Building Inspections to Pre-1980 Residential & Composite Buildings in Hong Kong

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<th>Speakers</th>
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<tr>
<td>Sr Dr Daniel C.W. Ho</td>
<td>FRICS, FHKIS, Hon. PFM, RPS(BS), AP(S), RI(S)</td>
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<tr>
<td>Sr David W.W. Chan</td>
<td>FRICS, FHKIS, RPS(BS), AP(S), RI(S)</td>
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<td>Sr Dr Edward C.Y. Yiu</td>
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<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Sr Dr HO Chi-wing, Daniel</td>
<td>Project Director</td>
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<td>Sr Dr YIU Chung-yim, Edward</td>
<td>Project Assistant</td>
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<tr>
<td>Sr TSE Chi-kin, Kenny</td>
<td>Task force Convenor</td>
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<td>Sr HO Kui-yip, Vincent</td>
<td>Task force member</td>
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<td>Sr LAM Wai-keung, Andrew</td>
<td>Task force member</td>
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<td>Sr LO Mei-tak, Rebecca</td>
<td>Task force member</td>
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<td>Sr SIN Kwok-leung, Alan</td>
<td>Task force member</td>
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<td>Sr TANG Chi-wang</td>
<td>Task force member</td>
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<td>Sr WONG Ka-chi, Louis</td>
<td>Task force member</td>
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<tr>
<td>Sr WONG Se-king, Peter</td>
<td>Task force member</td>
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## Interviewees

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
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<tr>
<td>Sr CHAN Che-bun, Anderson</td>
<td>MHKIS</td>
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<tr>
<td>Sr Dr CHAN Man-wai</td>
<td>FHKIS</td>
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<tr>
<td>Sr CHAN Wah-wai, David</td>
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<tr>
<td>Sr CHENG Po-ming, Danny</td>
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<tr>
<td>Sr CHENG Wai-man, Raymond</td>
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<tr>
<td>Sr CHOW Kon-man, Augustine</td>
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<tr>
<td>Sr Prof CHUNG Hung-kwan, Barnabas</td>
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<td>Sr LEUNG Chi-hang, Joy</td>
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<td>Sr WONG Bay</td>
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<td>Sr WONG Kwok-chi, Raymond</td>
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<tr>
<td>Sr WONG San, Samson</td>
<td>FHKIS</td>
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Aims 出版目的

• This Guide (本指引)
  - Is not just for MBIS (並非單為強制驗樓計劃而設);
    • MBIS CoP 2012 is provided by BD (2012) (屋宇署就該計劃已出版作業備考2012);
  - But for general building inspections (而是涵蓋一般專業驗樓須知);
  - Volume 1 is particularly drafted for the following 4+1 aspects (第一冊配合該計劃，提供以下4+1項的檢查指引):
    • External Elements & Others Physical Elements (外牆)，
    • Structural Elements (結構)，
    • Fire Safety Elements (走火與防火結構)
    • Drainage System (排水系統)，and (及)
    • UBW (僭建物)。
Scope

1. Inspection planning and defect diagnosis
   - A. typical preparations and planning for building inspection;
   - B. List of diagnostic techniques for defects commonly found in residential and composite buildings of their respective age groups

2. Special construction methods and features
   - A. regulations;
   - B. codes of practice;
   - C. construction techniques;
   - D. layout; and
   - E. materials commonly found in the buildings of their respective age groups

3. NO guidance on repair and rehab. Works

4. NOT cover exempted houses
Why Old Standards?

• S.5 B(IR)R
  – (1) An examination or assessment mentioned in s.3 must be carried out by reference to the standards specified in ss (2) …
  – (2) The standards referred to in ss (1) are:
    – ... (d) the standard of building design and construction prevalent at the time of construction of the building.
  – (3) if more than one standard in ss (2) is applicable to a building, reference is to be made to the latest of the applicable standards.
• But no details in MBIS CoP 2012
Which Standards to be Complied?

- A building built in the 1950s;
- But some housing units of it had undergone A&A in the 1990s;
- And the fire safety elements of the shops have been upgraded in accordance with the FS(CP)O;
- More recently, some minor works have been approved under the B(MW)R; and
- Some existing balconies cannot be found in approved drawings.
Purposes of Building Inspection

- Check the **legal status** of the building and its works therein;
- Check the **conditions and performance** of the building’s elements and installations in order to formulate a detailed investigation or maintenance and management scheme; and
- Check and **diagnose** the building’s symptoms and defects, if any, in order to formulate a detailed investigation or a **repair, rectification, or demolition** scheme.
Purposes of Building Inspection

1. Building Inspection (visual inspection with or without simple equipment)
   - Preparations
   - Legal Status Check
     - Authorised? Legalised?
       - Cf. Authorised documents
         - Report to BA & Client
   - Conditions Survey
     - Specifications Compliance?
       - Cf. Legislation (relevant ver.)
         - Detailed Investigations
   - Defects Inspection
     - Performance?
       - Cf. Relevant Standards
         - Repair, Rectification, or Rehabilitation

Passing Basis? Repair Basis?

Cause?
Preparations for the Inspection

• Preparation is of utmost importance, and not just retrieval of drawings, but is largely ignored in practice and in MBIS CoP 2012;

• 10 major preparation tasks:
  – Desk preparation of drawings, client requirements, etc.;
  – Preparation of Inspection method(s);
  – Preparation and calibration of equipment;
  – Safety and precautionary measures;
  – Security measures;
  – Preparation for the erection of scaffolding and means of access;
  – Preparation for any necessary insurance policies, protection and environment concerns;
  – Preparation for the contractual arrangement(s), costs, and liability issues;
  – Supervision and monitoring;
  – Emergency handling, contingency planning, licence application, etc.
Desk Preparations

- A written client brief showing detailed requirements and scope of the inspection
- A Client’s Authorisation and Agreement of Building Inspection (see HKIS, 2008 Reference Conditions for Appointing Consultants)
- Ownership boundary of the inspection (if more than one IO? If public open space managed by owners?)
- Common parts, slopes and DMC (if co-own with next lot? If common part within exclusively possessed area? If no DMC?)
- Retrieval of drawings, completion records of A&A / MW / FSW (if no drw?)
- Retrieval of OP, Completion Cert, Acknow. Letter (if no OP?)
- Inspection report template (items a-j)
- Policy statement for building inspection
Inspection Authorization & Agreement (example)

- Parties:
- Agreement:
- Confidentiality:
- Subject:
- Scope of Inspection:
- Limitations of the Inspection:
- Inspection Exclusions:
- Notice Requirements:
- Limitation of Liability:
- Arbitration / Mediation:
- Right of Entry:
- Participation:
- Severability:
- Payment Terms:
- Determination:

Q. Who to sign if there are more than one IO?

Refer HKIS (2008a) Reference Conditions for Appointing Consultants (Building Maintenance)

聘任顧問參考細則 (樓宇維修適用):
Inspection Boundary

• Which parts are included in the inspection agreement?
• How to define common parts? DMC? (Albert House case)
• Accessibility to exclusively possessed parts for inspection?

Q. In case some common parts are located within privately owned parts, shall they be inspected?
Inspection Accessibility

• Accessibility to non-owned parts for inspection?
  – If an inspection of shoring in another owner's lot is required, the BA's prior authorisation vested in s.18(6a) of the BO must be obtained.
  – If an inspection has to be made by entering, cutting through, or interfering with another person's property, the BA's prior authorisation vested in s.28B(1) of the BO must be obtained.
  – In case an inspection involves party walls or shared structures in a surviving building, you must observe s.54 of the current BO, which retains s.110 to s.126 of BO 1935, Rights of Building and Adjoining Owners, the details of which can be found in Schedule 2 of the current BO.
Preparations for Inspection Method(s)

• Formulate the most appropriate inspection method(s) for the task;
• Plan for the required data to be collected for diagnosis.
• Prepare the sampling method.

• Q. Inspect external wall tiles
  – What is the most appropriate inspection method?
  – Infrared scanning? Which standard?
  – Hammer tapping? How many samples? Random samples or reachable areas?
  – Pull-out tests? Which standard? How many samples, where to take?

Pull-out test: 0.5 MPa or 0.168 MPa?
Preparations for the Equipment

- General tools and equipment
- Calibrations
- Independent laboratory test services
- Protective clothing
  - Safety shoes
  - Safety helmets
  - Safety clothing

Q. Inspect external wall tiles by infrared scanner
  - Which models are accepted?
  - Max Zoom x? for high-rise buildings?
  - How to check calibration?
Safety and Precautionary Measures

• 3Rs: Risk assessment; Risk measurements; Risk controls.
  – Termites (component collapse)
  – Animals or insects (attack)
  – Asbestos, toxic liquid/gas, radioactivity (health damage)
  – Overloaded parts (collapse)
  – Unstable parts (collapse)
  – Deteriorated parts (collapse)
  – Falling from heights (injuries)
  – …

  – Have you provided the inspectors all the safety protection, training, and insurance?

Q. How to assess toxic gas risk when entering a confined space?
Emergency and Contingency

- Emergency contacts
- Contingency plans
- Incidents occur during inspection:
  - Asbestos exposure
  - Flooding
  - Blockage
  - Installation breakdowns
  - Serious structural damage
  - Fire

Q. Any liabilities if any accidents are caused or any components / elements are damaged by the inspection?
Legal Status Check

- Legal status check does not only check Unauthorized items / contraventions, but also many authorized / compliance items / legal status;

11 Authorisation Check:

1. Authorised / Compliance Items / Legal Status
   - A. design approval: approved building plans (s.14 BO)
   - B. occupation approval: occupation permit (s.21 BO)
   - C. any discrepancy in building use (s.25 BO)
   - D. any special exemption in the design and construction authorised by BA (s.42 BO)
   - E. any outstanding orders from BA (s.24, s.26, s.26A, s.28 BO)
   - F. any authority to erect shoring, if any (s.18 BO)
   - G. any approved previous inspection / investigation / repair
   - H. any authorised alteration or addition (s.14 BO)
   - I. any exempt alteration or addition (s.41 BO)
   - J. any validated / authorised minor works (B(MW)R)

2. Unauthorised Items / Contraventions
   - K. any non-exempt alteration or addition (UWB)
UBW or Incompliance?

- *Nelson v. Victory Mark* (HCA 8530/1999)
  - “a contravention of the Regulations does not result in an offence, the works carried out in contravention of the same are not illegal or unauthorized works.”
  - non-compliance, but not UBWs;
  - OP was granted, no A&A was carried out;
  - The beams as constructed did not comply with the regulations in that the headroom was less than 2.3m.

Q. Is it rectifiable?
Q. Would it be checked on site during OP?
UBW or Incompliance?

- Lo Yin Ming v. BAT and BA (a Judicial Review)
  - S.128(3) BO 1935
  - “In the case of minor alterations or repairs the Building Authority may dispense with the submission of plans by an authorised architect.”
Timeline of Statutory Building Control

1. Pre-1946 (or pre-war)
   - BO 1939
   - Approval plans lost
   - Low-rise
   - Specifications more lenient
   - Approval process different

2. 1946 (or post-war) to 1968
   - BO 1939
   - Approval plans mostly available
   - High-rise
   - Technology advancement, requirements strengthened
   - BO 1955, subsidiary regulations 1955 – 1968
   - Construction methods and building features changed drastically

3. 1968 – pre-1980
   - High-rise framed structures of reinforced concrete
   - Major CoPs released (MoE, FRC, ….)
   - Performance-based approach

Q. Checking against which standards / regulations?
Q. Repair up to which standards / regulations?
5.2 Structural Elements: Pre-War Buildings

Q. Repair back to LCC 1938 standard or BCR?
Q. Can a veranda or balcony be enclosed? (see cl.4.4.4 or s.11(b) of 1956 BPR)

- No approved building plans or calculations;
- Very different designs:
  - Chimneys
  - Verandas and Balconies
  - Wells
  - Timber floors and stairs
  - Masonry or brick walls
  - Roof tiles
  - Parapets lower than 1100mm
  - Sand based plastering (黃花沙)
## Old Design Standards

<table>
<thead>
<tr>
<th>Period</th>
<th>Design Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1903-1934</td>
<td>Public Health and Buildings Ordinance 1903 (R.C. building, which belonged to the Exceptional Building, which, in turn, was subject to Building Authority approval)</td>
</tr>
</tbody>
</table>
| 1935-1955 | Buildings Ordinance 1935  
London County Council Bylaws 1915 |
| 1956-1968 | Buildings Ordinance 1955; B(C)R 1956  
London County Council Bylaws 1938 or  
London County Council Bylaws 1952 and subsequent amendments (for structural designs prepared and signed by a qualified engineer) |
| 1969-1974 | London County Council Bylaws 1952 and subsequent amendments (for structural designs prepared and signed by a qualified engineer) |
| 1975-1986 | B(C)R 1975 (imperial version) and B(C)R 1976 (metric version) |
| 1987-1989 | Code of Practice for the Structural Use of Concrete 1987 |
Latest Statutory Requirements Apply

- Laws with retrospective power:
  - Fire Safety (Buildings) Ordinance
  - Fire Safety (Commercial Premises) Ordinance
- Large-scale Alterations and/or Additions
- More than one standard is applicable
- Overridden by Public Safety?
Retrospective Power

• Fire Safety (Buildings) Ordinance
  – With its plans of the building works of which were first submitted to the BA for his approval on or before 1 March 1987; or
  – Which was constructed on or before 1 March 1987 where no plans of the building works of the building were submitted on or before that date …

• Q. For FS(B)O
  – Shall it be considered in a building inspection? Or
  – Until it is required by FSD?

“The RI shall review if the subject building is under the purview of the FS(CP)O or FS(B)O…” (p. 15 of MBIS CoP)
A&A Works

Q. Would A&A works affect the statutory required standards of the building?

- From the original standards when the building was built;
- To the latest standards when A&A works were done?

1. New building works, whether they are alterations or additions (A&A) on surviving buildings, may be subject to the latest statutory requirements...

2. APP-117 (PNAP 249):
   a) New structural elements in the A&A works should be …regarded as new buildings.
Q. Would repair works be counted as A&A? so to apply new codes?

FOUR situations in which the latest building regulations and codes of practice would apply:

- The partial or total removal of existing major wind-resistant walls or frames, which would result in a reduction in their stiffness by at least 5%.
- The extension of building dimensions, which would result in at least a 10% increase in the wind-exposed areas of a building.
- When existing floors used for storage purposes are affected.
- When flat slabs, which were originally based on the working stress method, are structurally altered or subject to any additional load, the shearing stresses in the slabs should be checked using the latest codes.
Special Construction Methods and Features

• Facade
  – Columned Verandahs over streets (pre-war)
  – **Cantilevered** balconies over streets (pre-1968)
  – **Cantilevered** canopies over streets (post-1968)

• Materials
  – Brick and sand (黃花沙) (pre-war)
  – Salt water concrete (咸水樓) (1960s-1970s)
  – Asbestos (石棉) (before 1980s)

• Structural Design
  – Load bearing walls
  – Party walls
Collapses of Canopy / Balcony

• Cantilevered balcony (1949) at Marble Road, North Point 1997
  – Overstressed, misplacement and corrosion of bars,
  – concrete strength 30% below standards
• Cantilevered canopy (1973) at Albert House, Aberdeen 1994
  – Ownership of canopy not ascertainable
  – Fishing tanks with water seepage
  – Misplacement of bars
• Cantilevered canopy (1972) at WKK, Kwun Tong 1997
  – Misplacement of bars
• Cantilevered canopy (1979) at Kin Kwan Street, Tuen Mun 2011
  – Screeding covers the surface channel (BD, 2011)
Collapses related to UBW

- **Cantilevered canopy** at Wearbest, To Kwa Wan in 1990
  - Illegal canopy
- **Cantilevered canopy** at Mei King Mansion, To Kwa Wan in 2000
  - Illegal canopy
- **Cantilevered canopy** at Ma Tau Wai 2010
  - Dismantling UBW
  - “Repair works and removal of unauthorized building works on G/F commenced on 23 January 2010 and were still in progress in the morning of 29 January 2010.”
  
5.3 Fire Safety Elements: Pre-1955 Buildings

- No fire codes before 1955, but
- S.33(3) of BO 1935: “Every staircase … **fire resisting material**”
- S.33(5) of BO 1935: “…satisfactory **means of escape** in the case of fire.”
- S.33(6) of BO 1935: “All doors and window openings or glazed partitions communicating with any such staircase shall be adequately protected by **fire resisting doors** of solid teak not less than 2 inches thick or by wired glazing …”
- S.35 of BO 1935: “Every **existing** buildings …. Means of escape…” Does it mean a **retrospective requirement** for all pre-1935 buildings?
Q. Should it be inspected, if the scope is the common areas only?

MOE 1959 para 17(6) The exit route from any room, flat or storey to any part of a staircase which serves a storey more than 100 feet above the level of the ground shall be through a lobby. Such lobby shall be either
(a) a protected lobby …

MOE 1986 para 17(6) The exit route from any room, flat or storey to any part of a staircase which serves a storey more than 30m above the level of the ground shall be through a lobby. **Such lobby shall be designed as a common area and an integral part of the staircase so that it could not be readily incorporated as part of any adjacent unit(s) of accommodation**, and shall be either
(a) a protected lobby …
Which Version of Fire Code?

- Schedule 2 of the FS(B)O specifies that: …the detailed specifications and requirements of the installations and equipment ... are set out in the FSI Code 1994...[and] the detailed requirements for the design, construction or installation in relation to construction requirements ... are set out in the MOE Code 1996, FRC Code 1996 and MOA Code 1995 [9/2/2012].
- Yet, s.25 of the Ordinance makes the provision to change the requirements by replacing the codes in the Schedule with substituted or amended codes.

<table>
<thead>
<tr>
<th>Period</th>
<th>Legislation and Codes of Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1954</td>
<td>Fire Services Ordinance (No.32 of 1954) was enacted</td>
</tr>
<tr>
<td>1959</td>
<td>MOE code was first issued</td>
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<tr>
<td></td>
<td>B(C)R included fire resisting construction requirements</td>
</tr>
<tr>
<td>1964</td>
<td>CoP for the Min. FSI&amp;E was first issued in February</td>
</tr>
<tr>
<td>1986</td>
<td>MOE code was revised</td>
</tr>
<tr>
<td>1989</td>
<td>MOA code was first issued in October 1989</td>
</tr>
<tr>
<td></td>
<td>FRC code was first issued</td>
</tr>
<tr>
<td>1995</td>
<td>MOA code was revised in May 1995</td>
</tr>
<tr>
<td>1996</td>
<td>FRC code was revised &amp; with effect from August 1, 1996</td>
</tr>
<tr>
<td></td>
<td>MOE code was revised with commentaries</td>
</tr>
<tr>
<td>2011</td>
<td>the MOE, FRC, and MOA codes were integrated and replaced by the Code of Practice for Fire Safety in Buildings (FS Code)</td>
</tr>
<tr>
<td></td>
<td>MBIS/MWIS CoP were first issued</td>
</tr>
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</table>
Passed but Incompliance

- FS Cir 4/96 Part II specifies sprinkler installation before 1.4.95;
- In this case, OH(III) requires 135,000 L tank;
- Two tanks of each 67,500 L are provided, the effective volume is not enough, because the interconnection pipe is only 100mm diameter;
- It requires 150mm diameter interconnection pipe to achieve nominal flow rate of 2,250 L/min (LPC, 1998 Table 28) and the provision of direct link.

Q. It has passed the Fire Tests, should it be rectified? (answer in Volume 2, tbc)
A&A Works

• Generally, only the areas affected by the proposed A&A works (including shared exits) need to comply with the requirements of the latest codes. The remaining parts of the building that are unaffected by the proposed works will follow the original legislation and codes.

• If the A&A works result in a change in the occupancy factor, an assessment of the population of the subject premises in a submission of plans can use "head counts" on those premises where A&A works are proposed or in comparable premises.

• See Practice Note APP-85 for details.
### 5.4 Drainage System: Pre-1960 Buildings

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<thead>
<tr>
<th>Period</th>
<th>Legislation and Codes of Practice</th>
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</thead>
<tbody>
<tr>
<td>1903~1934</td>
<td>Drainage Regulations in Schedule M under the Public Health and Buildings Ordinance of 1903 were enacted</td>
</tr>
<tr>
<td>1935~1958</td>
<td>Drainage (General, Water Closets and Urinals, etc.) Regulations (No.18 of 1935) under the Buildings Ordinance of 1935 were enacted (see also s.86-s.98 Of BO 1935)</td>
</tr>
<tr>
<td>1959</td>
<td>Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations</td>
</tr>
</tbody>
</table>

- S.17 of BO 1935: a building shall be of cast-iron pipes coated inside with **Dr. Angus Smith's patent composition**, or of other material approved by the BA
- Q. In doing repair works, shall it be upgraded to the latest requirements?

Dr. Angus Smith?
Special Construction Methods and Features

- Night soil (no drainage system is required)
- Hopper
- Embedded drainage pipes within building elements
- Common drainage pipes and manholes passing through privately-owned areas (should they be inspected?)
- Cast iron pipes v uPVC pipes (how to connect when repair?)
- GI pipes v copper pipes (how to connect when repair?)
Typical Features

1946 - 67

1968 – Pre 1980

Pre-1945
Pre-1945

Typical special features:
1. Verandah projects over street, with supporting columns on the street.
2. Single (open) staircase serves two units per storey with different fire safety provisions from those found in other vintage buildings.
3. A scavenging lane (with or without yard) in the back.
4. Load-bearing party wall separating the two units.
5. Composite use with shops normally on the ground floor and domestic use on the upper floors.
6. Similar blocks were built next to the building without a building gap.
7. Low-rise of normally two to four storeys.
8. Well and chimney may be present.
Typical special features:
- Cantilevered balcony projects over street...
- Two staircases serving two units per storey....
- A scavenging lane with two yards in the back.
- Composite use with ... cockloft ...
- Similar blocks are built next to the building without building gaps.
- Medium-rise of normally seven to 14 storeys.
- Light-well and lift may be present.

Typical Ground Floor Plan for Domestic Buildings built from 1946 to 1967
1968 – Pre-1980

Typical special features:
• All features except the canopy were built within the lot boundary...
• The podium normally covered the whole lot and the domestic blocks covered a certain portion of the lot.
• Two or more staircases ... The two staircases were scissors-type, enclosed, and led to the street or to the podium. They were connected via common areas ...
• Towers (blocks) were built on top of a podium with building gaps.
• Composite use on the podium floors usually consisted of shops of no more than 15m in height ...
• High-rise of normally 15-30 storeys.
• Lifts and an enclosed lift lobby were usually found in the common areas and a lift machine room was located on the roof top.
When will Volume 2 be ready?

comments are welcome.

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