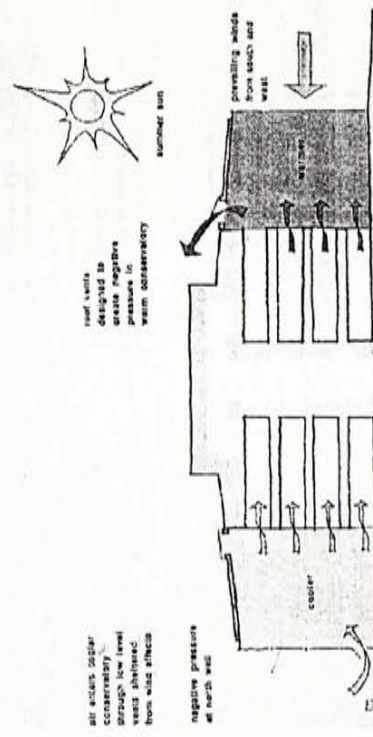






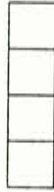

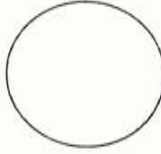


fig 8.10.2 Stockly Park Consortium

A FUTURE WORKPLACE

The perimeter-to-floor-area ratio reduces as the floorplate becomes larger

	Area	Perimeter	Perimeter ratio
	1	4	4:1
	4	8	2:1
	16	16	1:1

The perimeter efficiency of different plan shapes compared with a square

	Area	Perimeter	Perimeter ratio
	4	8	1
	4	10	1.25
	4	14	1.75
	4	7.09	0.89
	4	9.60	1.20
	4	11.5	1.44

8.11 Common Architectural Problems<sup>11</sup>

Too much glass:	Unwanted effects of large glazed areas glare, heat loss, heat gain, low thermal capacity and loss of privacy. The perimeter also heat up and cool down more
Optimism about the use of daylight	The open-plan offices with VDUs, glare and solar gains can commonly lead to blinds closed-light on.
Difficulties with Natural ventilation	Frequently, Windows were not easily operable, such as window is difficult to reach, blocking intended ventilation
Unsuitable or Unworkable control	Problems with strategies and devices ranged from light switches in silly places to automated controls with poor or poorly located user interfaces. For example, if it gets hot on the top floor, the design may assume that those on the north side of the ground floor will open their windows to admit cool air. But why should they if they are not yet hot? And if their windows are opened, will the consequent temperature and air movement be acceptable?
Trying too Hard	One reason why air-conditioned offices often waste more energy than naturally ventilated ones is that more can go wrong. Complex low-energy strategies also increase demands upon occupiers and the likelihood of failure.

## 8.12 Case Studies

### 8.12.1 Business Promotion Centre

Location: Duisburg, Germany  
 Year: 1995  
 Architects: Sir Norman Foster and Partner

#### Economical

- The city wanted a business Promotion Centre on the site that would not only be an office building but also a new landmark for Duisburg.
- The individual room of the office can break down into different company.

#### Spatial

- The building is surmounted by curved steel roof with dramatic terrace-shaped spaces beneath. On the upper-most level is the president's office, with a view of city. The entrance on the ground floor extends into a large exhibition hall

#### Social

- An urban sign for the micro-electronic park itself.
- There is lack of common space for the company who owning one floor to share facilities and enjoyment.

#### Structural

- The building has a lens-shaped floor plan, with steel-and concrete structure, a central core, and a radial support grid of 6 meters.
- The main structure and vertical circulation system is still the traditional central core, but it could be the most efficiency for maximize exterior glazing area.

#### Service

- Foster succeeded in the seemingly impossible task of sandwiching under floor heating ducts, fresh air ducts, cooled ceiling and large quantities of cables, controls, sensors, motors, microprocessors.
- All the gear needed for a fully integrated BMS, into an overall floor thickness of only 550 mm. The system brain is a powerful PC and some sophisticated software that analyses current and anticipated weather conditions

- This data to calculate the optimum heating, lighting and shading levels for the building a day or two.

#### Environmental

- The suspending glaze facade is one of the most advantage in environmental skin system with computer controlled blinds.
- The solar cells on the roof of the building provide electricity for the building.
- The innovation of the air-conditioning system-non-stop cooling, continuous air-conditioning

#### Reference:

Contemporary British Architects, Prestel-Verlag, 1994. P76-77

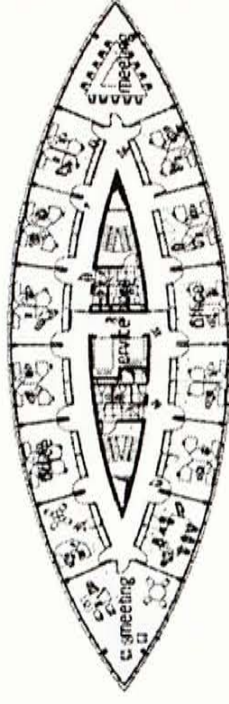


fig 8.12.1a Plan of the Block

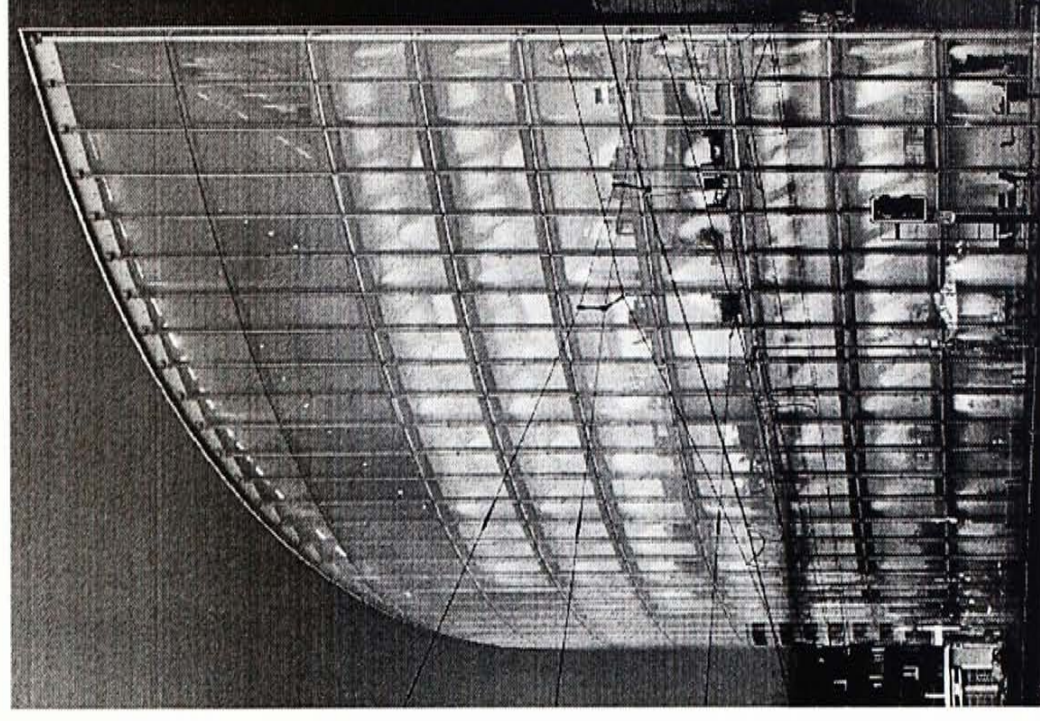


fig 8.12.1b Night view the Block

### 8.12.2 Inland Revenue offices

Inland Revenue offices, 1995  
 Location: Nottingham, England  
 Year: 1995  
 Architects: Michael Hopkins & Partners

#### Spatial

- All office area surrounding by garden and have window watch out.

#### Social

- The courtyard block create a leisure environment in a low dense manner for staff.
- There is large proportion of building area assign for recreational purpose for the enjoyment for staff apart from working.

#### Structural

- The prefabricated concrete structure to achieve the very tight timetable

#### Environmental

- A large civil service complex sets new standards in assisted passive energy servicing, giving users a remarkable degree of control over their immediate environments and suggesting approaches to office development.
- The top floor office space have sufficient natural sunlight on top and on both side provide an time awareness space for the staff.
- To avoid air conditioning, ambient energy use was to be maximized, artificial cooling eschewed and as many people as possible allowed to open windows.
- The massive brick and concrete acts as a thermal fly-wheel, tending to maintain an equable internal climate.
- The plan width was kept shorter than norm in developer, practice. Though the narrower width does make the building frontage longer, it allows the benefits of natural light to be appreciated over a large area, and it obviates dead zones in the middle of the floorplates which would need air-conditioning.
- Heating and ventilation are arranged by drawing air into the building through a small duct in each bay.
- Underfloor fans which can be adjusted individually, control the rate of air flow up over heat exchangers through continuous grilles on the perimeters of floors.
- In winter, hot water flows through the heat exchangers.
- In summer, cold water is circulated, which has some effect on cooling the air on hot days.
- At night in the same season, the fans are left on to cool the structure down, so that during the following day, its chilling effect can play a part in achieving an agreeable temperature in the offices.
- On hot days, individual can open the floor to ceiling windows, creating air movements that add the cooling of the other devices.
- Heat is extracted from all but the top floors of the office blocks through the cylindrical corner stair towers create chimney effect.

Reference:

The Architectural Review 1179, May 1995 p30-45



fig 8.12.2a Master Plan

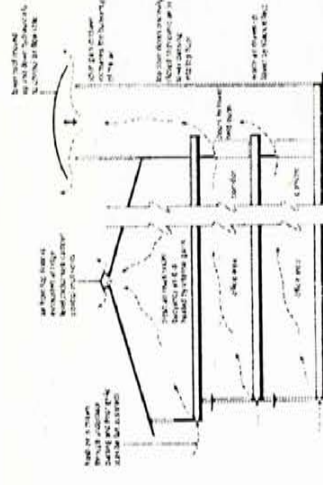


fig 8.12.2b Section of a typical bay

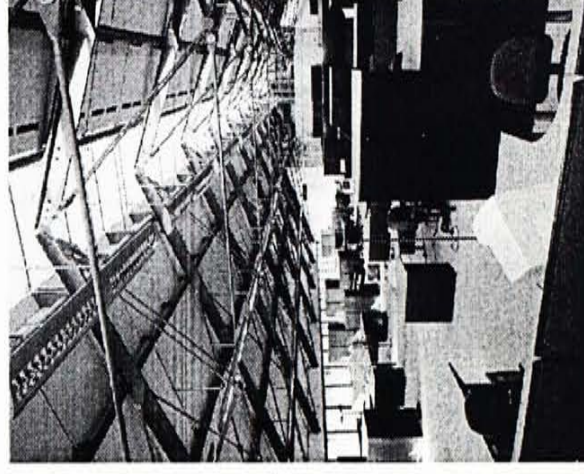


fig 5.12.2c Office Space

### 8.12.3 Office and workshop complex, Ettlingen

Location: Ettlingen, Germany  
 Year: 1995  
 Architects: Architekturburo Wulf

#### Social

- This office and workshop complex for a small town perfectly illustrates imaginative, beneficial use of ambient energy to improve the well-being of building inhabitants.

#### Environmental

- Planning strategy is layered. A long two-storey block rules off the north edge of the site.
- To its south, there is a linear double height greenhouse, and to the south of that, workshops pinto green space at right angle to the main west-east axis.
- At the top of north facing section is the clerestory which is opened automatically when the temperature in the glasshouse becomes too great.
- Panes at the top of the vertical south-east facing glass well are opened automatically too, so causing a convection current upwards under the glass roof, which draws overheated air out from the body of the conservatory.
- In winter, glasshouse is heated by the sun and waste energy from the offices, cafeteria and workshops, so its overall impact on the energy budget is beneficial and at the same time it provides an amenity which visitors as well as office and workshop staff can enjoy.
- The marginal increase over normal in atmospheric oxygen that its plants produce is supposed to make people in the building happier and more efficient.

#### Reference:

The Architectural Review 1179, May 1995 p50-56

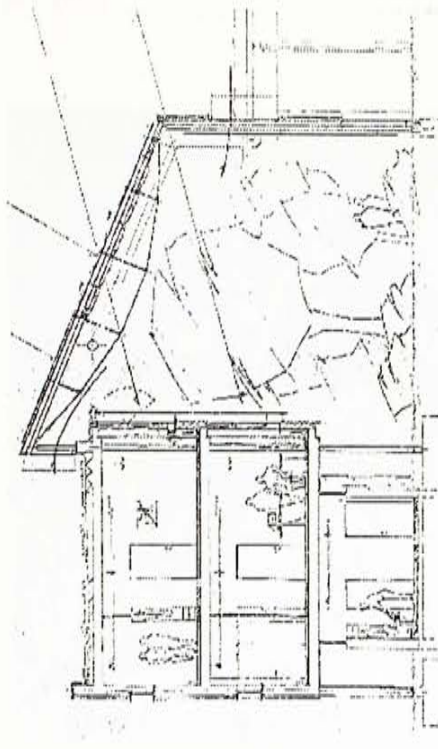


fig 8.12.3a Section of the complex

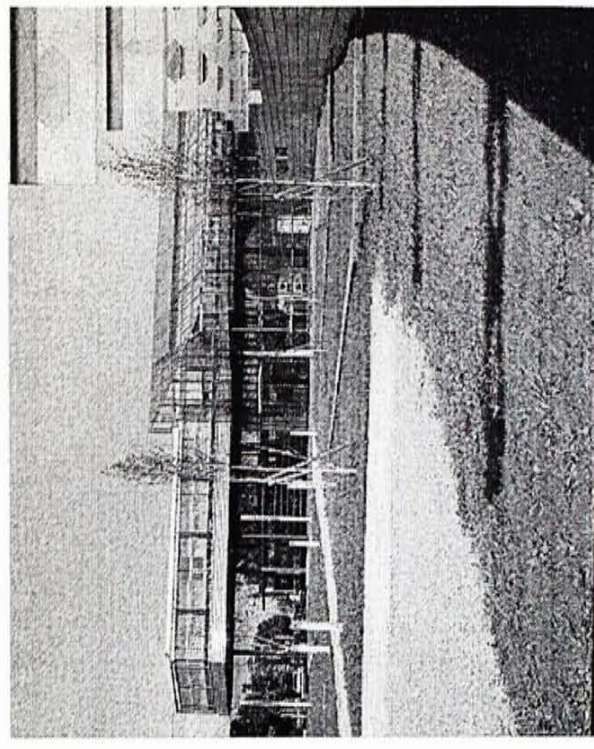


fig 8.12.3b Distant View of the complex



### 8.12.4 Office complex, New Delhi

Location: New Delhi, India Ettligen  
 Year: 1995  
 Architects: Raj Rewal

#### Spatial

- The great amorphous mass of office accommodation with 7000 workers has been subdivided into a more manageable composition of eight blocks.
- Each block is regarded as an individual administrative and social unit, so that workers can identify with their particular territory.

#### Social

- The complex is an environment require the usual working and administrative spaces, but also share common facilities such as an auditorium, seminar rooms and a restaurant.
- At the top of each block is a cafeteria enclosing by segments of barrel vault.
- Intend to provides a welcome respite for workers, these roof-top eyries are approached through open roof garden , and afford splendid views of the nearby monument.

#### Service

- Blocks are arranged around a central circulation and services core.

#### Environmental

- The form of the complex could reflected the climate of the area which courtyard provide comfort zone for the worker in the exterior.
- The think facade of the complex work as a thermal mass which maintain certain temperature indoor.
- The deep window reduce glare which provide shading for the opening.

#### Reference:

The Architectural Review 1179, May 1995 p57-61

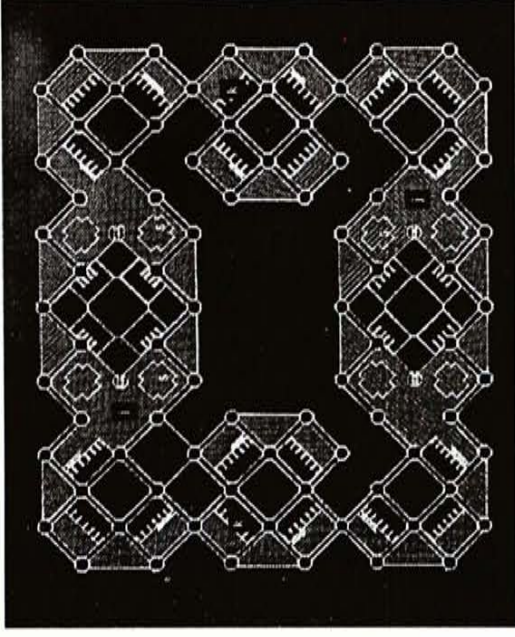


fig 8.12.4a Plan of the complex

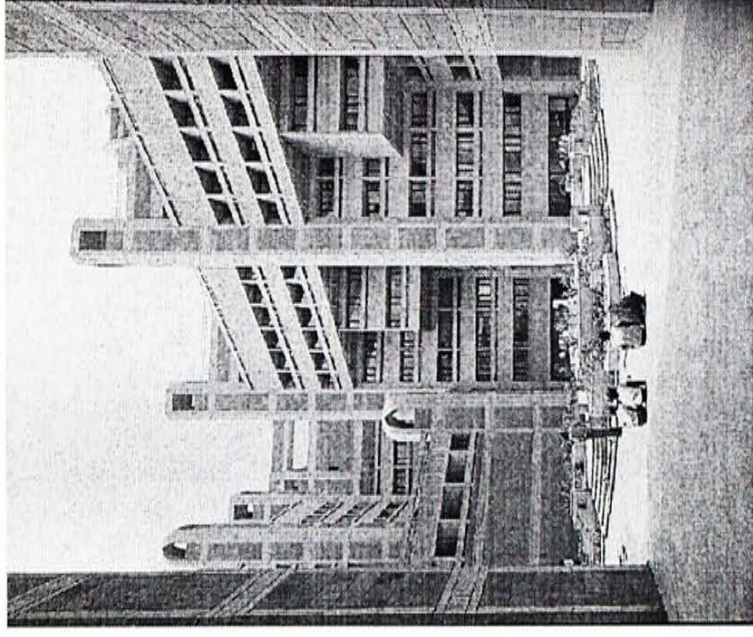


fig 8.12.4b Courtyard of the complex

### 8.12.5 Mixed development, Norway

Location: Oslo, Norway  
 Year: 1995  
 Architects: Niels Torp.

#### Economical

- Most of the surrounding blocks are occupied by small firms about 1 tenants who share a communal restaurant, cafe and auditorium.

#### Spatial

- Natural light can reach deep part of the interior. The light heart, the carving out of the space in the middle of the complex provide the garden for the staff.

#### Social

- The transformation of rather dull city block in Oslo's business quarter into a lively semi-public surrounded by social events.
- The effect is like a microcosmic fragment of city, with all its diversity, animation and potential for social exchange.
- It provide an exciting environment for the enjoyment of the staff and also experiment of visitor.

#### Environmental

- Response to the harsh Norwegian climate, a roof over the interstitial gaps between the buildings, creating a magical, moderated world of generous and exciting spaces.
- Animated by the constant diffusion of light through the glazed roof.

#### Reference:

The Architectural Review 1194, August 1996 p70-72

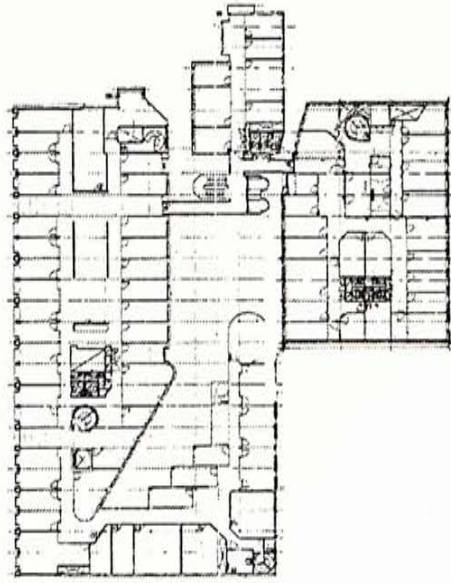


fig 8.12.5a Plan of the Complex

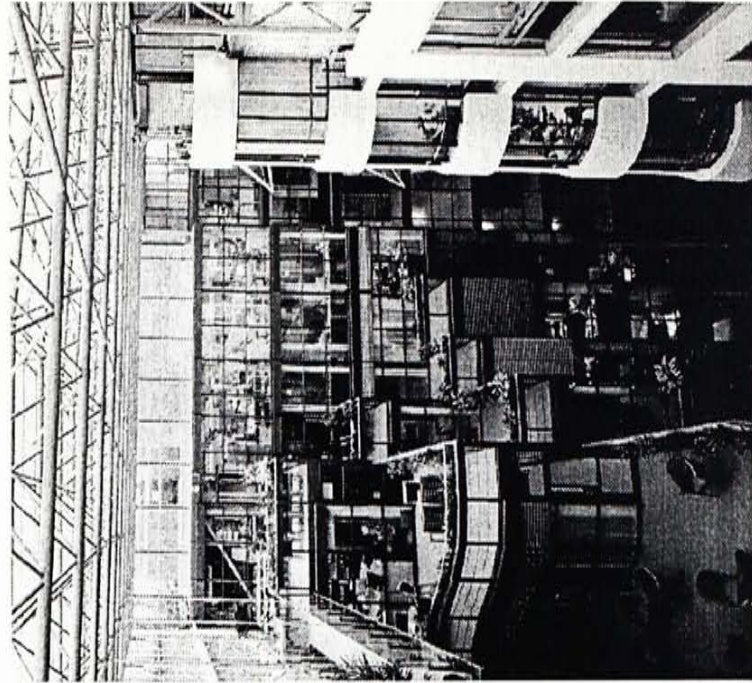


fig 8.12.5b Communal Atrium of the Complex

- <sup>1</sup> Dean Hawkes, *The Environmental Tradition: Studies in the architecture of environment*, E & FN Spon, 1996
- <sup>2</sup> Dean Hawkes, *The Environmental Tradition: Studies in the architecture of environment*, E & FN Spon, 1996
- <sup>3</sup> William M.C. Lam, *Sunlighting As Formgiver for Architecture*, Van Nostrand Reinhold Company, 1986
- <sup>4</sup> Verlag GerdHatje, *Design Center Linz* Thomas Herzog, Germany, 1994
- <sup>5</sup> *Designing the Office of the Future: The Japanese Approach to Tomorrow's Workplace*, by Volker Hartkopf, John Wiley & Sons, INC New York 1993
- <sup>6</sup> Bill Bordass, *Architects' Journal* July 1995, Avoiding office air-conditioning.
- <sup>7</sup> Dean Hawkes, *The Environmental Tradition: Studies in the architecture of environment*, E & FN Spon, 1996
- <sup>8</sup> Barrie Evans, *Architects Journal*, March 1994, The prospects for Solar Power.
- <sup>9</sup> Phyl Smith & Lynn Kearny, *Creating Workplaces Where People can Think*, Jossey-Bass Publishers San Francisco 1994
- <sup>10</sup> Richard Partridge, *Architects' Journal*, Future perfect air-conditioning.
- <sup>11</sup> Bill Bordass, *Architects Journal* July 1995, Avoiding office air-conditioning.

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**Part II:**

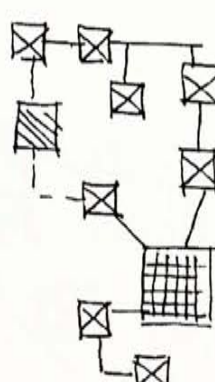
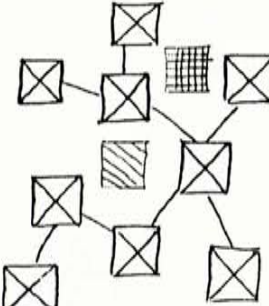
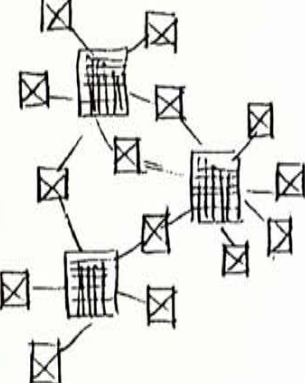
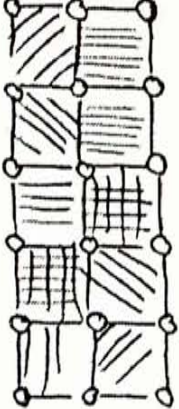
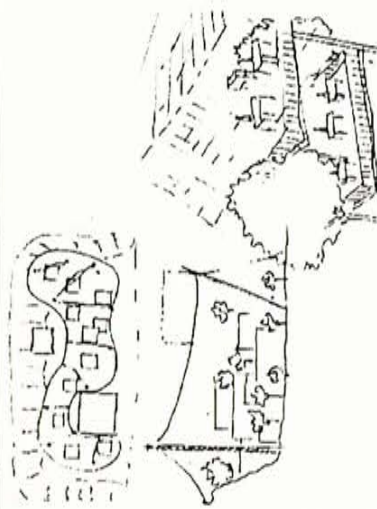
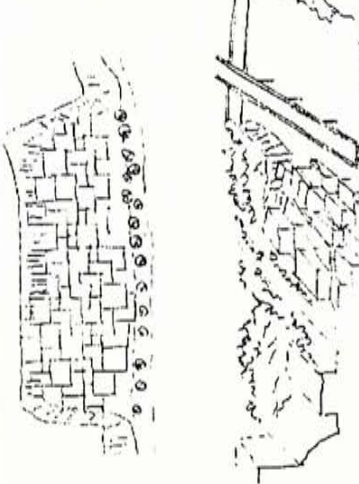
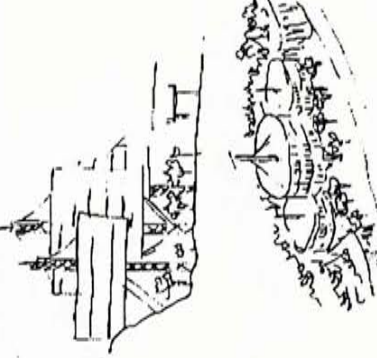
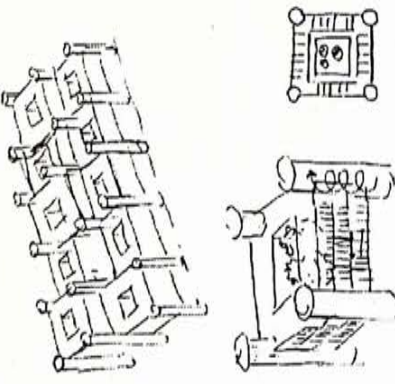
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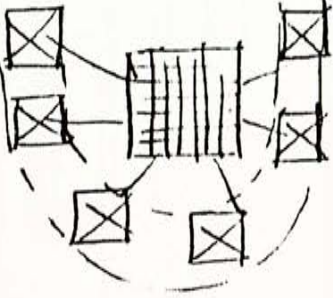
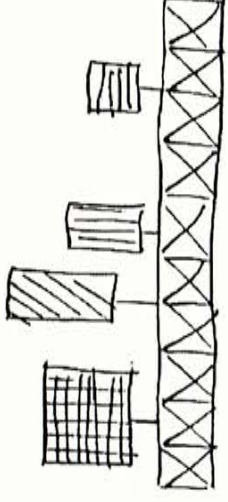
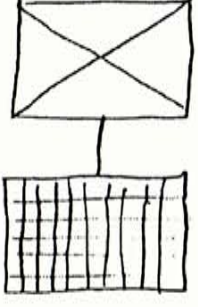
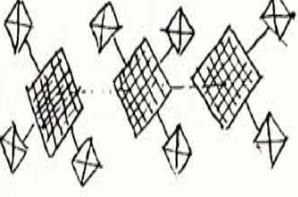
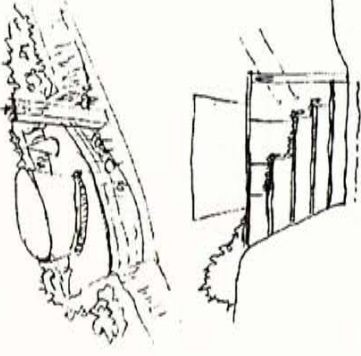
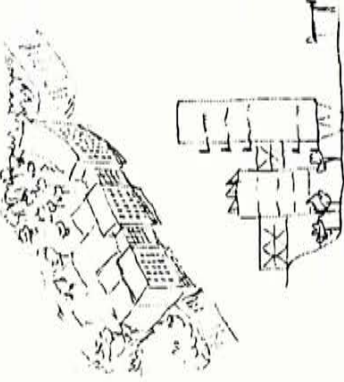
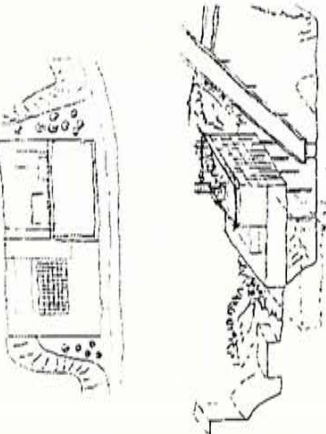
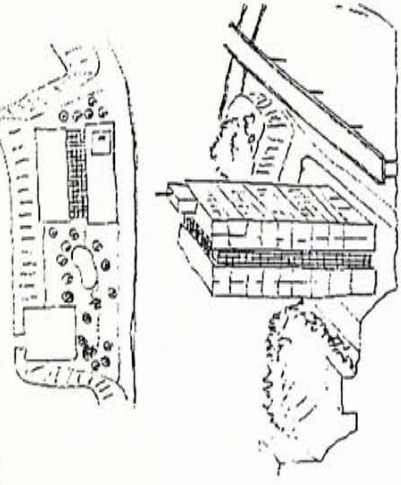


**SCHEMATIC DESIGN OPTION**

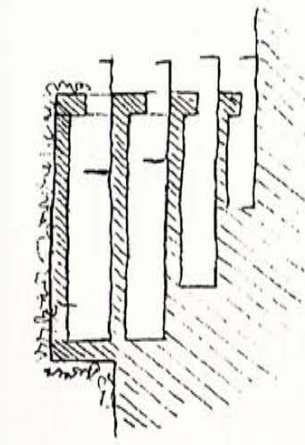
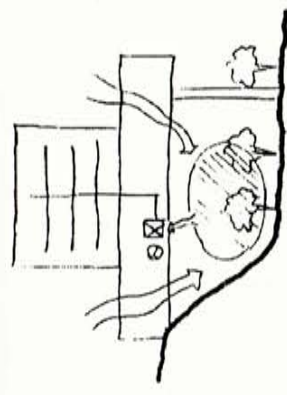
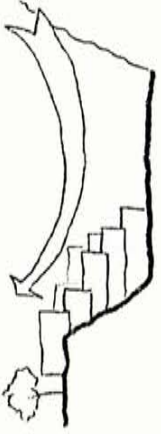
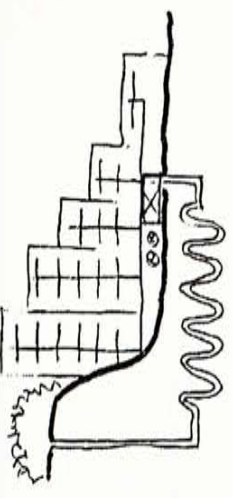
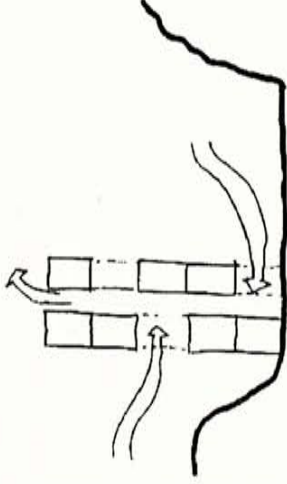
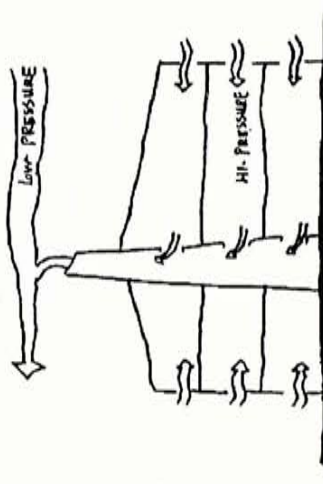
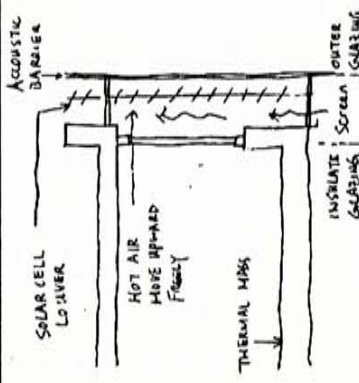
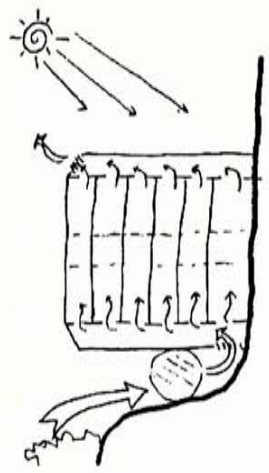
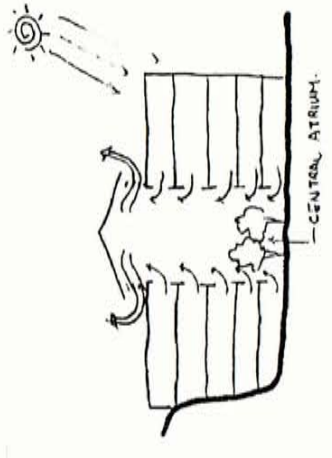
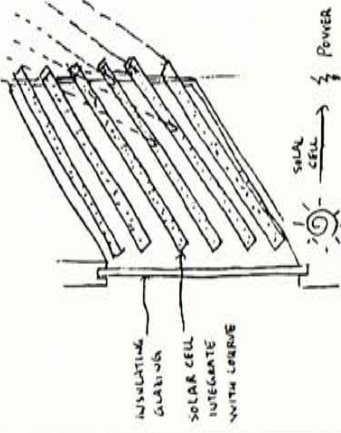
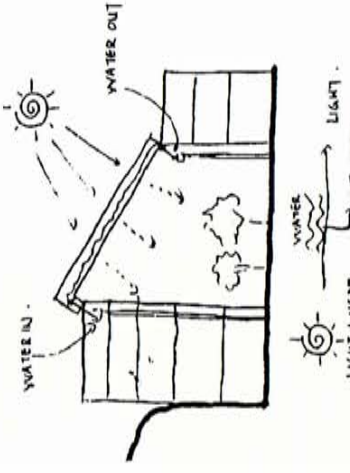
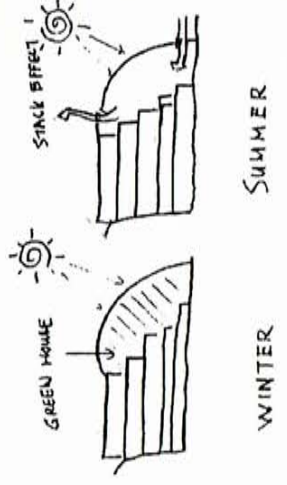
- 9.1 Element Organization Options
- 9.2 Energy Efficient Design Options
- 9.3 Schematic Design Options
- 9.4 Preservation Design Options
- 9.5 Arrangement Design Options
- 9.6 Schematic Design

9.1 Element Organization Options

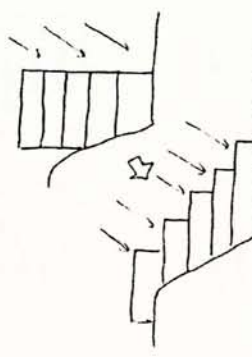
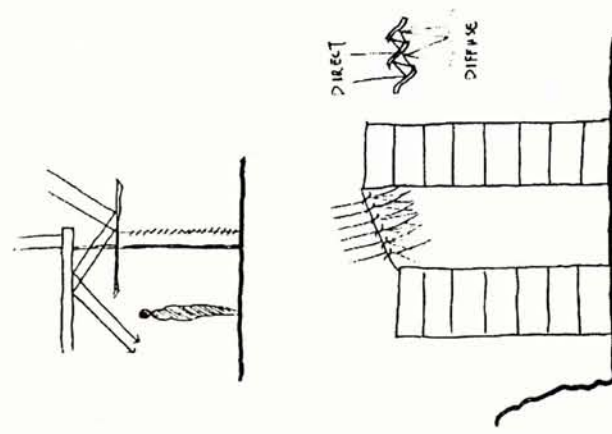
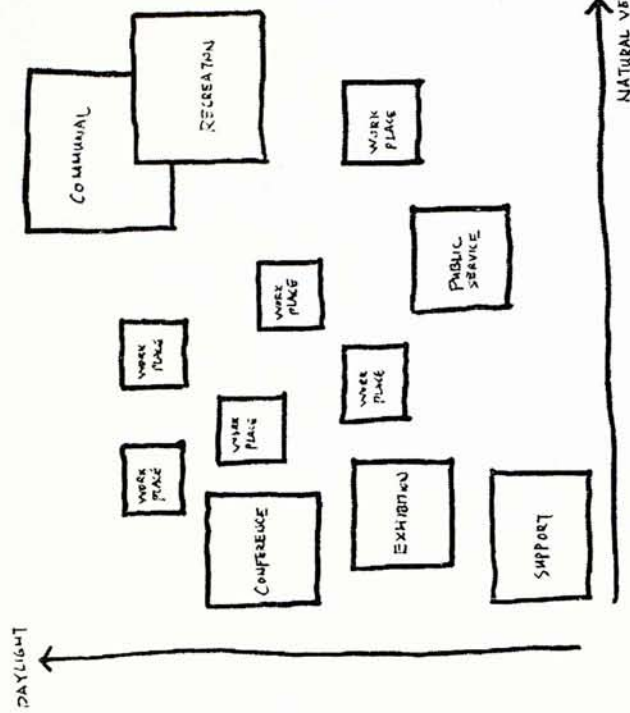
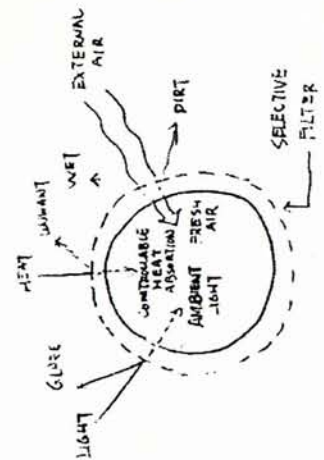
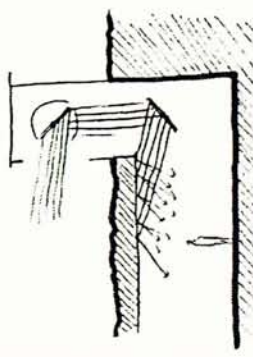
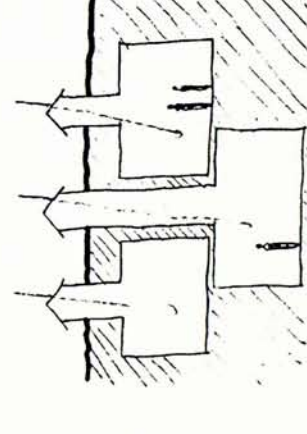
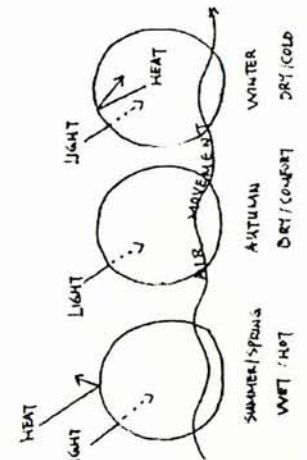
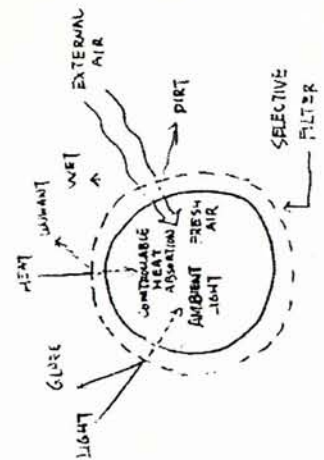
RESORT WORKING (LINEAR LINKED BRANCH)	INDIVIDUALISM SMALL GROUP WORKING (DECENTRALIZATION)	CELLULAR WORKING (ORGANIC CELLULAR GROWTH)	TASK GROUP WORKING (RIGID GRID CELLULAR)
			
			
<ul style="list-style-type: none"> <li>• Extreme individual with potential to be highly separated</li> <li>• Each workplace is an individual and self-defined working environment</li> <li>• Difficult to serve the units by central control system</li> <li>• Employee working purely depend on self-discipline</li> <li>• Leisure working in a resort to eliminate work pressure</li> </ul>	<ul style="list-style-type: none"> <li>• Each workplace have individual environmental but with break down communal space</li> <li>• Less flexibility to modify function but with possible to growth physically</li> <li>• Centralize environmental difficult with no clearly defined zones</li> <li>• Employee working depend on self-discipline</li> <li>• Encourage sense of belonging and varies interaction</li> </ul>	<ul style="list-style-type: none"> <li>• Large group with self support, communal and linkage with others</li> <li>• Each group with certain characteristic and linked together</li> <li>• Servicing can totally separated specific to different group.</li> <li>• Each group operate individually</li> <li>• Encourage group spirit with visual and physical linkage to others</li> </ul>	<ul style="list-style-type: none"> <li>• No hierarchy with rigid cellular contain</li> <li>• Employee of different task from different department with individual territories</li> <li>• Simply servicing control by zoning</li> <li>• Depend on remote control and different work task management</li> <li>• Without any team spirit but enhance interchange from different department</li> </ul>

DISCRETE WORKING WITH CENTRAL FOCUS (TOWARD)	LINEAR WORKING (ELONGATED WITH ONE SIDE SUPPORT)	MASS WORKING (WORKING AND SUPPORT DISTINCTION)	HIERARCHY WORKING (VERTICAL LAYERING)
			
			
<ul style="list-style-type: none"> <li>• Focal point for whole company which is easily identify</li> <li>• Each workgroup with individual sense but all depend on a unique support area</li> <li>• Easily central servicing by zoning</li> <li>• Each workgroup work linked together by the focus</li> <li>• Each workplace with certain degree personnel but all focus to a point</li> </ul>	<ul style="list-style-type: none"> <li>• Status distinction but without spatial variety</li> <li>• Splitting working and other function space totally</li> <li>• Central servicing easily achieve</li> <li>• Each workplace is linked linear without any hierarchy</li> <li>• Identical environment with similar condition for each workplace but not much personnel touch</li> </ul>	<ul style="list-style-type: none"> <li>• Physical close but no encourage of interaction</li> <li>• Working in a large volume without strong physical separation</li> <li>• Easily served with central servicing with only one clear cut</li> <li>• Simply traditional unique management</li> <li>• Psychological without any separation in any sense, personal touch is difficult to exist</li> </ul>	<ul style="list-style-type: none"> <li>• Hierarchy in status</li> <li>• Working separation in vertical floor separation</li> <li>• Central service with typical vertical distribution</li> <li>• Traditional hierarchy management departmentally</li> <li>• Psychological with only departmental separation without personnel touch</li> </ul>

9.2 Energy Efficient Design Options

<p>MERGING WITH THE SOIL</p> 	<p>DUMPING EFFECT</p> 	<p>VALLEY NATURAL VENTILATION</p> 	<p>UTILIZE SOIL'S THERMAL ENERGY</p> 
<p>WIND TUNNEL</p> 	<p>WIND SCOPE</p> 	<p>THINK FACADE DESIGN</p> 	<p>THERMAL LAYERING ENVELOPE</p> 
<p>ATRIUM WITH STACK EFFECT</p> 	<p>SOLAR ENERGY TO ELECTRICITY</p> 	<p>WATER COOLING EFFECT</p> 	<p>MECHANICAL VALVE FOR SEASON</p> 



MAXIMIZING SUNLIGHT LAYERING OF SPACE FOR DIFFERENT LIGHT LEVEL	LIGHT SHELVES TO INCREASE INNER LIGHT LEVEL: REFLECTOR FOR SKYLIGHT	ENVIRONMENTAL REQUIREMENT CHART	
			<p><b>ENVIRONMENTAL AWARENESS</b></p> 
<p><b>MIRROR FOR UNDERGROUND</b></p> 	<p><b>SKYLIGHT FOR DEEP IN GROUND</b></p> 	<p><b>SEASONAL MODIFICATION</b></p> 	<p><b>ENVIRONMENTAL AWARENESS</b></p> 

9.3 Schematic Design Options

<p>Architectural sketches for Option 1. The sketches include a site plan with labels like 'Water Office', 'Atrium', and 'Entrance'. There are several elevation drawings showing building facades with windows and structural elements. A floor plan shows a layout with rooms and corridors. The drawings are rendered in a sketchy, hand-drawn style.</p>	<p><b>Option 1</b></p> <ul style="list-style-type: none"> <li>• The ideas of layering for environmental control could be preferable.</li> <li>• The atrium space will be too narrow.</li> <li>• The front space of the building facing the road will be too crowd.</li> </ul>
<p>Architectural sketches for Option 2. The sketches include a site plan with a circular feature and a 'T-104' label. There are several elevation drawings showing building facades with curved and angular forms. A floor plan shows a layout with circular and rectangular spaces. The drawings are rendered in a sketchy, hand-drawn style.</p>	<p><b>Option 2</b></p> <ul style="list-style-type: none"> <li>• The ideas of free flow air could be preferable.</li> <li>• The option is too structural orientated without site specification.</li> <li>• The scale of the space is also difficult to maintain.</li> </ul>

	<p><b>Option 3</b></p> <ul style="list-style-type: none"> <li>• The roof as the filter to shield off the exterior as environmental control is quite positive.</li> <li>• The stepping of the building in the site is good response.</li> </ul> <p><b>Finally, Option 3 is selected to develop.</b></p>
	<p><b>Option 4</b></p> <ul style="list-style-type: none"> <li>• The ideas of deal with modular of workteam would be good.</li> <li>• There is almost no site specification</li> </ul>

	<p><b>Option 5</b></p> <ul style="list-style-type: none"> <li>• The free floor plan is very flexible.</li> <li>• The free floor plan is too unspecified.</li> <li>• It would difficult to suit in the site.</li> </ul>
	<p><b>Option 6</b></p> <ul style="list-style-type: none"> <li>• The divide portion would be lack of physical connection.</li> <li>• The form of the block is difficult to justify</li> <li>• The scale of the space is also very difficult to maintain.</li> </ul>

	<p><b>Option 7</b></p> <ul style="list-style-type: none"> <li>• The ideas of modular design would be interesting.</li> <li>• The ideas of interaction between space is positive</li> <li>• The flexibility is the weakest point..</li> </ul>
	<p><b>Option 8</b></p> <ul style="list-style-type: none"> <li>• The ideas of creating focus is workable.</li> <li>• The form is difficult to suit into the site.</li> <li>• There is not enough back up to create such kind of form.</li> </ul>

9.4 Varies Design Options

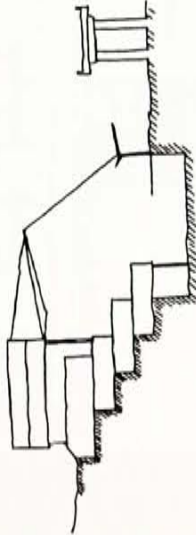
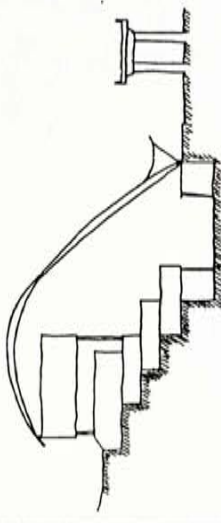
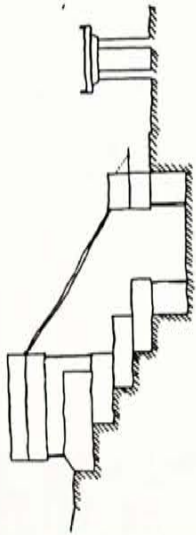
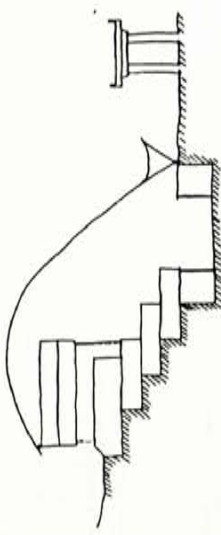
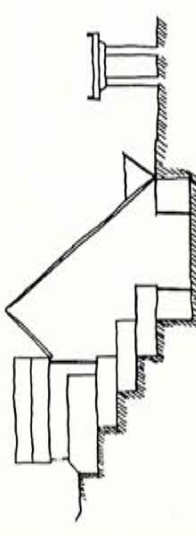
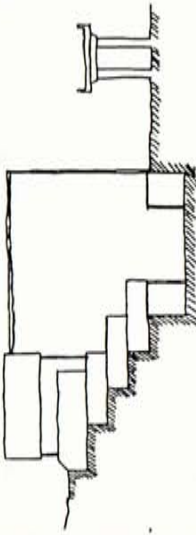
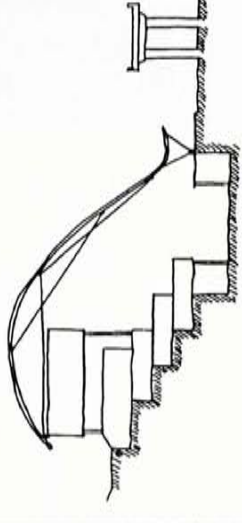
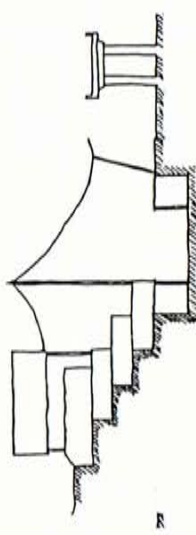
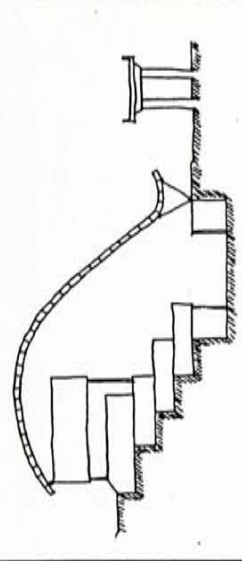
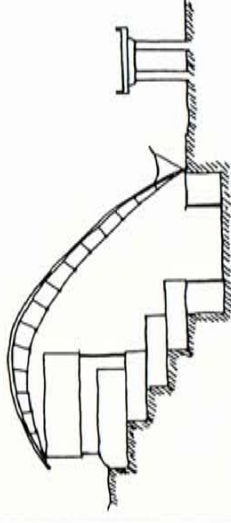
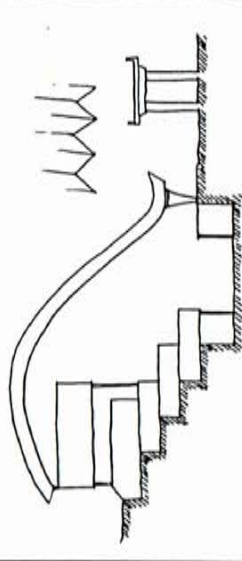
Preservation

	ISOLATION	INTEGRATION	ENCLOSING	RELOCATION	REBUILT AND CAPTURING

Preservation Design Matrix

	Preserve the Tower	Rebuild another Symbolic Element
Image of the company	+	+
Historical meaning of Company development	+	-
Site Contextual	+	+ should be
Visual Interest to the general	O May not enough	+ should be
Landmark of the general public	O	O
Landmark of the local public	+	O
Function to public	O	O
Function to company	O	+ should be
Construction Cost Increase	-	O
Flexibility of development	-	+
Identity of design	+	O

Finally, the tower is decided to preserved.

Options of Covering of the Roof		Structural Option of form of covering	
MECHANICAL SHAPE		3 HINGE ARCH ONE-WAY SUPPORT	
SLOPE ROOF		CURVE WITH NATURE	
		FORM WITH PYRAMID	
SQUARE GLASS BLOCK		CURVE WITH CABLE ONE-WAY SUPPORT	
		TENSILE FORM	
		PLATE TWO-WAY SUPPORT	
		POPPED BEAM ONE-WAY SUPPORT	
		FOLDED PLANE ONE-WAY SUPPORT	

Option Curve with nature is adapted at last.

Arrangement Design Options

**OPTION OF ARRANGEMENT OF WORKPLACE, INFORMAL MEETING PLACE AND CIRCULATION**

**Option 1**

- Large Amount of light can enter the deep of the workplace.
- Too complicated and waste too much space

**Option 2**

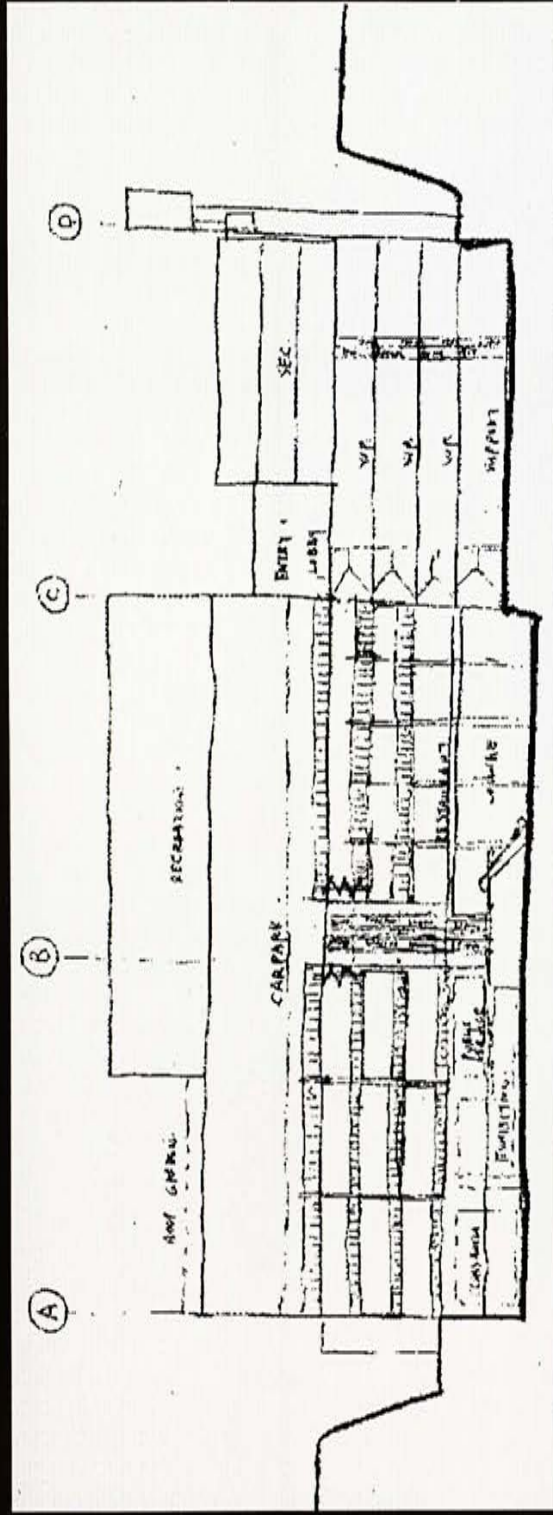
- More simple and quite effective
- The circulation become very exciting

**Option 3**

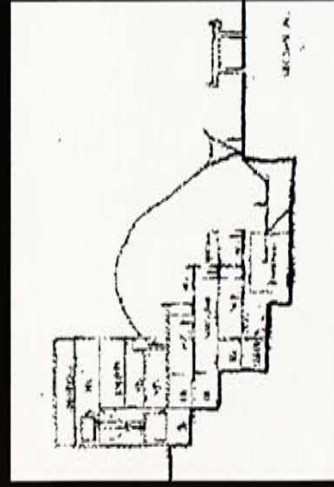
- Very effective arrangement
- The cellular workplace have to suffer without sunlight



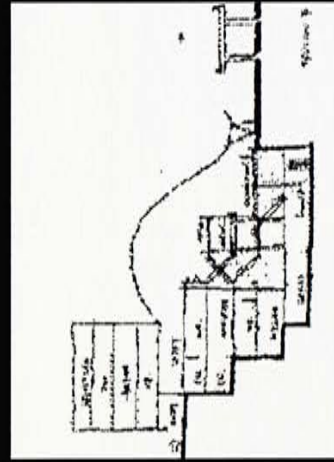
First Schematic design dated 11 Nov. 1996



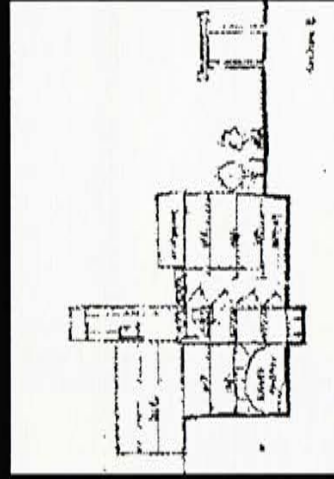
SECTIONAL ELEVATION



SECTION A-A



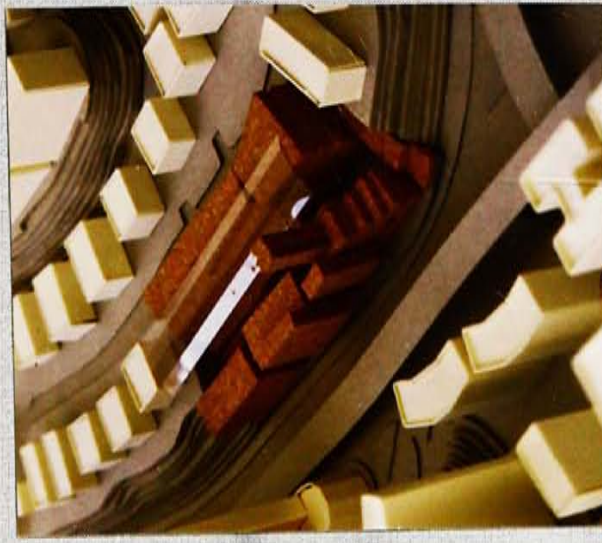
SECTION B-B



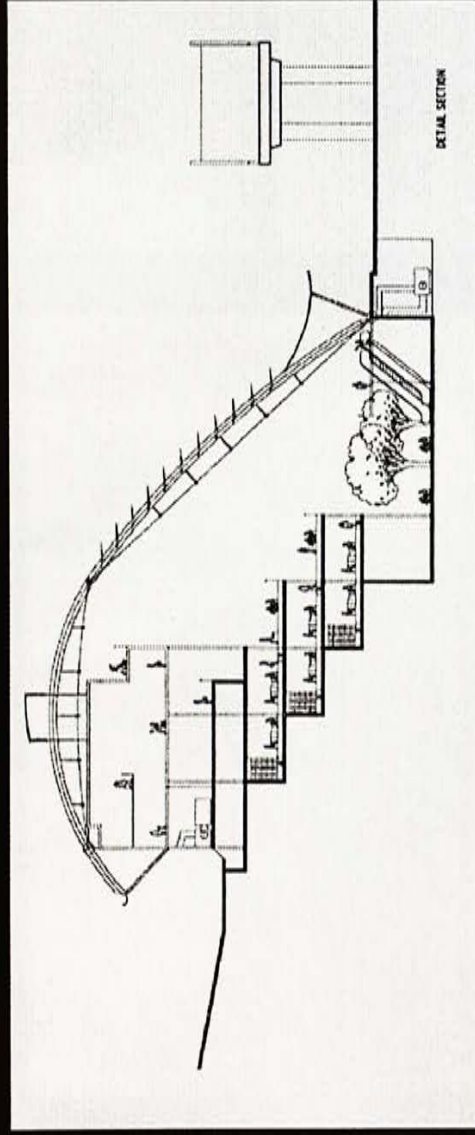
SECTION C-C

Comment:

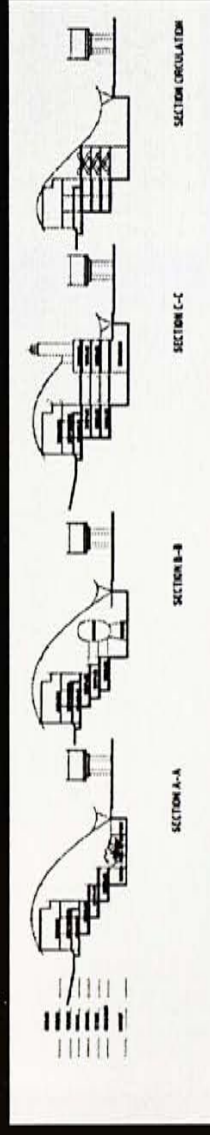
- The ideas to divide the plan into 3 zone which can fit into the requirement of China Light and Power is appropriate
- The way to stop of the roof at the third section(C-C) may not be a good idea.
- The proportion of the atrium of the third section (C-C).
- There would be more possibility for the roof design.
- The structure of the roof should be investigated more.



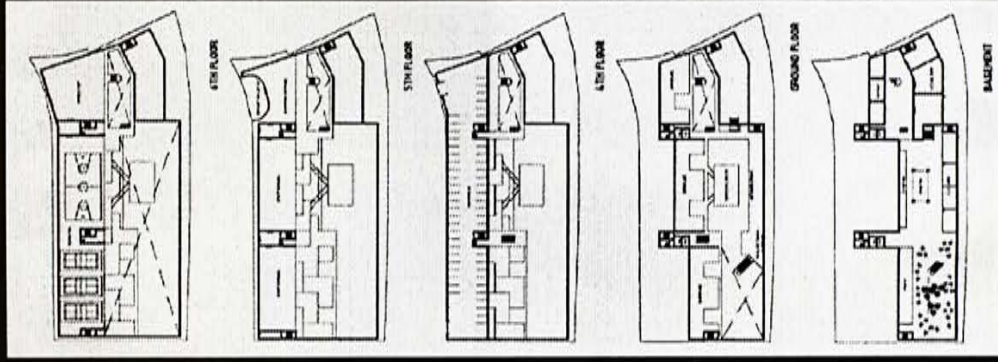
Second Schematic design reviewed on 22 Nov. 1996



DETAIL SECTION



SECTION STUDIES



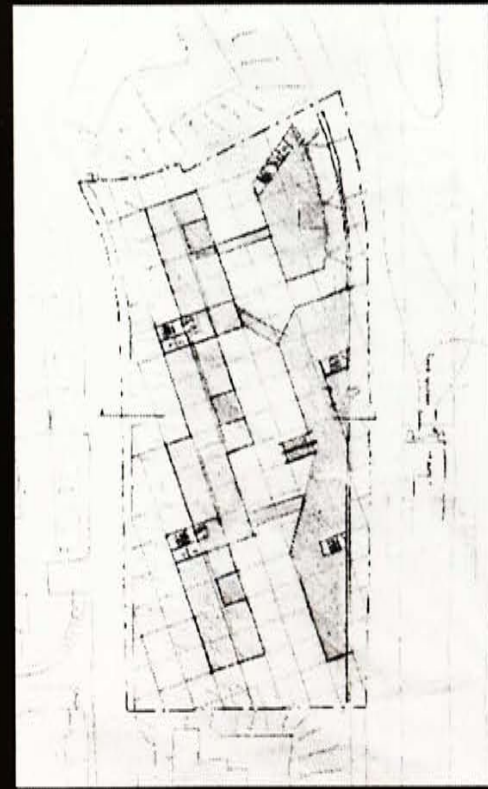
PLAN AT DIFFERENT LEVELS

Comment:

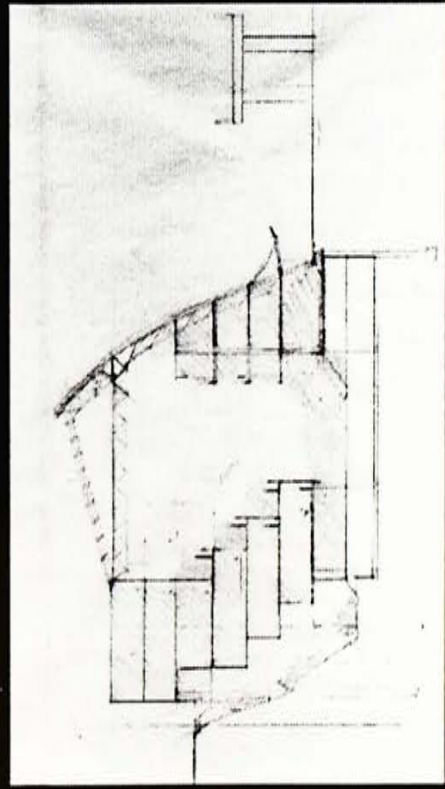
- The Clock Tower should be retained as it can reflect the development of the company.
- The Flyover would be covered in order to improve the relationship with the building.
- The Roof should be continue to reduce the problem of connection and covering
- Natural ventilation may be not ideal in such a site.
- The retaining wall would be a problem in practical sense.
- The carpark in Kadoorie Avenue may not be good enough in term of problem limited number of carpark and destroy the quality of living at Kadoorie Hill.

(refer to appendix b)

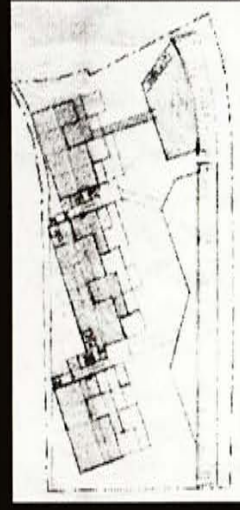
Third Schematic design dated 25 Nov. 1996



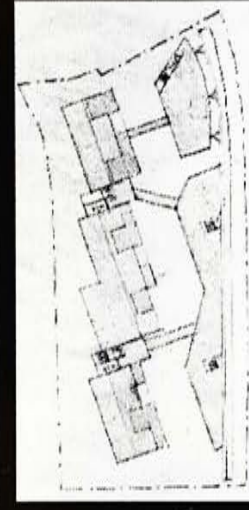
SITE PLAN



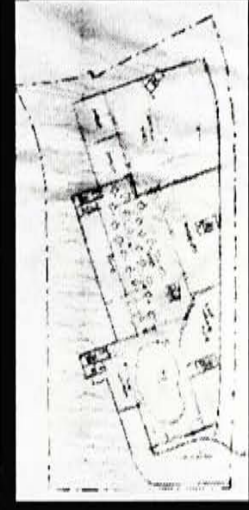
SECTION



5TH FLOOR



3RD FLOOR



GROUND FL



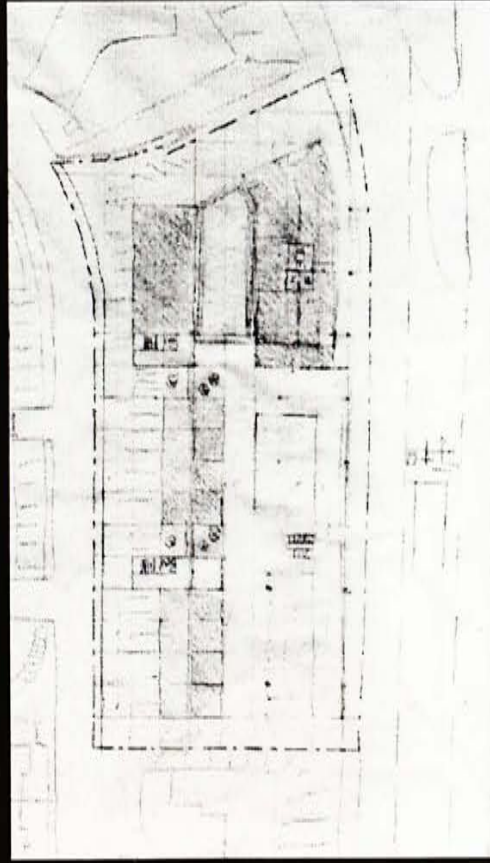
CARPARK LE

Comment:

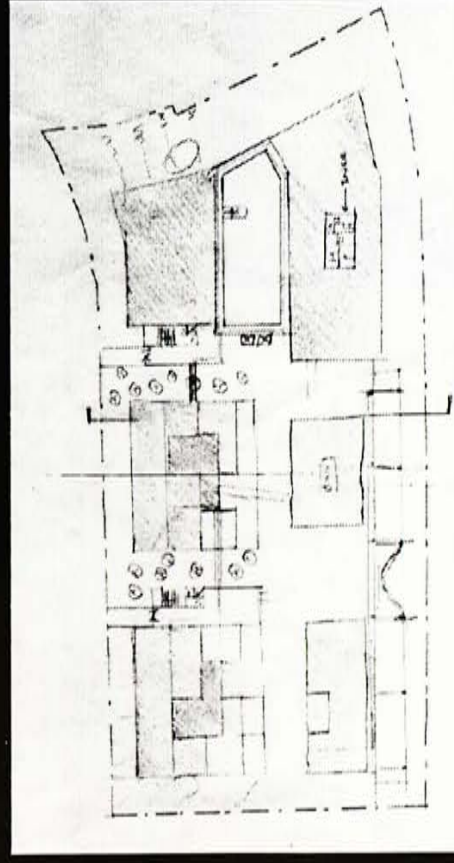
- The turning of grid may be difficult to justify.
- The tightness of the site is not allow so many left over space.



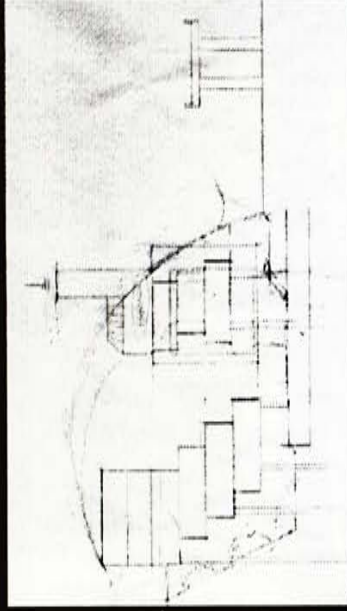
Fourth Schematic design dated 29 Nov. 1996



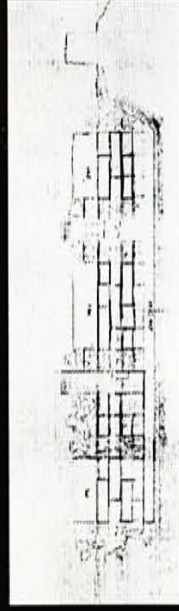
1ST FLOOR



GROUND FLOOR



SECTION



INT ELEVATION



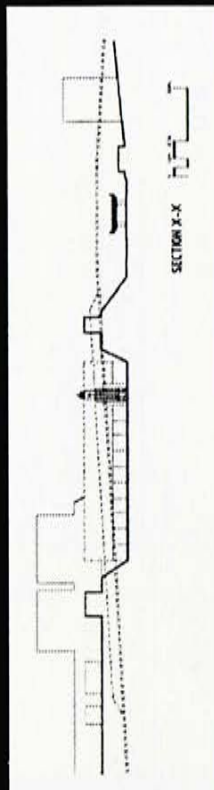
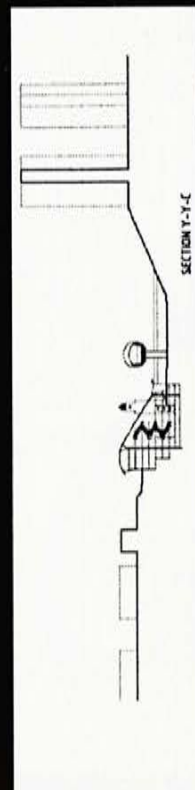
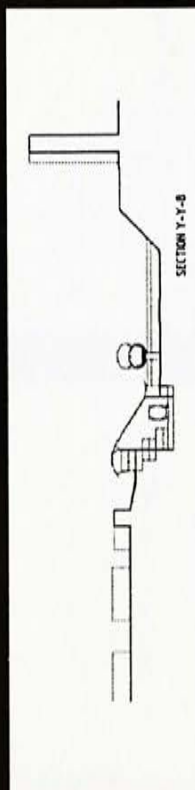
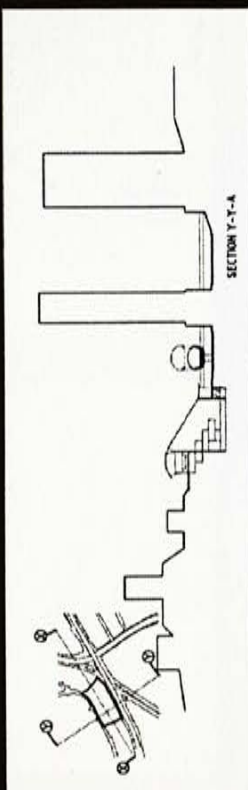
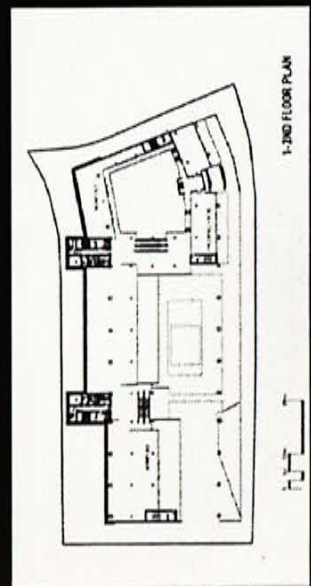
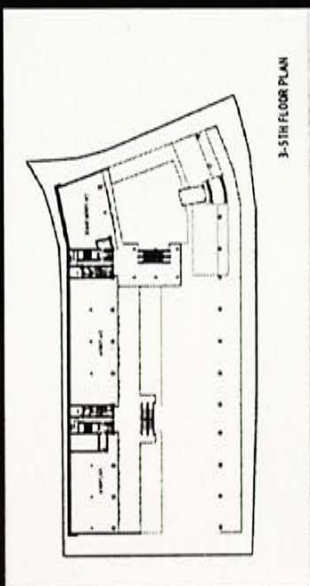
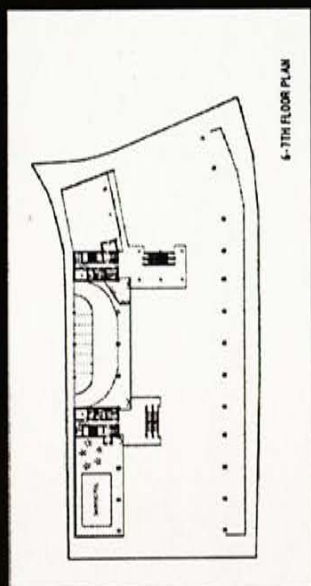
SECTION STUDIES

Comment:

- The intention to introduce intermediate lighting garden may be good.
- However the limited of space is not allow.
- The size of the lighting garden as a litrium may not be succeed as the size is so limited.



Fifth Schematic design dated 13 Dec. 1996 Page 1



Comment:

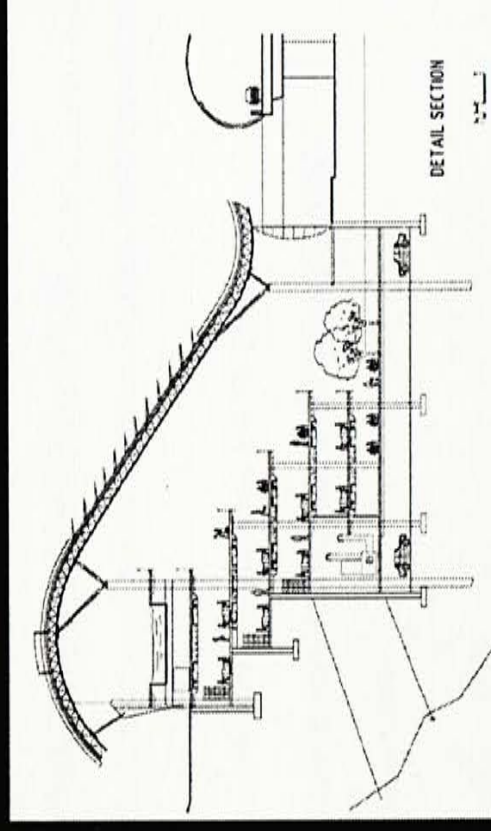
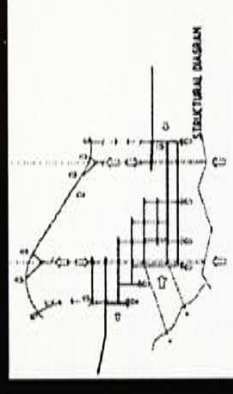
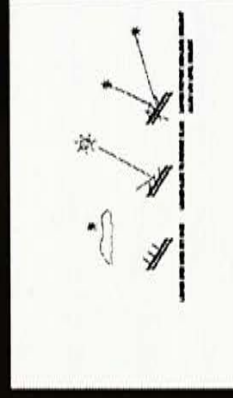
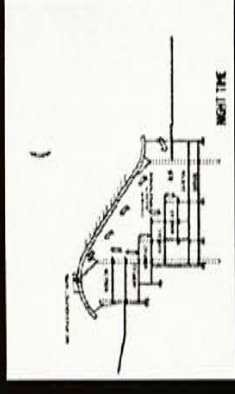
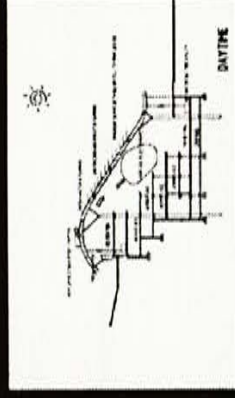
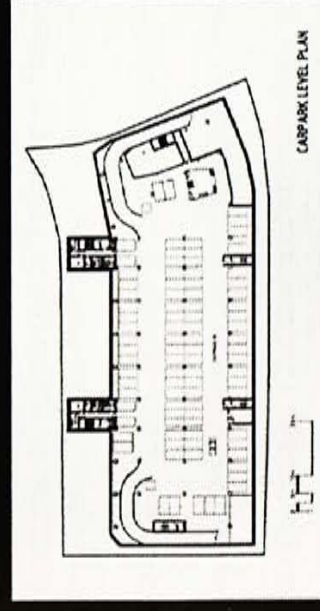
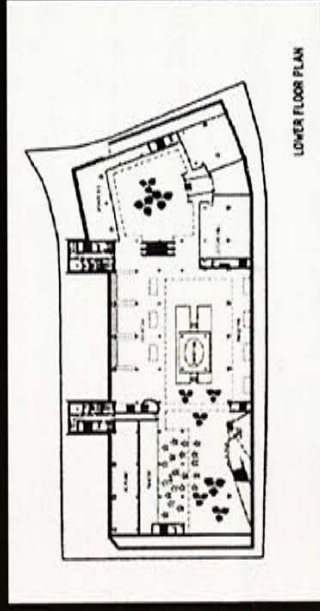
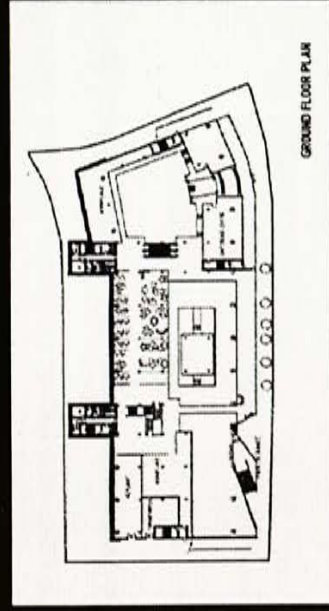
Preservation of the Old Building

- The way to deal with and integrate the clock tower is still not satisfied.
- The possibility to change of the structure near the clock tower.
- The facade of the old building can be retained as the separation from the building to the busy traffic.

Design Development

- Justification of the size of the roof as the shading device.
- and the justification of the large retaining wall.
- compare to the small number of the office space.
- Layering of the space in the front is more preferable.
- Stepping in 3 dimension has more potential.

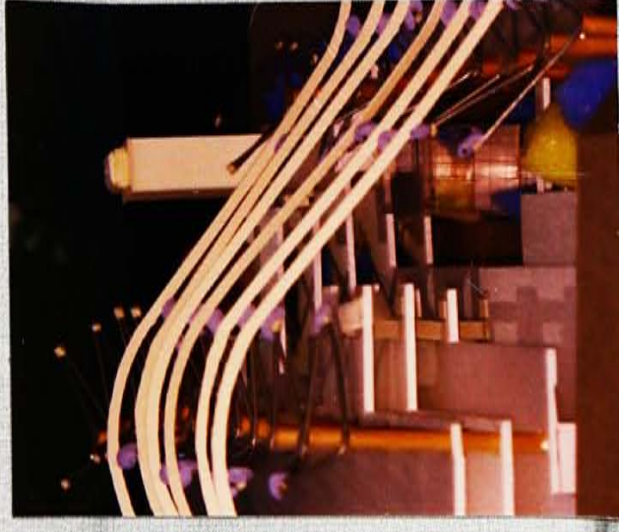
Fifth Schematic design dated 13 Dec. 1996 Page 2



**Office space design**

- Modular design of the office typical in relate to the organization structural and overall system.
- There should be an intermediate space in the front before the going down to the lower ground opening area.

(refer to appendix b)



## BIBLIOGRAPHY

### Research of China Light and Power Co. Ltd.

*Fact and Issues*, China Light and Power Company, Limited 1996

China Light and Power Company, Limited: Annual Report 1995

Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982

Wed site: [www.chinalightandpower.com.hk](http://www.chinalightandpower.com.hk)

### Research of Workplace

Steelcase Strafor, *The Responsive Office: People and Change*, Polymath Publishing 1989

Walter B. Kleeman, *Interior Design of the Electronic Office*, by, Jr. Van Nostrand Reinhold 1991

Volker Hartkopf, *Designing the Office of the Future: The Japanese Approach to Tomorrow's Workplace*, John Wiley & Sons, INC New York 1993

Phyl Smith & Lynn Kearny, *Creating Workplaces Where People can Think*, Jossey-Bass Publishers San Francisco 1994

V H C Crisp, D J Fisk and A C Salvidge, *The BRE Low-energy Office*, by, D J Fisk and A C Salvidge, Building Research Establishment, Department of the Environment. 1984

William Dudley Hunt, *Office Buildings: Architectural Record Book*, Jr.An, F. W. Doge Corporation 1961

Michael Hammer and James Champy, *Reengineering the Corporation ,manifesto for business revolution*, 1993 HarperBusiness New York

### Research of Energy Efficiency Design

Dean Hawkes, *The Environmental Tradition: Studies in the architecture of environmen*, E & FN Spon, 1996

William M.C. Lam, *Sunlighting As Formgiver for Architecture*, Van Nostrand Reinhold Company, 1986

Verlag GerdHatje Design Center Linz Thomas Herzog, Germany, 1994

C. Den Ouden and T.C.Steemers *Building 2000 Volume 2*

Barrie Evans, *Architects Journal*, March 1994, The prospects for Solar Power.

Richard Partridge, *Architects' Journal*, Future perfect air-conditioning .

Bill Bordass, *Architects' Journal*, July 1995, Avoiding office air-conditioning

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- fig 2.1.1-fig 2.1.3 China Light and Power Company, Limited: Annual Report 1995  
 fig 2.2.1-fig 2.2.4 China Light and Power Company, Limited: Annual Report 1995  
 fig 2.4.1-fig 2.4.2 *Fact and Issues*, China Light and Power Company, Limited 1996  
 fig 3.1.1 Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982  
 fig 6.1.1-fig 6.1.4 Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982  
 fig 6.2.1-fig 6.2.2 Nigel Cameron, *Power: The Story of China Light*, Oxford University Press 1982  
 fig 7.1.1-fig 4.1.3 Walter B. Kleeman, *Interior Design of the Electronic Office*, by, Jr. Van Nostrand Reinhold 1991  
 fig 7.1.4 Steelcase Strafor, *The Responsive Office: People and Change*, Polymath Publishing 1989  
 fig 7.1.5 William Dudley Hunt, *Office Buildings: Architectural Record Book*, Jr.An, F. W. Doge Corporation 1961  
 fig 7.1.6 Walter B. Kleeman, *Interior Design of the Electronic Office*, by, Jr. Van Nostrand Reinhold 1991  
 fig 7.2.1-fig 7.2.2 A + U special issues 94:01 Herman Hertzberger  
 fig 7.2.3-fig 7.2.4 *Kelvin Rohce*, Rizzoli International aPublishing 1985  
 fig 7.3.1a& b-7.3.3 Volker Hartkopf, *Designing the Office of the Future: The Japanese Approach to Tomorrow's Workplace*, John Wiley & Sons, INC New York 1993  
 fig 7.4.1 Dean Hawkes, *The Environmental Tradition: Studies in the architecture of environment*, E & FN Spon, 1996  
 fig 7.4.2-3 Volker Hartkopf, *Designing the Office of the Future: The Japanese Approach to Tomorrow's Workplace*, John Wiley & Sons, INC New York 1993  
 fig 7.5.1a-d Phyl Smith & Lynn Kearny, *Creating Workplaces Where People can Think*, Jossey-Bass Publishers San Francisco 1994  
 fig 7.5.2c *Movie Discourse*  
 fig 7.5.3a-c *Movie Discourse*  
 fig 7.5.4b Phyl Smith & Lynn Kearny, *Creating Workplaces Where People can Think*, Jossey-Bass Publishers San Francisco 1994  
 fig 7.6.1 Charles King Hoyt, *Public Municipal and Community Buildings*, An Architectural Record Book McGraw-Hill Book Company 1980  
 fig 7.6.2 Contemporary British Architects, Prestel-Verlag, 1994. P98-99  
 fig 7.6.3 Office buildings: New concepts in Architecture & Design Meisei Publication 1995  
 fig 7.6.4 Heinz Mohl: *Building and Projects*, Axel Menges 1994  
 fig 7.6.5 The Best in Industrial Architecture, Rotovision SA 1992  
 fig 7.6.6 Office buildings: New concepts in Architecture & Design Meisei Publication 1995  
 fig 7.6.7 Otto Rleworldt, *Designer Offices*, Laurence King Publishing 1994  
 fig 7.6.8 The Architectural Review 1172, October 1994 p10-35  
 fig 7.6.9 EL Croquis 65/66 1994 Jean Nouvel  
 fig 7.6.10 GA Document Extra 04 Christian De Portzamparc  
 fig 8.1.1 *The Environmental Tradition: Studies in the architecture of environment*, by Dean Hawkes, E & FN Spon, 1996  
 fig 8.2.1-4 *The Environmental Tradition: Studies in the architecture of environment*, by Dean Hawkes, E & FN Spon, 1996  
 fig 8.3.1 *The Environmental Tradition: Studies in the architecture of environment*, by Dean Hawkes, E & FN Spon, 1996  
 fig 8.4.1-2 *Design Center Linz Thomas Herzog*, by Verlag GerdHatje, Germany, 1994  
 fig 8.4.3 *Architects' Journal*  
 fig 8.4.4 Volker Hartkopf, *Designing the Office of the Future: The Japanese Approach to Tomorrow's Workplace*, John Wiley & Sons, INC New York 1993  
 fig 8.5.1-fig 8.6.3 Dean Hawkes, *The Environmental Tradition: Studies in the architecture of environment*, E & FN Spon, 1996  
 fig 8.7.1 Architectural Review 1992  
 fig 8.8.1 Office buildings: New concepts in Architecture & Design Meisei Publication 1995  
 fig 8.9.1-fig 5.9.2 *Creating Workplaces Where People can Think*, by Phyl Smith & Lynn Kearny Jossey-Bass Publishers San Francisco 1994  
 fig 8.10.1 Dean Hawkes, *The Environmental Tradition: Studies in the architecture of environment*, E & FN Spon, 1996  
 fig 8.10.2 *Architects' Journal*, Future perfect air-conditioning by Richard Partridge  
 fig 8.12.1 Contemporary British Architects, Prestel-Verlag, 1994. P76-77  
 fig 8.12.2 The Architectural Review 1179, May 1995 p30-45



- fig 8.12.3 The Architectural Review 1179, May 1995 p50-56  
fig 8.12.4 The Architectural Review 1179, May 1995 p57-61  
fig 8.12.5 The Architectural Review 1194, August 1996 p70-72

### **List of Government Document concern with the project**

- Building Ordinance and Building Regulation Building Authority, Hong Kong Government
- Code of Practice for The provision of Means of Access for Firefighting and Rescue Purposes, Building Authority. May 1995
- Code of Practice for The provision of Means of Escape in case of Fire and allied Requirement, Building Authority. 1996
- Guide to Retaining Wall Design: Geotechnical Engineering Office Civil Engineering Department Hong Kong.
- Guide to Slope Maintenance: Geotechnical Engineering Office Civil Engineering Department Hong Kong.
- Hong Kong Planning Standard and Guidelines: Internal Transport Facilities: Planning Department, Hong Kong Government
- Hong Kong Planning Standard and Guidelines: Environment: Planning Department, Hong Kong Government
- Guidelines on Energy Audit Environmental Department, Hong Kong Government
- Practice Note for Authorized Persons and Registered Structural Engineers 189 Jan 1996: Guide to slope Maintenance.
- Practice Note for Authorized Persons and Registered Structural Engineers 166 June 1995: Guide to Retaining Wall Design.
- Practice Note for Authorized Persons and Registered Structural Engineers 168 August 1994: Registration of slopes and Retaining Walls.

## **Miscellaneous**

### Interim Review Report:

8th October 1996

Reviewer: Prof. Stephen Haugton, Alfred Yeung and Steve Lombardi

### **Research:**

- The future development plan of the company, the philosophy of the company is lacking in the research of company's profile.
- The future policy and planning of the company may be integrate with the my idea of the future office operation.

### **Office environmental control:**

- Personal control may be the most important of the environmental control of a workplace.
- The relation of the in between, interior and exterior space of the various environmental condition could be more explore.
- ORBIS report of the comfort of office technology would be an very good reference for workplace environment's design.

### **Reference:**

- There is a recent Power Company's building designed by Norman Foster published by RIBA journal.
- Herman Hertzberger's 70s office project of the insurance company is an very useful example of the office design socially.

30th October 1996

First round

Reviewer: Prof. Joseph , Mr. John Ma and Mr. Cheng Wai Tat from China Light

**Organization:**

- Re-engineering CO-operation Concept
- Business Production Re-engineering (BPR) have been adopted by CLP as their management direction in future and already trying to implement.
- The Team Concept and Multi-skill of staff is the major system from BPR. The company will change from triangle hierarchy structure into a flatten structure.

**Data Management Concept**

- Document Management System (DMS) have been applied in CLP. Workflow concept and paper less office would be happened in China Light. For instance, drawing can be stored in advance format which can save a lot of space.

**Company:**

- Equipment in the office, proportion of communal space and working space should be designed
- Planning of transmission of the staff out from the old building into the new building should have a basic idea. Maybe phase work could be helpful.
- The relationship between workgroup and executive branch should study more.

**Site Concern:**

- Geo-technical awareness, especial the slope should be carefully considered. The Building Regulation have a straight restriction in the slope building.
- Noise control would be another concern

**Preservation:**

- There should be no pre-conception to preserve the tower.
- The image of the Energy Efficiency should more important than the image of the tower.
- Maybe talk with the client to get what they think.

30th October 1996

Second round

Reviewer: Prof. Tunney Lee

**Organization:**

- A company organization will change 2-3 year very quickly, but a building will stay at least 20 years. Most office should go for flexibility.
- A sensible client should aware the organization is changing in many sense continuously. They will never request architects to design a office for specific organization but with a flexible one with capability to suit for the present organization. The possibility for future develop in term of environment and support like under floor cable.
- Although CLP is changing from tradition organization structure into BPR, there is a gap in-between. We should adapted the philosophical one - Re-engineering- as the base in this thesis project.
- One interesting example in US, a office system work like a immediate Installation Space. You can go to the office twice a week, when you appoint to go the office, your kits will be installed in a space overnight, which contained your photo, file, and even cup for you to work on that day. After you finished, another kit for other will be installed in the space again.

**Environmental:**

- After having adapted one structure of organization. concentration should be stressed on environmental issues. modification of the structure a little bit later on.
- Hi-tech Control: Hi thinking with low energy.
- Shading is very important in open space. A outdoor space with shading and air movement is already very comfortable even in summer.
- There is possibility to use fan in exterior space which can enhance air-movement. 3 mile per hour already can achieve comfort level.
- Mixed Mode Environmental control (1)by season, (2)by function of space
- Communal space, corridor can be natural ventilation, office space with equipment should be mechanical control with personal control.
- Arup idea of the exterior atrium in HKITC in Kowloon Tong would be an good approach in Hong Kong climate.

22nd November 1996

Reviewer: Mr. Freeman Chan

- Site selection may be on the junction of Argyle Street and Kadoorie Avenue, since it is more eye-catching. It is a more gentle border of Zone 1 to Zone 3.
  - The highway may be covered so that it can be integrated with the site.
  - Sheltering the path from Mongkok size to The site can improve the walking experience of the pedestrian.
- Suggestion:** There should be a diagrammatic plan to explain the ideas with the section.
- Reference:** Arthur Erickson , Law Court in Vancouver.

Reviewer: Prof. Guntis Plesums

**Preservation:**

- The Clock Tower should be retained. Very less building like this is existing in Hong Kong. It mark the period of a place as well as the development of a company.
- To keep the tower, there should be a transformation in term of structure, but keep the spirit.
- The location of the tower should be in a way for public or employee special.
- Get rid of the conference centre in zone B.
- The change of the roof form in circulation zone is not good enough, the change may be happened inside rather than outside.

**Suggestion:**

- Should look at a more detail section to study the relationship between space and the structure, circulation.
- Stress in now should be placed on circulation (horizontal) and spatial design. The technology thing should placed later. They can solve out more easily in cycle form.

Reviewer: Mr. John Ma and Mr. Cheng Wai Tat of China Light and Power

**Development of Company:**

- The development should go into maximum plot ratio as director's choice.
- The company is so big, there is not a problem to house fully the building.

**Structure:**

- The stepping design may not be fully supported by the slope. Retaining wall will be very expensive. If the retaining wall go straight down in the rear size of the building and the leaf over space in the current scheme also for occupation could be more efficient.

**Accommodation:**

- The recreation space at present could be too much. The recreation space should be Multi-purpose.
- Office area may be insufficient.
- Natural air movement may not be possible here since the air quality is not ideal here.

Reviewer: Mr. Vito Bertin

- Roof form can be continued which can reduce a lot of problem such as enclosing, junction design.
- Suggestion: Why building face inward to separated the busy traffic and internal.

13th December 1996

Reviewer: Prof. Guntis Plesums, Mr. Brian Sullivan, Mr. Gu Daqing, Mr. Alex Lu of Simon Kwan Associates

#### **Preservation of the Old Building**

- The way to deal with and integrate the clock tower is still not satisfied.
- The possibility to change of the structure near the clock tower.
- The facade of the old building can be retained as the separation from the building to the busy traffic.

#### **Design Development**

- Justification of the size of the roof as the shading device.
- and the justification of the large retaining wall.
- compare to the small number of the office space.
- Layering of the space in the front is more preferable.
- Stepping in 3 dimension has more potential.

#### **Office space design**

- Modular design of the office typical in relate to the organization structural and overall system.
- There should be an intermediate space in the front before the going down to the lower ground opening area.

#### **Environmental concern**

- Noise Level Measurement should be done.

#### **Recommendation Reading**

- Works of Arthur Erickson in Vancouver
- Transportation Building in Boston by Goodyield.

### Interview Report

Date: 1 Oct., 1996 10:00 am  
Mr. Ma Wing Wah John HKIA, RIBA Authorized Person (List 1)  
Project Architect., Engineering Department, Transmission Business Group of China Light & Power Company, Ltd.

#### **Land/Development**

- One of the interesting development item in China Light is the Workshop in Tsing Yi
- The land used by China Light in new development is most probably is the unattractive land assigned by the government. The cost of this land is not according to the development potential of this site, but to the actual developed usage by China Light. The land granted by government and condition will be written in the lease
- If the land is no more use by China Light, it will change back to the original use of the land and for further develop.

#### **Office Facilities**

- MSD is the department which manage the LAN in the Office, Mr. Ma highly suggest that we should contact MSD.

#### **Site of Headquarters**

- Mr. Ma point out that the development potential of Headquarters is affect by the gazette date on Dec. 1994.
- Mr. Ma also notice that there may not enough space in the existing Headquarters.
- There is some feasibility studies have be done by other parties regarding the redevelopment of the Headquarters.

Date: 1 Oct., 1996 3:00 pm  
 Ms Katherine Ma  
 Assistant Public Affair Manager, China Light & Power Company, Ltd.

#### **Company Development**

- China is like to grow with Hong Kong, also backup the power of the Hong Kong development.
- The most important development items of China Light is divided into two part:
- To maintain the company's quality of the service; Generation, Transmission and Distribution
- To have a border view toward new development in developing area in Asia, such as PRC, India, Indonesia, etc.

#### **Operation of Company**

- Most of the time, China Light will sent staff to the target countries, to discuss with their government, cooperation business partners
- Sometime, China Light will invite some of the important people in these countries to visit their plants and have meeting with them.

#### **Existing Office Space**

- There is no plan to develop an new office for China Light.
- There are five major office of China Light: Argyle Street, Sham Sui Po, Yau Ma Tei, Tsez Wan Shan and Shatin
- There two major approach for their future development
- To centralize the office: reduce duplicate resource e.g. Telecom
- Remain subdivided office, close to certain division, location and public group.
- There is no plan to relocate and modify the department which work at the Headquarters in near future.

#### **Site of Headquarters**

- Many news reports that the Headquarters will be redevelop as it is underutilized at present, however there is two reason to hesitate.
- Company not willing to be too luxury
- It will involved too much investment to redevelop the office, it is too difficult to justify.

#### **Activities and Structure of Company**

- The Senior Executive Committee: There one MD and nine GM in China Light. 4 GM is not work in the Headquarters.
- Every Thursday, there will be regular meeting for these managers, there is also many cross department meeting held time by time.
- There is a lot travel for these manager as well as other staffs travel place by place, such as the Tai PO Centre, Tsing Yi, ..... The car group of China Light may be largest in Utilities Company among, some for construction work some for manager meeting and visit.
- Every office and division have their domestic administration staff.



**Human Resource and Training**

- The target of China Light is to provide 5% of the working time for training time of their staff.
- There is training Centre in Sham Sui Po office, Shatin Centre , also in Tai Po,. There is also some on-site training for the staff, e.g. generator plant, Climbing of electrical tower.
- There is also many conference for more than hundred of staff, it will more pleasant, new in these places. There can relax and enjoy chattering with each other.

**Business Promotion:**

- There is about 40-50 person in the business promotion group,
- The target to the business is the public as well as the industrial, commercial user.
- They will introduce the concept of energy saving, e.g. ice-storage in industrial use, energy saving cooking method -non-flame cooking for family.
- To enhance the consumer service.
- There should some good showcase for the foreigner
- To tell them how capable of China Light are.

**Public Relate**

- There is about 15 staff in public relate
- There is five main target for the public relate: General public, Media, Legislation Council, Government, Investment and International : represent a healthily development in Stock Exchange.
- There may be a good Presentation Centre.

**Office Facilities**

- The MSD interview will be arrange.

Date: 14 Oct., 1996 3:00 pm

Ms H.F. Yeung

CLP Delight Centre Manager, Kowloon North, Distribution and Customer Service, China Light & Power Company, Ltd.

Location: Western Kowloon Plaza

Size: 430 sqm (approx.)

Number of public : 600 person/day

#### Concept:

- CLP Delight Centre is the Multi-purposes Centre of Distribution and Customer Service Group.
- It is the concept of "One stop shop service" which means customers can come to the Centre and made many thing at a time.
- It is a central and directly contact from China Light to its customers.

#### Function

- Public can apply electricity , pay the bill, change the account and stop the account and other customer service in the Centre.
- Another major purpose of the Centre is to tell the interesting, convenient and comfort bring from electricity to the customer, hopefully will be appreciate by them.
- The concept of the learning course and demonstration is very new to China Light, it is only the most initial stage.

#### Facilities in Centre

- There is consisted a exhibition gallery for electrical appliance.
- There is also a demonstration Centre to tell public how is the electrical life.
- There will be some cooking course especially non-flame cooking and interest course for public.

#### Public User

- The student mostly come Kowloon, some of them come from Hong Kong, and New Territories.
- There is a lecture room for several purpose, such as meeting and conference from other organization apart from China Light.

Comment from Miss Yeung, it is prefer to have such facilities in more different location rather than a big centralize one.

Date: 28 Oct., 1996 15:00 am  
Teleconversion with Mr. Ho  
Highway Department

Regarding the access to the site, Highway Department only concern with the road finishing and installation for entering the site.

They also concern with connection of the access of the site to main road.  
Highway Department suggested we should contact transport department or District Land Office for more detail discussion.

Date: 4 Nov., 1996 11:00 am  
Teleconversion with Mr. Lam  
Transport Department

Regarding the access of the site from Kadoorie Avenue

Five Point we should aware:

The road is slope in varies portion, it is the most suitable route for access.

There is sharp bend near Argyle Street, which will be difficult for long vehicle for bending.

Around the Braga Circuit. Another 90 degree bend.

The area in Kadoorie Avenue is zone 3 residential area in density zone by Town Planning. The area may not be suitable for the company vehicle access especially the construction car.

The residents there may object deal more people and traffic enter the region.

The Process to modify the entrance of the site which already specific in the lease.

We can apply to modify the lease in District Land Office. District Land Office will consult Transport Department, the suggestion will past to Domestic Affair and discuss with the local residents. If no one has reasonable object, the modification can pass.

\* Drawing will sent to both department for further informal discussion on traffic issues in later stage.

Date: 5 Nov., 1996 11:00 am  
 Interview with Mr. Wong Hon Meng, Senior Environmental Protection Officer  
 Environmental Protection Department Hong Kong Government

In fact, Government has less control in Office building in Hong Kong, since most of the local office building will apply mechanical ventilation system. There is also more or less control on the environmental condition inside an office building, such as radon level, air quality level.

In the proposal, there is two major consideration should be aware. Noise & Air Quality

**Noise:**

Two major noise may happened in the site

- Highway from traffic
  - Aircraft: It will not exist anymore two or three year later.
- The three ways to reduce noise level:
- By Screening: There is some noise screen which can reflect the noise but still maintain certain degree of vision and air movement.
  - By layout: It is also possible by the insensitive function area such as podium for carpark.
  - By Setback: generally speaking, the noise level will reduce 3 dB if the distant is increase twice.
- The noise from traffic is calculated from the axial of the vehicle to the receiver.  
 The noise may be direct or reflected, but the reflected noise could be minor.  
 Internal layout to ensure suitable working environment from equipment, other occupants is also very important.

Noise is going straight in general term. If you can see the noise source, there should be noise reach. Sight line would determine the possibility of noise affect.

**Air Quality / Comfort**

- For natural ventilation, plantation and landscape can increase the humidity. However, there is less existing example to reduce the humidity
- The air quality for the recreation area, especially active recreation should be in a better air-quality area.
- For Natural ventilation, the intake air location should be away from pollution, main road. The same as the air-condition input is usually on the building top. The air in high level is more reliable, stable.

**Comment on my schematic design:**

- The enclosing as the noise barrier would be very possible.
- The air intake on the road side is not very good.
- The carpark portion could be work as a noise barrier if it placed on the road side.
- The maintain and drainage of the mega roof enclose should be considered more seriously.
- The layering of space is good attempt to save energy

**Three important consideration during design:**

- Does the design suit for its function or it is only thinking in the environmental way.
- The Practicality of the design, such as the client and GAF calculation.
- The priority of the environmental feature with the maintenance cost and long term issue.

Date: 1 Oct., 1996 3:00 pm  
Telephone Interview with Ms Katherine Ma  
Assistant Public Affair Manager, China Light & Power Company, Ltd.

**Business Re-engineering in China Light and Power**

- Stress on customer service.
- Place less on the team work and Multi-task concept.
- Each Business group has different individual characters.
- 5-15 people of different or same department will group together.

**Preservation of the clock tower**

- It can be an landmark to China Light and Power

Date: 16 Dec., 1996 12:30 pm  
Telephone Interview with Mr. H K Wong,  
Computer Planning Officer, China Light & Power Company, Ltd

- In future plan, there will be every staff will have a computer in China Light.
- The ideal case for networking inside a Office is all the cable and plug concealed into the infrastructure of the building so that every desk can connect to the Network easily
- There will be local main frame computer in varies location connected together, one will put in the Headquarters.



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