



## Lecture : Introduction to building services I -

### Electrical Services

22 September 2016

*Guest teacher :*

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Cheung's Old web site: <http://www.ad.arch.hku.hk/~kpcheung/index.html>

Web site jointly developed with \*Dr Hui : <http://www.ad.arch.hku.hk/research/BEER/>

# Electrical Services

Priority :

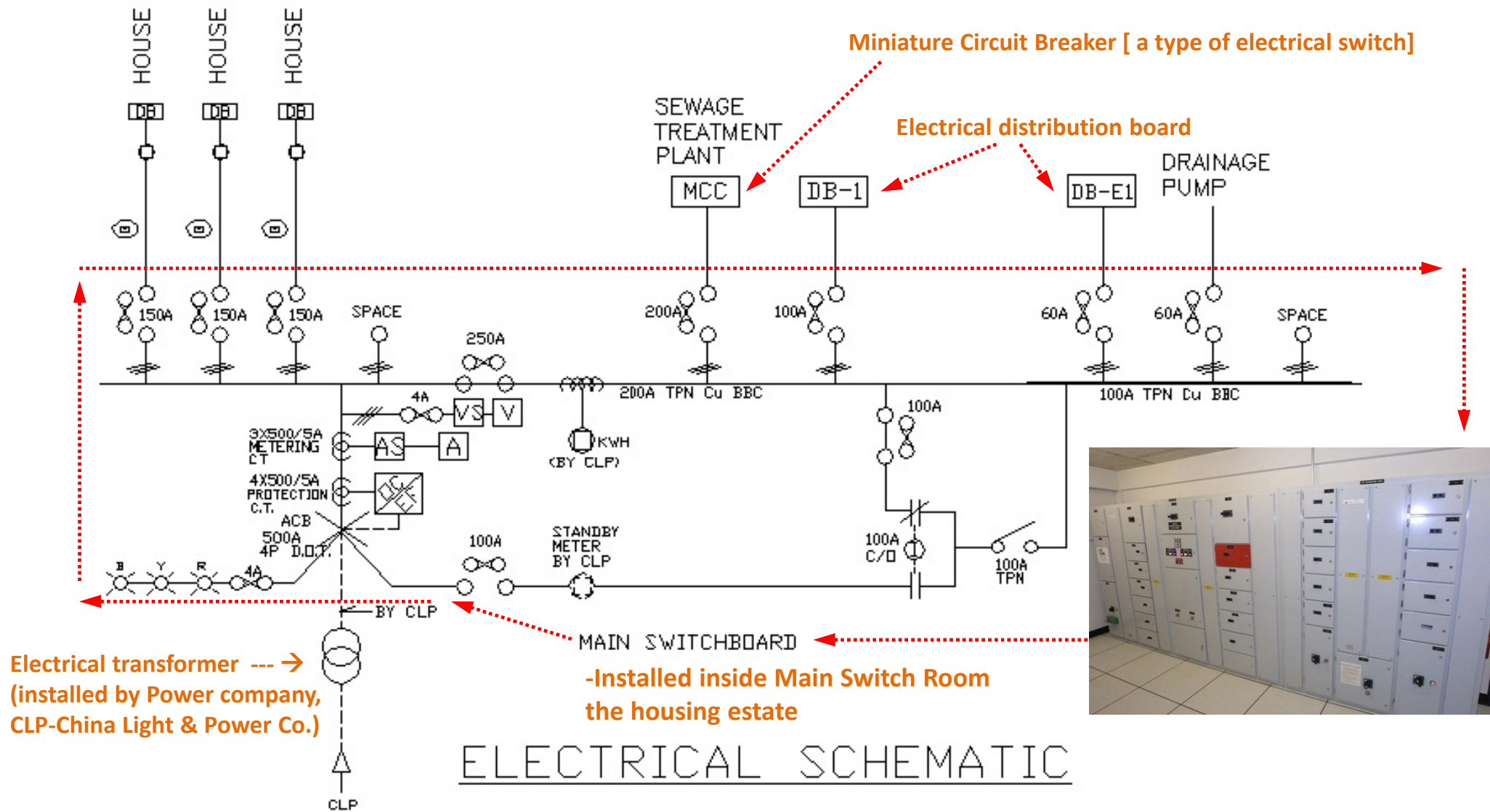
**Safety** [ structural, **fire**, accident prevention] ,

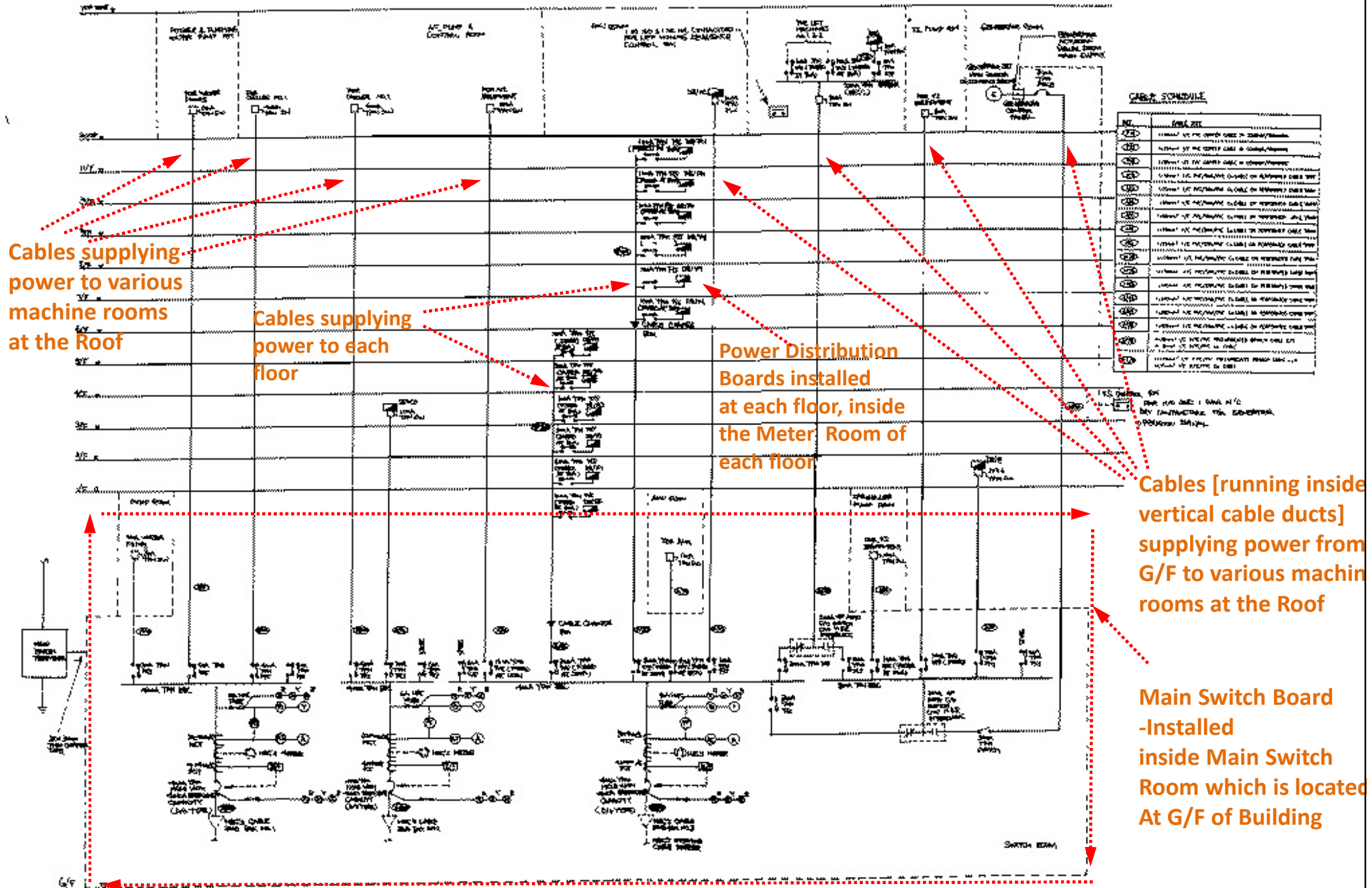
**Health** : Good hygiene of water supply and soil and waste drainage [ good indoor air quality- good IAQ, little Electromagnetic effect, reasonable daylight, greening, ],

Comfort [Reasonable comfort : temperature, humidity, noise versus quietness] ,

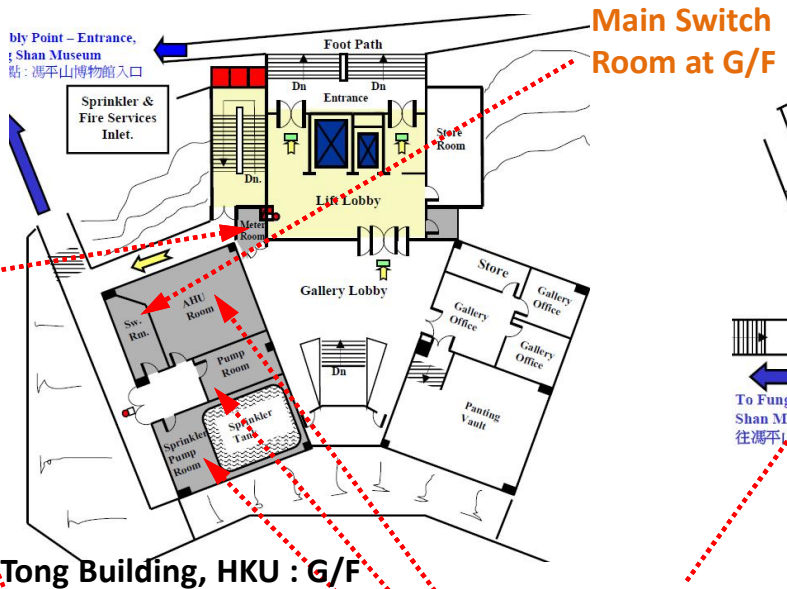
Sustainable building & Sustainable world [**Energy saving, Energy efficient**, Low carbon building ]

# Electrical Services of a group of houses <http://arch.hku.hk/teaching/project/f-el.htm> [ 15 diagrams]



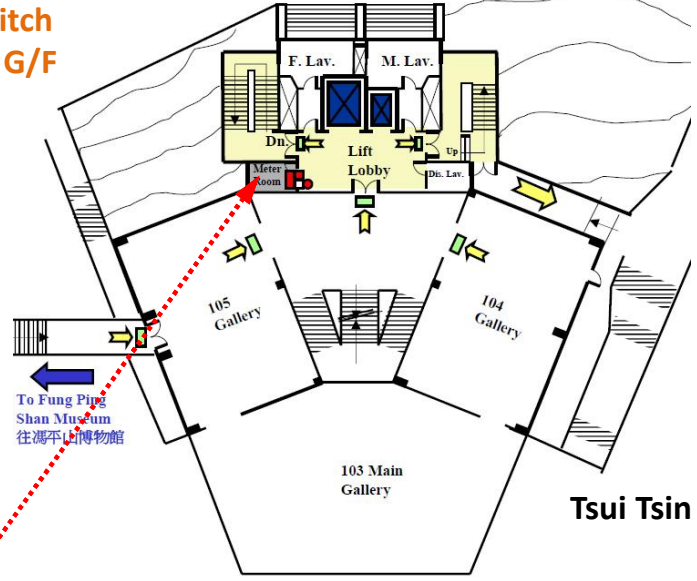


Tsui Tsin Tong Building, HKU : Electrical Supply System Schematic Diagram <http://arch.hku.hk/teaching/intgtch/131.htm>



Meter room at each floor, installed with Power distribution boards

Tsui Tsin Tong Building, HKU : G/F



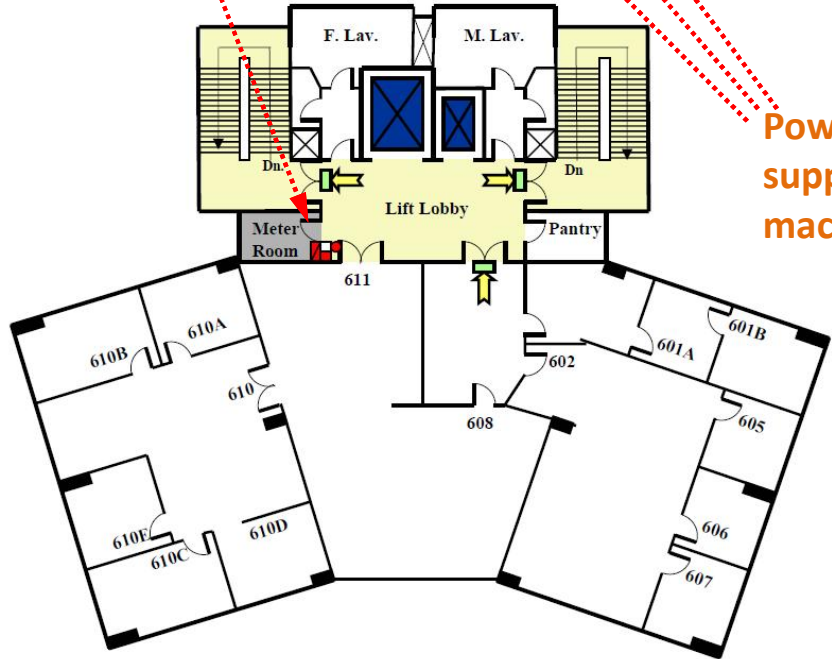
Tsui Tsin Tong Building, HKU : 1/F

### Electrical Services

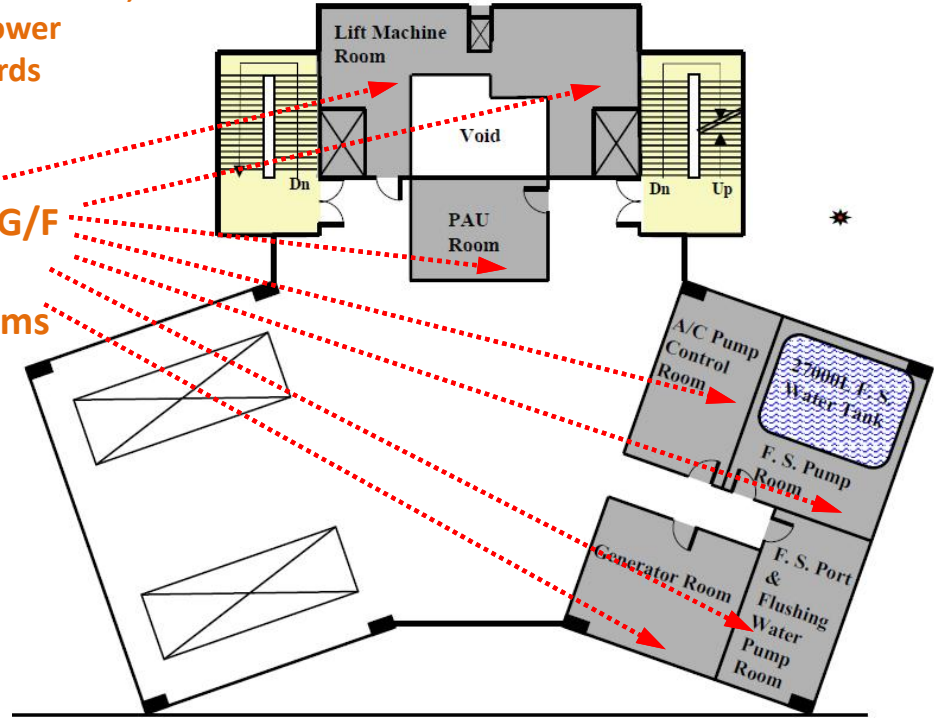
\*\*Electrical Transformer is installed in another building, not in this building

Meter room at each floor, installed with Power distribution boards

Power form G/F supply to machine rooms



Tsui Tsin Tong Building, HKU : 6/F



Tsui Tsin Tong Building, HKU : Roof



# 嘉道理生物科學大樓

# Kadoorie Biological Sciences Building

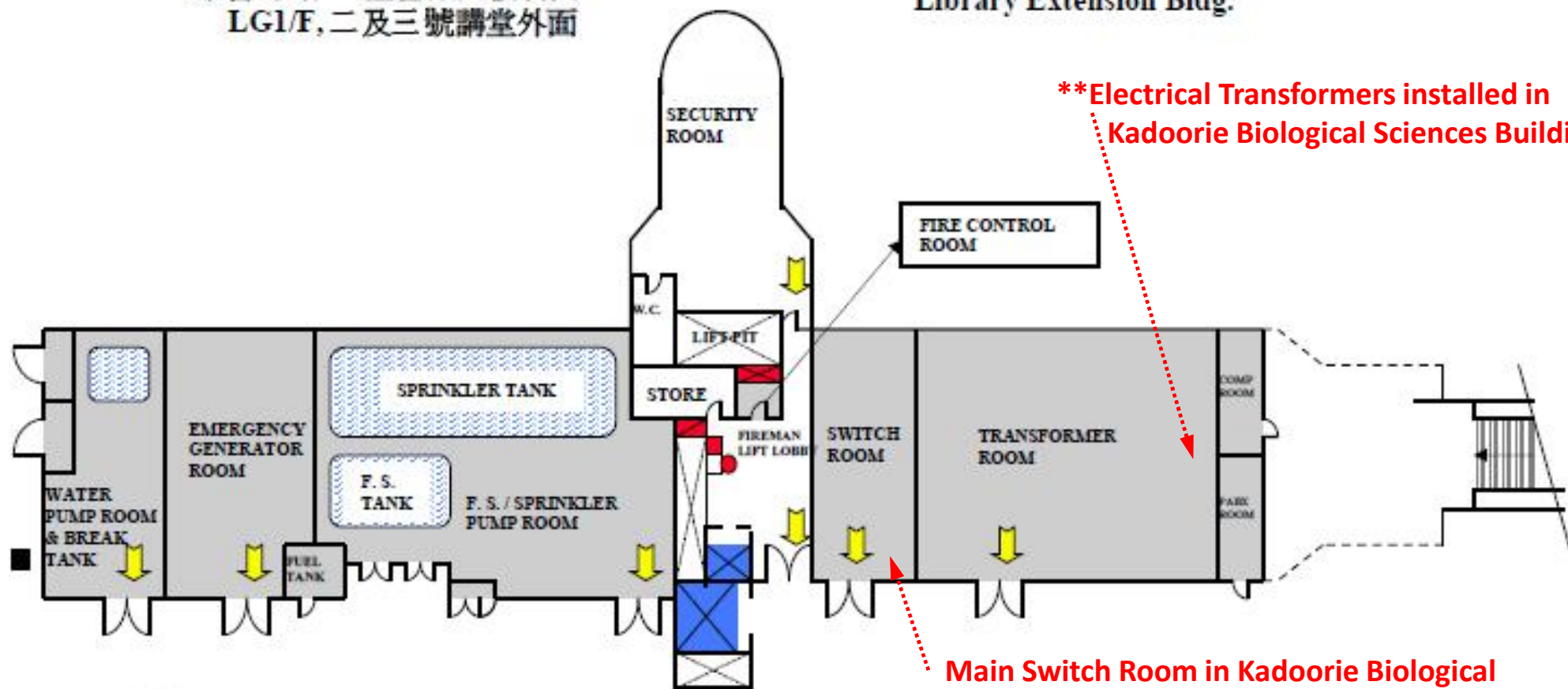
地下  
火警疏散圖

集合地點 – 圖書館大樓新翼，  
LG1/F, 二及三號講堂外面

G/F

Fire Evacuation Plan

Assembly Point – o/s Lecture Rms. 2 & 3, LG1/F.,  
Library Extension Bldg.



LEGEND 圖標：

FIRE PANEL 消防控制版

HOSEREEL 消防喉轆

MANUAL CALL POINT 火警鐘掣

FIRE ALARM BELL 火警鐘

EXIT SIGN 出路牌

ESCAPE ROUTES 逃生路線

PROTECTED AREA 保護區域

PLANT ROOM 機房

STAIRCASE 樓梯

CORRIDOR 走廊

LIFT 電梯

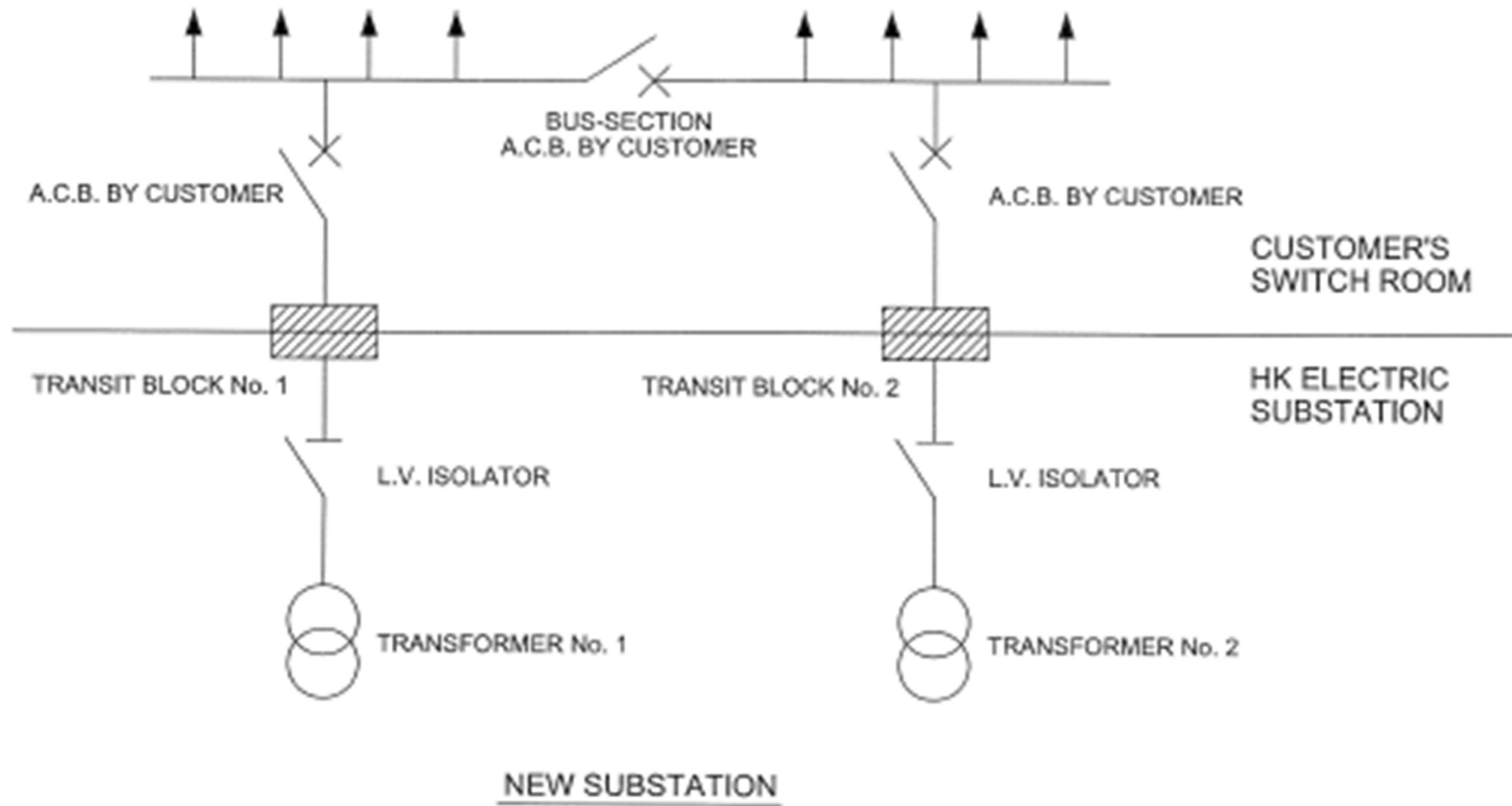
Drawn by Safety Office on 11/2000

Revised on 8/2005

File name: KBSBpo

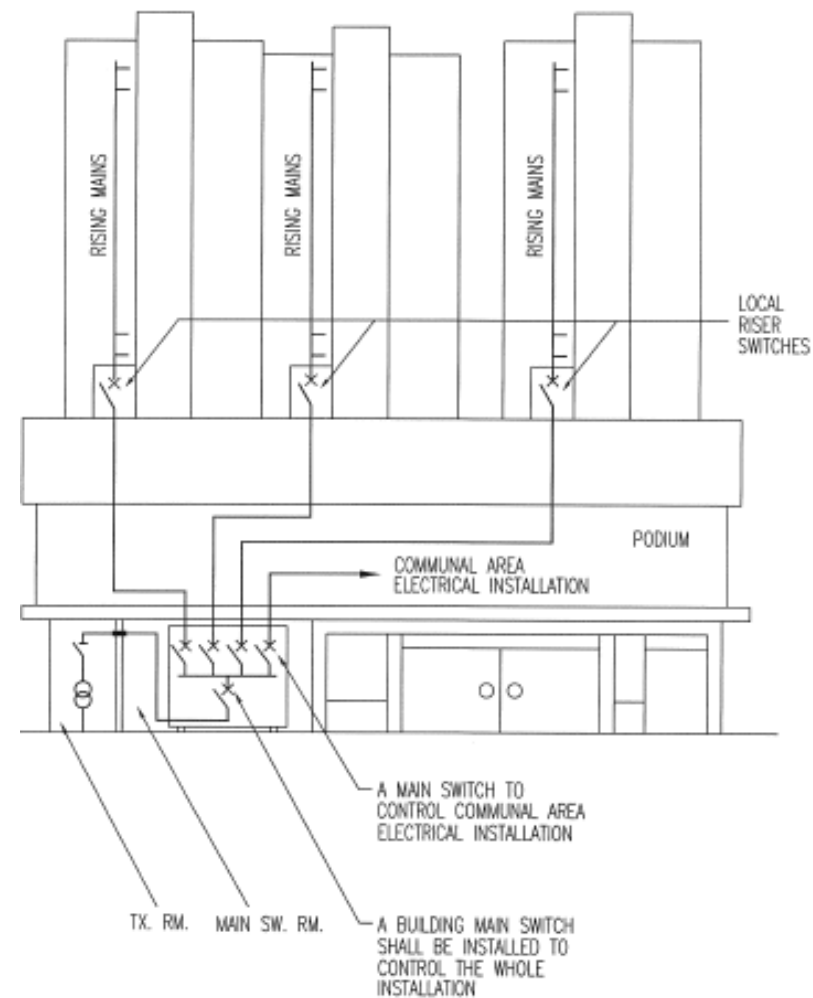
For more details see : <http://www.safety.hku.hk/homepage/pdf/FPKBSB.pdf>

6.29



Drg. No. GCS/6/04  
TYPICAL ARRANGEMENT FOR CUSTOMER'S LV INTERCONNECTION  
FOR A 2-TRANSFORMER SUBSTATION (P245A/93/R-1)

For details, See page 6.29 etc. of Further reference 2 published by Hong Kong Electric Company Limited  
<http://www.hkelectric.com/NR/ronlyres/6DC78BCE-95F2-42BD-BBBB-35C34C3E6050/0/Chapter6GCS5thEdition.pdf>



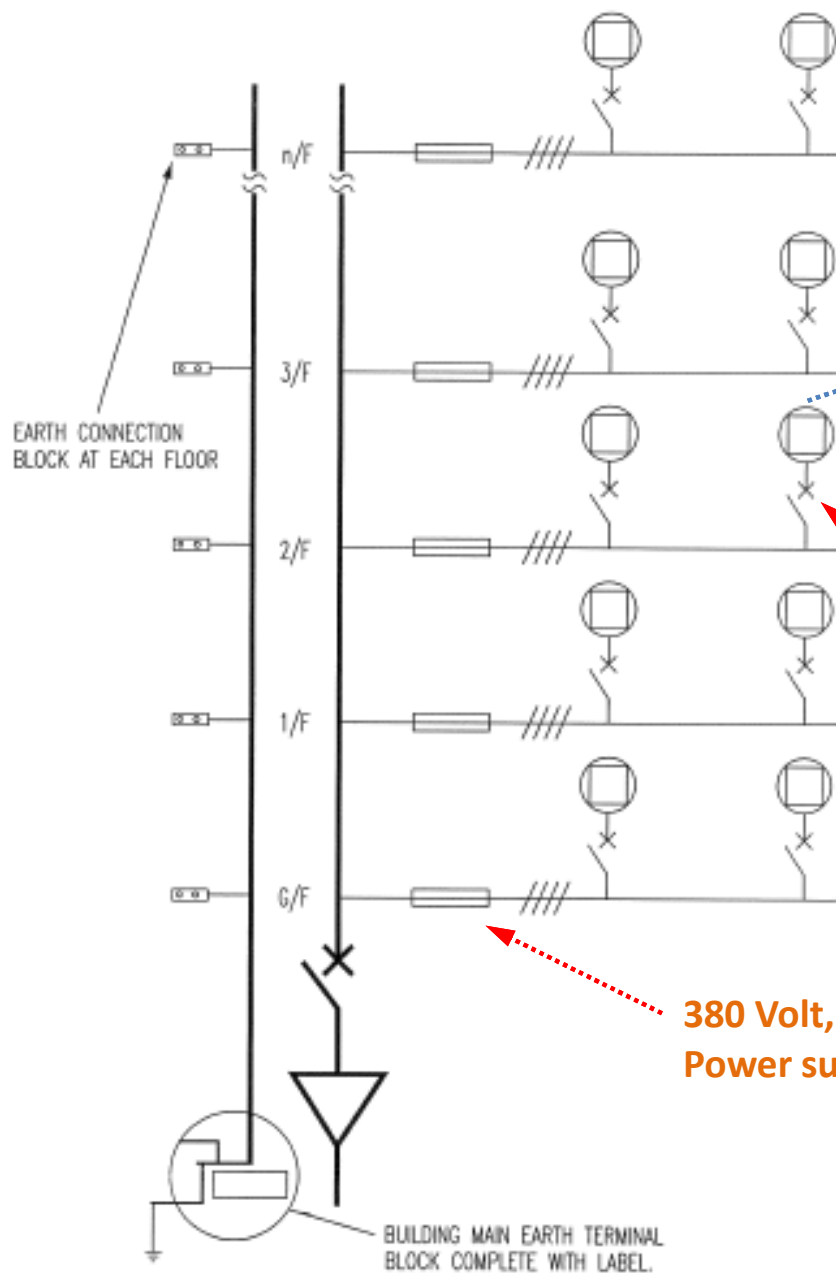
Drg. No. GCS/6/12  
MAIN SWITCH / LOCAL RISER SWITCH ARRANGEMENT  
FOR BUILDINGS

6.37

For details, See page 6.37 etc. of Further reference 2 published by Hong Kong Electric Company Limited

<http://www.hkelectric.com/NR/rdonlyres/6DC78BCE-95F2-42BD-BBBB-35C34C3E6050/0/Chapter6GCS5thEdition.pdf>





Power distribution board and other cabling work are connected downstream of the electrical meter of each tenant



Electrical meter of power supply for each tenant [i.e. each flat, or each office tenant]  
( image : courtesy of [pbworld.com](http://pbworld.com) )

Electrical power isolation switch for each tenant [i.e. each flat, or each office tenant]

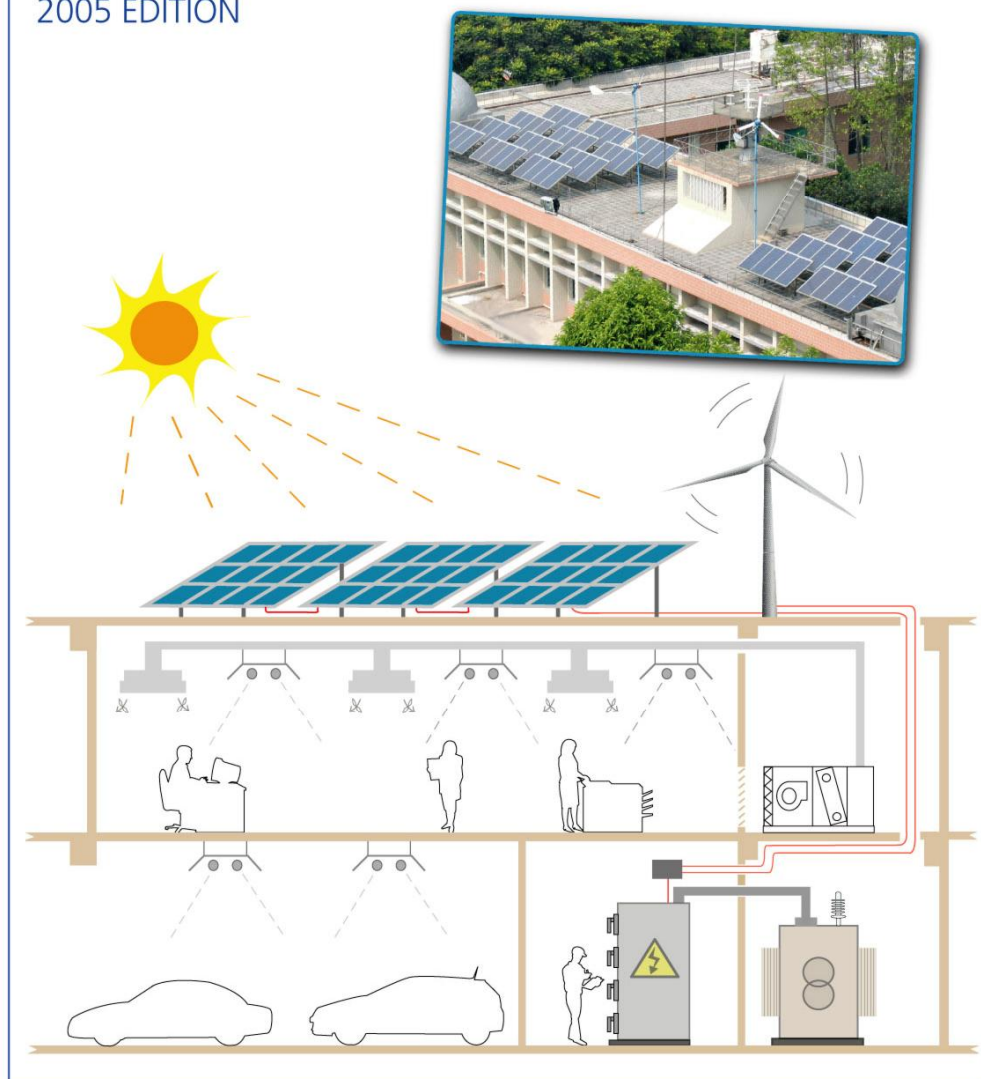
380 Volt, 3 phase, 50 Hertz ( i.e. 50 cycles per second ) 4 wire,  
Power supply : 380/3/50 power supply to each tenant

Drg. No. GCS/6/13  
**COMMUNAL RISING MAINS SYSTEM**

## Technical Guidelines on

# Grid Connection of Small-scale Renewable Energy Power Systems

2005 EDITION



For details, See page Reference 1

published by EMSD –HKSAR Government

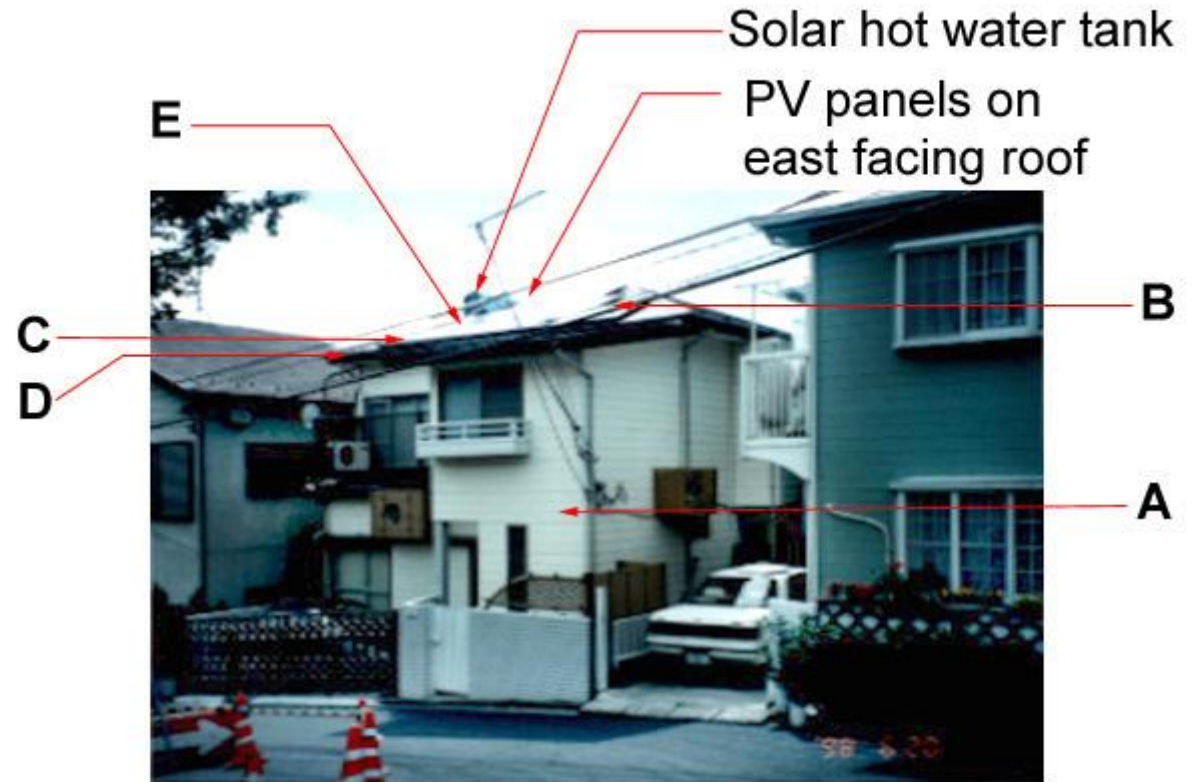
<http://www.hkelectric.com/NR/rdonlyres/6DC78BCE-95F2-42BD-BBBB-35C34C3E6050/0/Chapter6GCS5thEdition.pdf>

## A Solar House near Yokohama in Japan

Mr. Tani installed **a solar hot water system** in 1993 on the south-facing roof of his house at 0.8M yen. The water tank holds 200 litres of hot water. The water tank looks like a small box on the roof. He also installed **a solar Photo Voltaic System**. <http://arch.hku.hk/teaching/envctrl/project122/p122.html>



Looking at the house from the South-West side



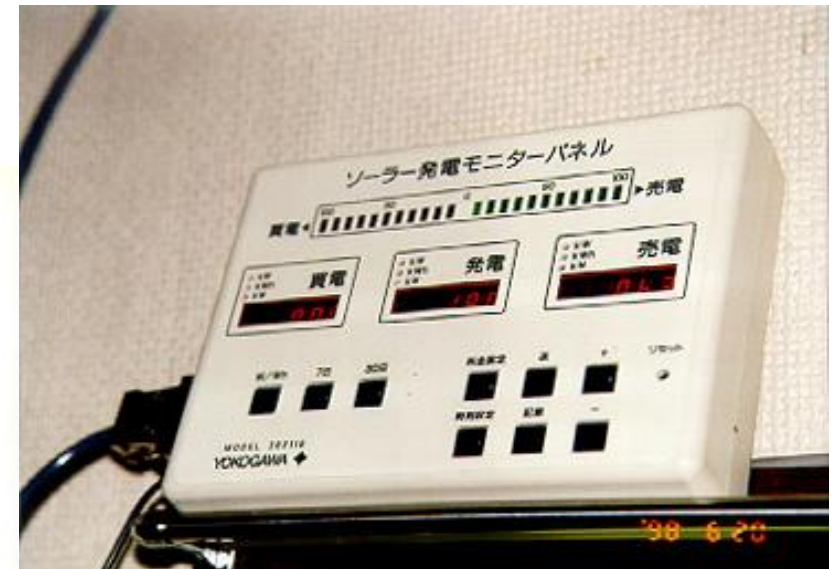
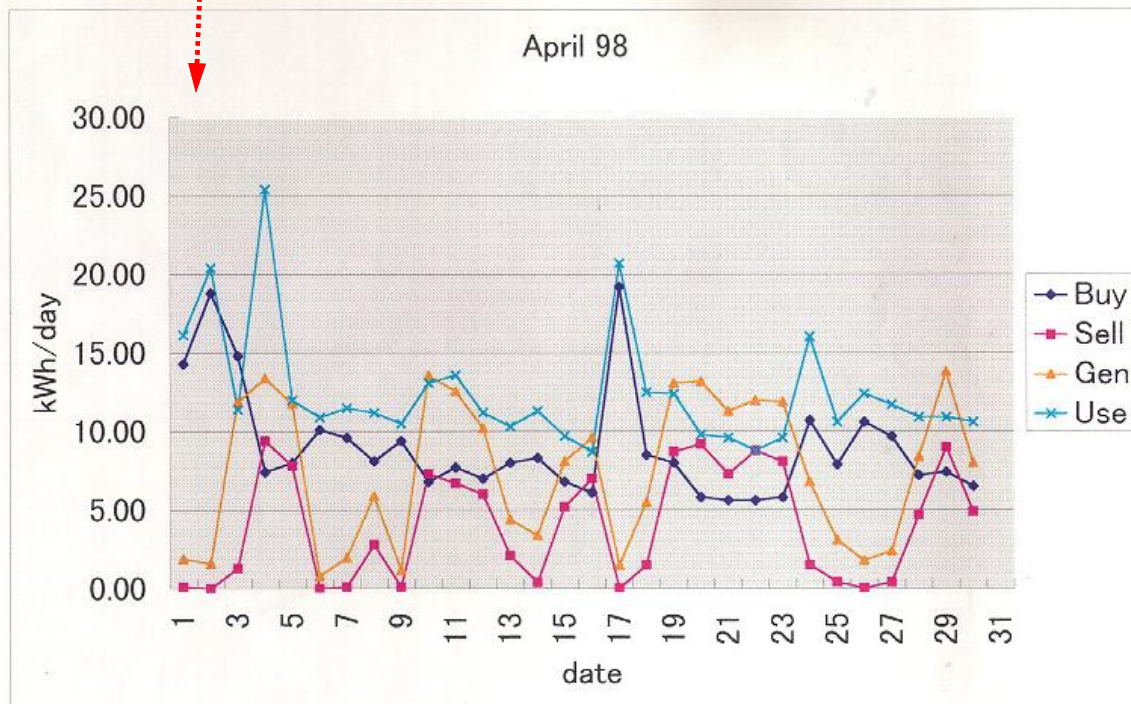
Looking at the house from the North-East side  
(The solar photovoltaic panels are installed on the West and East facing parts of the roof. The solar hot water panels are connected to the 200 litre waer storage tank - the small box on the South-facing part of the roof.)



## A Solar House near Yokohama in Japan

Mr. Tani installed **34 pieces of 1m X 1m solar photovoltaic (PV) panels on the East and West facing roof in Dec 1997 at 4M yen**, of which 1/3 was subsidised by the government. The maximum output was expected to be 3.4kW. (For comparison: A small Honda is about 1M yen). There was no battery in the solar PV system. If the batteries and the related equipment were installed, the installation price would increase by 50%. The following photos show the PV electricity equipment installed inside the house to regulate and distribute the solar electricity generated. <http://arch.hku.hk/teaching/envctrl/project122/p122.html>

solar electrical generation depends on availability of sunshine [chart for April 1998]  
:kilo-Watt-hour versus day on the month

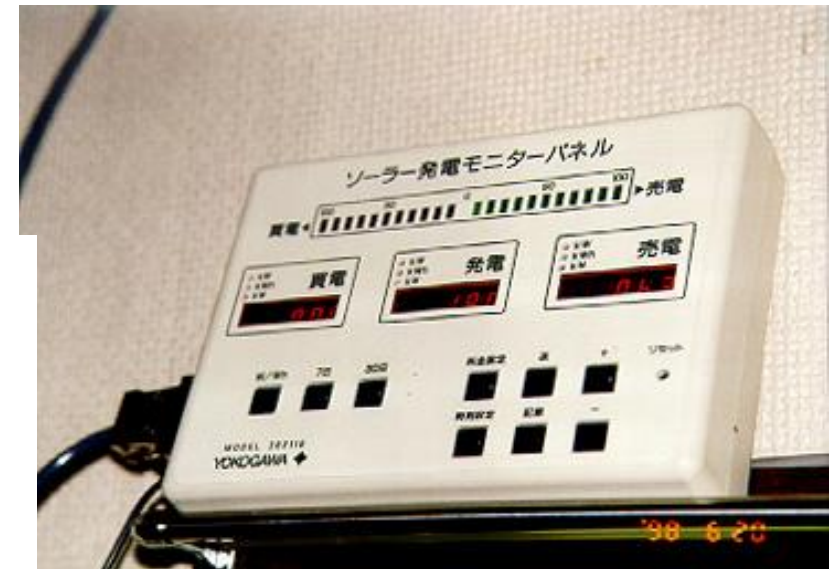
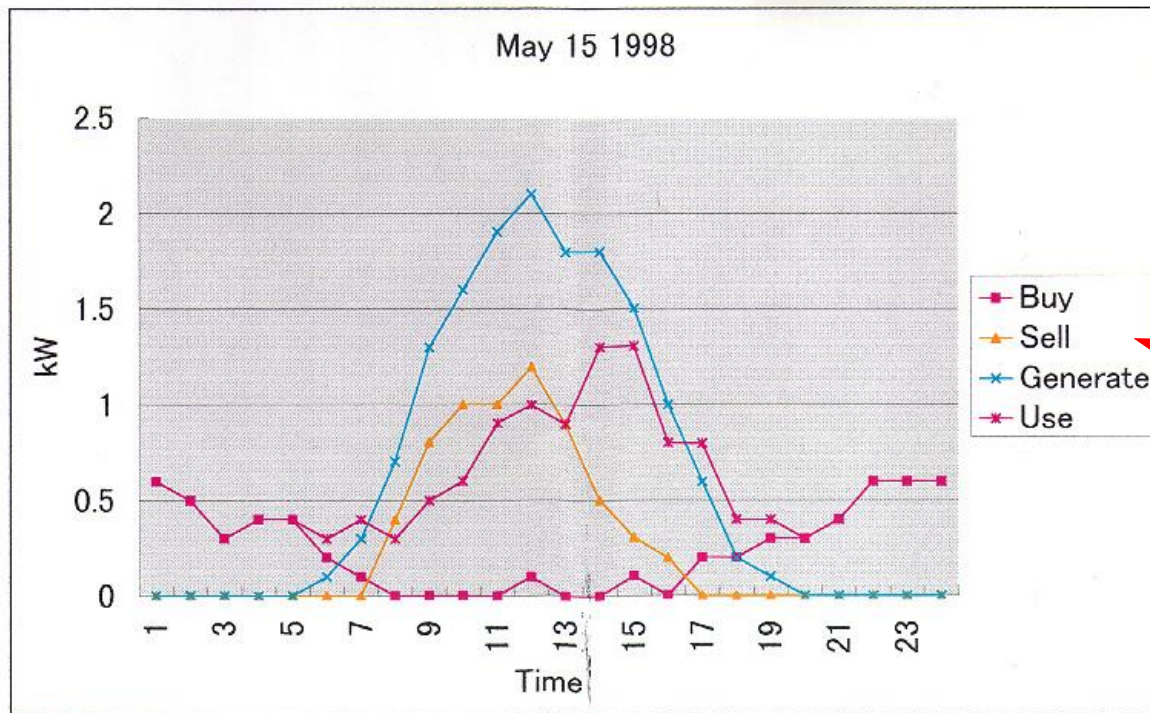


The meters showed how much solar electrical was generated and sold to the electric power grid to gain income. The meters also showed how much electrical was used, and brought from the electric power

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solar electrical generation depends on availability of sunshine [chart for May 15, 1998]  
: Kilo-Watt versus hours of the day



The meters showed how much solar electrical was generated and sold to the electric power grid to gain income. The meters also showed how much electrical was used, and brought from the electric power



# Integrated Sustainable Approach

- Electrical Transformer Room [ not provided in Tsui Tsin Tong Building, because the transformer is installed in another building & Main switch room are commonly provided at G/F, cable duct and sub-switch rooms are provided at each floor
- Water efficient and energy efficient lighting devices, pumps, lift motors and other equipment are to be used
- Computerized Building Management System to be installed to control switching on/off on lights, and air-conditioning equipment, when they are needed/ not needed
- Use of Renewable energy if feasible [ See Further Ref. 1 ]
- Optimized overall planning with air-conditioning and other building services, and FUNCTIONS of the buildings to be carried out to attain **Integrated Sustainability**

## Case study on overall *Building Services Integration*

- **Tsui Tsin Tong Building, HKU:** Building No.13 in [HKU main campus map](#)
- Case Study <http://www.ad.arch.hku.hk/teaching/cases/ttsui/ttsui.htm>
- [Integrated technology study by BA\(AS\)-3 students 95/96 \[HKU\] :](#)  
<http://www.ad.arch.hku.hk/teaching/intgtech/>
- Floor Layout and evacuation plans for **Tsui Tsin Tong Building, HKU :**  
<http://www.safety.hku.hk/homepage/pdf/FPTTT.pdf> ;

## Basic Reading :

1. Electrical Services of a group of houses <http://arch.hku.hk/teaching/project/f-el.htm>
2. Section 13. Electric Services and Lifts of Tsui Tsin Tong Building, HKU <http://arch.hku.hk/teaching/intgtech/content.htm>
3. Electrical wiring [http://en.wikipedia.org/wiki/Electrical\\_wiring](http://en.wikipedia.org/wiki/Electrical_wiring)
4. Tsui Tsin Tong Building, HKU- Case study <http://arch.hku.hk/teaching/intgtech/> ;
5. Tsui Tsin Tong Building, HKU - Evacuation plans with building services plant rooms <http://www.safety.hku.hk/homepage/pdf/FPTTT.pdf> ;
6. Smith, David Lee, *“Environmental Issues for Architecture”*, Chapter 12 & 13. Hoboken, N.J. : Wiley, c2011. HKU Lib. Call # [720.47 S645](#)
7. Reid, Esmond, *“Understanding Buildings”*, London : Construction Press, 1984. HKU Lib. Call # [690 R35](#)

## Further reference :

1. Technical Guidelines on Grid Connection of Renewable Energy Power Systems (2007 Edition)  
[http://re.emsd.gov.hk/english/gen/grid/grid\\_tech.html](http://re.emsd.gov.hk/english/gen/grid/grid_tech.html) & HKRE Net [http://re.emsd.gov.hk/english/gen/overview/over\\_intro.html](http://re.emsd.gov.hk/english/gen/overview/over_intro.html)
2. Guidelines on design of electrical installation of Hong Kong Electric :  
<http://www.hkelectric.com/NR/rdonlyres/6DC78BCE-95F2-42BD-BBBB-35C34C3E6050/0/Chapter6GCS5thEdition.pdf> ; &  
[http://www.hkelectric.com/web/DomesticServices/SupplyRulesAndGuideToConnectionOfSupply/GuidetoConnectionofSupply/Index\\_en.htm](http://www.hkelectric.com/web/DomesticServices/SupplyRulesAndGuideToConnectionOfSupply/GuidetoConnectionofSupply/Index_en.htm)
3. *Supply Rules of CLP Power Hong Kong Limited*  
<https://www.clponline.com.hk/mybusiness/customerservice/openaccount/supplyrules/Pages/Default.aspx?lang=en>
4. All buildings of HKU - Evacuation plans with building services plant rooms  
[http://www.safety.hku.hk/homepage/manual\\_Floorplan.html](http://www.safety.hku.hk/homepage/manual_Floorplan.html)

\*\*\* Thank you very much \*\*\*