

Professional Guide to Building Inspections

Volume 1: Pre-1980 Residential &
Composite Buildings in Hong Kong



Professional Guide to Building Inspections

Volume 1: Pre-1980 Residential &
Composite Buildings in Hong Kong

First Edition

2013

Building Surveying Division,
The Hong Kong Institute of Surveyors (BSD, HKIS)



Authors

This Guide is produced by the Building Surveying Division (BSD) of the Hong Kong Institute of Surveyors (HKIS). Team members include:

Academic Researchers

Sr Dr HO Chi-wing, Daniel	Project Director	Associate Professor, Department of Real Estate and Construction, The University of Hong Kong
Sr Dr YIU Chung-yim, Edward	Project Assistant	Researcher, REDBRIC

Task Force Members

Sr TSE Chi-kin, Kenny (Convenor)	Building Surveying Division (BSD), the Hong Kong Institute of Surveyors (HKIS)
Sr HO Kui-yip, Vincent	
Sr LAM Wai-keung, Andrew	
Sr LO Mei-tak, Rebecca	
Sr NG Ka-yue, Terry	
Sr SIN Kwok-leung, Alan	
Sr TANG Chi-wang	
Sr WONG Ka-chi, Louis	
Sr WONG Se-king, Peter	

© HKIS BSD 2013 Hong Kong.

Copyright in all or part of this publication rests with HKIS BSD.

No part of this guide may be reproduced or used in any form or by any means including graphic, electronic, or mechanical, including photocopying, recording, taping or web distribution, without the written permission of HKIS BSD.

Preface

The publication of this professional guide is a milestone for the development of the building surveying profession in Hong Kong. With our expertise in building inspections, this guide systematically presents the legal, procedural, design, and construction environment during the pre-1980s era in Hong Kong. The guide also explains the best practice, including the effective scheduling of building surveys and preparation of reports, for professional building surveyors. I trust that other building professionals will also find this guide useful when they inspect and report on existing buildings in Hong Kong.

While the main purpose of this guide is to provide professional guidance on surveying pre-1980 residential and composite buildings in Hong Kong, it can also serve as a reference for those who prepare inspection reports under Building (Inspection and Repair) Regulation 12(2)(a) and/or Land (Compulsory Sale for Redevelopment) Ordinance S.4(2)(a)(i).

This is the first volume of a series of guides on building inspections. Other volumes under preparation will cover the inspection of residential and composite buildings completed after 1980 and buildings for other uses. Another series that covers building inspections for laymen has also been included in our action list of planned maintenance, which was initiated by our past Chairman, Sr Edwin TANG.

I would like to thank my fellow surveyors who contributed their valuable time to and provided comments for the production of this guide, in addition to those who want to maintain a low profile and remain anonymous.

Sr Robin LEUNG

BSD Chairman, 2012-13

Acknowledgements

The research team thanks the following interviewees :

Interviewees (in alphabetical order by last name)

Sr CHAN Che-bun, Anderson (MHKIS)

Sr Dr CHAN Man-wai (FHKIS)

Sr CHAN Wah-wai, David (FHKIS)

Sr CHENG Po-ming, Danny (FHKIS)

Sr CHENG Wai-man, Raymond (FHKIS)

Sr CHOW Kon-man, Augustine (FHKIS)

Sr Prof CHUNG Hung-kwan, Barnabas (FHKIS)

Sr HO Kui-yip, Vincent (FHKIS)

Sr KUNG Sui-lun, Andrew (FHKIS)

Sr LEUNG Chi-hang, Joy (MHKIS)

Sr WONG Bay (FHKIS)

Sr WONG Kwok-chi, Raymond (MHKIS)

Sr WONG San, Samson (FHKIS)

Disclaimers

This Guide is issued to surveying professionals to help them conduct building inspections not only to implement the Mandatory Building Inspection Scheme (MBIS), but to also serve as a general guide for inspecting pre-1980 residential and composite buildings in Hong Kong. All the materials contained in this Guide are for reference only and are not intended as statements of statutory requirements or to be construed as professional advice or opinion. The guidelines provided in this Guide do not have either legal force or legal authority, nor do they claim to be fully comprehensive. While the Institute endeavours to ensure the accuracy and reliability of the contents of this Guide and the information provided therein, the Institute and the authors who prepared this Guide do not guarantee their accuracy and reliability and accept no liability (whether in tort, in contract, or otherwise) for any claim, loss, or damages of whatever nature arising from any inaccuracy in or omission from this Guide, or from the use of or reliance on the information contained in it. Users of this Guide should seek independent professional advice (including legal advice), if necessary.

HKIS BSD

Contents

Preface	2
Acknowledgements	3
Disclaimers	4
Contents	5
Glossary	7
1 Introduction	8
1.1 Background	8
1.2 Scope of the Guide	9
1.3 Scope of the Inspection	10
2 How to Use this Guide	13
2.1 Who Should Use the PGBI Guide?	13
2.2 Purposes of Building Inspection	13
2.3 Research Methods of the Guide	14
2.4 Organisation of the Guide	15
2.5 Preparations for the Inspection	16
2.6 Legal Status Check	16
2.7 Condition Survey - Compliance & Performance	17
2.8 Defect Inspections	19
3 Preparing for the Building Inspection	20
3.1 Desk Preparations	20
3.2 Preparation of the Inspection Method(s)	23
3.3 Preparation of the Equipment for the Inspection	23
3.4 Safety and Precautionary Measures for the Inspection	23
3.5 Security Measures during the Inspection	24
3.6 Preparation for the Erection of Scaffolding and Means of Access to carry out the Inspection	24
3.7 Preparation for any Necessary Insurance Policy, Protection, and Environmental Concern as a Result of the Inspection	25
3.8 Preparation for the Contractual Arrangement, Cost, and Liability Issues of the Inspection Works	25
3.9 Supervising and Monitoring the Inspection Process	26
3.10 Emergency Handling, Contingency Planning, and the Licence Application for the Temporary Occupation of Government Land or Other Owners' Land for Inspection Works and/or Material Storage	27

4	Checking for Legal Status	28
4.1	Authorisation Check on Building Design, Construction, and Occupation	28
4.2	Inspection of a UBW Against the Legislation in force at the Time the Building Was Built	29
4.3	Inspection of a UBW Against the Latest Legislation	30
4.4	Other Special Situations of UBWs	30
5	Checking for Conditions and Performance	32
5.1	External Elements	32
5.2	Structural Elements	33
5.3	Fire Safety Elements	43
5.4	Drainage System	50
6	Checking for Defects and Symptoms	53
6.1	External Finishes	53
6.2	Structural Elements	55
6.3	Fire Safety Elements	58
6.4	Drainage System	61
6.5	Factors to be Considered for Detailed Investigations	63
6.6	Professional Ethics and References to Government Reports	63
	References	64
	Appendixes	66
	Appendix 1 Building Inspection Equipment	66
	Appendix 2 Typical Floor Plans and Elevations of Different Vintage Buildings in Hong Kong	67
	Appendix 3.1 – S.128 of BO 1935	72
	Appendix 3.2 – S.9(1) of BO 1955	73
	Appendix 3.3 – S.16, S.22-s.25 of B(A)R 1956	74
	Appendix 3.4 – S.9(1) of BO 1959	76
	Appendix 3.5 – S.38-s.42 of BO 1935: Requirements of Roofs	77
	Appendix 3.6 – S.48-s.50 of BO 1935: Verandahs and Balconies Over Streets	78
	Appendix 3.7 – Schedule G of BO 1935 – Verandahs and Balconies Regulations	79
	Appendix 3.8 – S.54-s.62 of BO 1935: Kitchens, Fireplaces, and Chimneys	81
	Appendix 3.9 – S.182-s.190 of B(C)R 1975: Fire Resisting Construction	82

Glossary

Abbreviations used in the Guide shall have the following meanings:

Abbrev.	Represent
AP	Authorised Person
BA	Building Authority
BAT	Building Appeal Tribunal
BD	Buildings Department
BO	Buildings Ordinance
B(A)R	Building (Administration) Regulations
B(C)R	Building (Construction) Regulations
B(IR)R	Building (Inspection and Repair) Regulations
B(MW)R	Building (Minor Works) Regulations
B(P)R	Building (Planning) Regulations
BMO	Building Management Ordinance
BO(ANT)O	Buildings Ordinance (Application to the New Territories) Ordinance
FRC	Fire Resisting Construction
FRR	Fire Resistance Rating
FS(B)O	Fire Safety (Buildings) Ordinance
FS(CP)O	Fire Safety (Commercial Premises) Ordinance
FSP	Factor of Structural Performance
MBIS	Mandatory Building Inspection Scheme
MOA	Means of Access for Fire-fighting and Rescue
MOE	Means of Escape
MWIS	Mandatory Window Inspection Scheme
IO	Incorporated Owners
OP	Occupation Permit
PGBI	Professional Guide to Building Inspections
PNAP	Practice Note for Authorised Persons, Registered Structural Engineers, and Registered Geotechnical Engineers
RI	Registered Inspector
UBW(s)	Unauthorised Building Work(s)

1 Introduction

1.1 BACKGROUND

Building inspections are conducive and indispensable to the proper maintenance of a building. They require professional knowledge, diagnoses, and sound, professional judgment to carry out, especially on existing buildings. Unfortunately, there has been very little professional guidance on building inspections in Hong Kong.

With the introduction of the Mandatory Building Inspection Scheme (MBIS) by the enactment of the 2011 Buildings (Amendment) Ordinance in June 2011 and the subsidiary legislation including the Building (Inspection and Repair) Regulation¹ (B(IR)R) in December 2011, the MBIS has been in effect since 30 June 2012.

Owners of buildings aged 30 years or above (except domestic buildings not exceeding three storeys) are required to appoint a Registered Inspector (RI) to carry out the prescribed inspection of the common parts, external walls, and projections or signboards of the buildings upon receipt of a notice (once every ten years) served by the Building Authority under Part IIA of the Buildings Ordinance (BO).

A Code of Practice for the MBIS (MBIS CoP 2012) was published by the HKSAR Government's Buildings Department (BD) in 2012 (BD, 2012).² It is comprehensive and addresses in detail: (1) the duties of the RI, (2) inspection requirements, (3) detailed investigation procedures, (4) rectification and repair procedures, (5) supervision and control requirements, and (6) reporting procedures. It also provides six sample inspection forms for the six required elements. All in all, the MBIS CoP specifies the technical standards and procedural requirements for the RI to carry out building inspections, but it does not elaborate on inspection planning, professional judgment, defect diagnosis, and special construction methods and features commonly found in buildings.

The inspection of surviving buildings involves examinations or assessments with reference to the standards used at the time when the buildings were built. It becomes crucial to understand the legislation, designs, materials, codes of practice, and practice notes that prevailed when the buildings were built. Section 5 of the B(IR)R specifically spells out the requirements and is quoted below:

- (1) An examination or assessment mentioned in Section 3 must be carried out by reference to the standards specified in subsection (2) to:
 - (a) ascertain whether a building is safe or liable to become dangerous, or has been rendered dangerous;
 - (b) identify any defect or deficiency of a building; and
 - (c) make proposal for any prescribed repair.

- (2) The standards referred to in Subsection (1) are:

¹ http://www.legco.gov.hk/yr11-12/english/subleg/brief/146-149_brf.pdf

² http://www.bd.gov.hk/english/documents/code/CoP_MBIS_MWISe.pdf. A draft code was published in August 2011.

- (a) the standard of works as shown in any plan approved by the Building Authority in respect of the building, according to which the building was completed;
 - (b) the standard of works as shown in any plan in respect of the building submitted to the Building Authority under the Building (Minor Works) Regulation (Cap 123 sub. leg. N);
 - (c) the standard of improvement works completed in respect of the building in accordance with the Fire Safety (Commercial Premises) Ordinance (Cap 502) or the Fire Safety (Buildings) Ordinance (Cap 572); and
 - (d) the standard of building design and construction prevalent at the time of construction of the building.
- (3) If more than one standard specified in Subsection (2) is applicable to a building, reference is to be made to the latest of the applicable standards.

In other words, the MBIS CoP 2012 does not provide adequate professional guidance in conducting the prescribed inspections of the six elements mentioned above. This Professional Guide to Building Inspections (PGBI) provides professional guidance to members of the HKIS (BSD) in their inspections of existing (pre-1980) residential and composite buildings in Hong Kong.

1.2 SCOPE OF THE GUIDE

This PGBI offers professional guidance on **residential and composite buildings in Hong Kong built before 1980**, which are affected by the MBIS. Residential buildings exempted from the BO (s.40), including exempted houses in the New Territories governed by the Buildings Ordinance (Application to the New Territories) Ordinance, are not covered in this Guide. Listed buildings and heritage are also beyond the scope of this Guide.³

This PGBI covers the following:

1. Inspection planning and defect diagnosis – typical preparations and planning for building inspection and list of diagnostic techniques for defects commonly found in residential and composite buildings of their respective age groups
2. Special construction methods and features – regulations, codes of practice, construction techniques, layout and materials commonly found in buildings of their respective age groups

This PGBI does not intend to offer guidance on repair and rehabilitation works. Nor does it include guidance on the prescribed inspection of windows required by the Mandatory Window Inspection Scheme (MWIS).

³ For buildings listed by the Antiquities and Monuments Ordinance, users can refer to the BD's (2012) Practice Guidebook for Adaptive Re-use of and Alteration and Addition Works to Heritage Buildings 2012.

1.3 SCOPE OF THE INSPECTION

An inspection in this Guide refers to a visual inspection with or without simple equipment (a list of the general tools and equipment for a visual building inspection is provided in Appendix 1). Users of this PGBI are required to exercise their professional judgment on the necessity of detailed investigations and/or further detailed inspections with more advanced equipment and technologies.

The items to be inspected are categorised, according to HKIS (2010), into "A Guide to Prepare a Building Maintenance Manual," which sets out five systems of a building and 14 Works and Installations for Inspection. The five systems are: (A) structural, (B) enclosure, (C) environmental modification, (D) protection, and (E) utilities. The 14 Works and Installations under the hierarchy of the five systems are shown in Table 1.3.1.

Table 1.3.1 The 14 Works and Installations – Levels 1 and 2

A. Structural System:

- 1) Structural components or elements
- 2) Slope and earth-retaining structures

B. Enclosure System:

- 3) External wall finishes and/or claddings
- 4) Window, glazed cladding, or curtain wall systems or similar installations

C. Environmental Modification System:

- 5) Roofing materials and associated system components
- 6) Central mechanical heating, ventilation, and air-conditioning systems
- 7) Internal private roads, grounds, footbridges, and covered walkways

D. Protection System:

- 8) Fire resisting facilities and fire escape elements
- 9) Fire services installations and system equipment

E. Utilities System:

- 10) Plumbing and drainage systems, including underground and aboveground facilities
 - 11) Electrical installations embracing low and high voltage supplies
 - 12) Lift, escalator, and elevated platform installations
 - 13) Gas supply, including liquefied petroleum gas supply system
 - 14) Other major installations
-

The aforementioned 14 Works and Installations include the four prescribed building elements and an additional inspection of UBWs under the MBIS. They also cover the whole of the building – internal and external, common and private, aboveground and belowground.

To facilitate members when they carry out the MBIS, this Guide is divided into two volumes, with Volume 1 focusing on the 4+1 MBIS elements/UBWs and Volume 2 on the other works and installations.⁴

The MBIS specifies that the following three areas x (4+1) elements/UBWs of a building shall be mandatorily inspected (Table 1.3.2):

1. Three Areas:
 - a. Common parts defined by s.2 of the Building Management Ordinance (Cap. 344), except for the areas within individual private premises
 - b. External walls, whether or not the external walls are common parts
 - c. Projections, as prescribed in the Building (Inspection and Repair) Regulation and signboards erected on a building

2. Four Plus One Elements/UBWs:
 - a. External elements and other physical elements
 - b. Structural elements
 - c. Fire safety elements
 - d. Drainage system
 - e. Unauthorised building works (UBWs)

Table 1.3.2 The 3 x 5 Matrix of the MBIS-prescribed inspection of a building

Elements\Areas	a. Common Parts	b. External Walls	c. Projections & Signboards
a. External elements & other physical elements			
b. Structural elements			
c. Fire safety elements			
d. Drainage system			
e. UBWs			

⁴ Volume 2 will be published in the future.

The BD provides a list of examples of the building elements within the scope of prescribed inspection for the MBIS at: http://www.bd.gov.hk/english/services/doc/MBISMWIS_AnnexI_e.pdf. For ease of reference, they are summarised in Table 1.3.3.

Table 1.3.3 Examples of the MBIS-Prescribed Elements

Elements\Areas	Examples
a. External elements & other physical elements	External walls Fence walls Manually or electrically operated metal gates erected at fence walls or building entrances External finishes such as tiling, rendering, and cladding Fins, grilles, and metal louvres Protective barriers, railings, parapets, and balustrades along external walls or at the edge of roofs Curtain walls Skylights Appendages such as awnings, planters, eaves, mouldings, projections, architectural features, drying racks, signboards, window canopies, and similar features attached to external walls
b. Structural elements	Columns/ walls/ beams/ slabs Staircases Cantilevered projecting structures Transfer structures Screen walls and basement walls Hanging structures Exposed pile caps Other exposed structural elements
c. Fire safety elements	Means of escape Means of access for fire-fighting and rescue Fire resisting construction
d. Drainage system	Drainage system located along the external walls of the building Drainage system in the common parts Drainage system laid within common pipe ducts Underground and aboveground common drainage systems

2 How to Use this Guide

2.1 WHO SHOULD USE THE PGBI GUIDE?

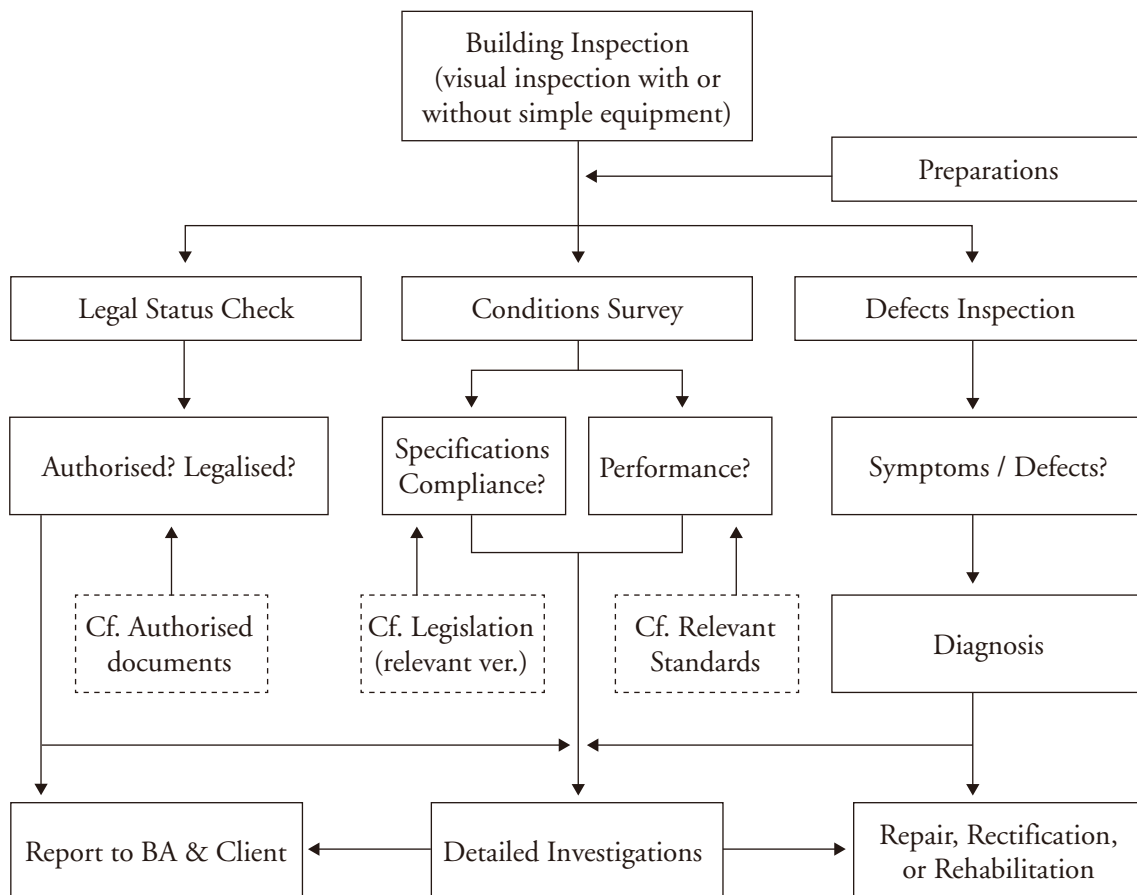
Users of this Guide are assumed to be HKIS (BSD) Members who are familiar with building technologies and facilities management, as well as with the contents of MBIS CoP 2012. Other users should seek a professional building surveyor for advice on how to correctly interpret this Guide.

2.2 PURPOSES OF BUILDING INSPECTION

The aim of a building inspection is to identify potential hazards that can jeopardise the health and safety of a building. Thus, there are three purposes of a building inspection (visual inspection with or without simple equipment, a list of the general tools and equipment for a visual building inspection is provided in Appendix 1), namely:

1. to check the legal status of the building and its works therein;
2. to check the conditions and performance of the building's elements and installations in order to formulate a detailed investigation or maintenance and management scheme for it; and
3. to 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 for it.

Figure 2.2 Relationships between the Three Purposes of Building Inspection



The MBIS CoP 2012 focuses on the inspection of building defects only without much emphasis on diagnosis, legal status checks, or condition and performance compliance. Members should note that it is a professional practice for a building surveyor to always confirm with a client the scope and purpose(s) of the inspection works before proceeding with the actual inspection.

Defects are often symptoms only, not the causes of building dilapidation. Focusing on defects without identifying their underlying causes often results in repairs-on-repairs. Thus, this PGBI puts more emphasis on finding the causes of a building's defects and assessing its performance. As performance-based design and approval has become more common nowadays, the evaluation of a building's performance vis-a-vis the specified performance requirements during its design or approval stage is crucial during the periodic inspections of it.

Compliance with the statutory requirements is certainly one of the main purposes of a building inspection, but whether the latest requirements or the then-prevailing requirements at the time the building was built shall be referred to is confusing. For example, Section 5(2)(d) of the Building (Inspection and Repair) Regulations specifically requires the inspection to be carried out "by reference to the standards of building design and construction prevalent at the time of construction of the building," but neither the regulations nor the MBIS CoP 2012 elaborates on the references to past regulations, codes of practice, practice notes, circular letters, etc.

Complications also exist when a building has undergone alteration and addition works throughout its life span. Compliance with either set of requirements may require professional expertise and judgment, although Section 5(3) of the Building (Inspection and Repair) Regulations specifies that "if more than one standard specified is applicable to a building, reference is to be made to the latest of the applicable standards." But how to determine the "applicable" standards requires more elaboration. This PGBI will provide some guidance on these issues.

2.3 RESEARCH METHODS OF THE GUIDE

This PGBI was compiled by generalising and consolidating data and views obtained from the following two methods:

1. Desk study: review legislative and technical data and records on the construction of residential and composite buildings built before the early 1980s. Review the common designs, tools and equipment, materials, approval procedures, site supervision, legislation, and court cases related to the conditions and repairs of residential and composite buildings.
2. Interviews: conduct interviews with experienced professionals regarding the typical problems found in building inspections, defect diagnoses, and remedial works for buildings from that era.

2.4 ORGANISATION OF THE GUIDE

The organisation of this PGBI follows the threefold purpose approach and is divided into six Chapters as follows:

1. Chapter 1 - Background
2. Chapter 2 - Introduction to the Use of this Guide
3. Chapter 3 - Preparations for a Building Inspection
4. Chapter 4 - Guidance on the Inspection of Authorisation
5. Chapter 5 - Guidance on the Inspection of Conditions and Performance
6. Chapter 6 - Guidance on the Inspection of Symptoms and Defects

This PGBI is also divided into two volumes. Volume 1 focuses on the prescribed 4+1 elements/UBWs of a building required by the MBIS, namely: 1. external elements and other physical elements; 2. structural elements; 3. fire safety elements; 4. drainage system; and 5. unauthorised building works (UBWs).

In Chapters 5 and 6, four sub-sections of professional guidance on each of the prescribed elements will be provided.

A Glossary of Abbreviations and an Acknowledgements section to interviewees and contributors to the production of this Guide are provided on the front pages. Three appendixes are at the back of this PGBI Guide, which provides: (1) a list of the general tools and equipment for a visual inspection, (2) excerpts of legislation, and (3) typical floor plans and elevations for different building vintages.

Table 2.4.1 Organisation of this Guide

Chapter	Descriptions
	Acknowledgements to interviewees and contributors
	Glossary of Abbreviations
1 Introduction	Provides backgrounds to and introduces the PGBI.
2 How to Use this Guide	Explains the framework of the PGBI.
3 Preparations for the Inspection	Guide to preparing for inspections
4 Legal Status Check	Guide to checking for the legal status of a building and building works, including UBWs
5 Conditions Survey	Volumes 1-4 elements: A. External Elements & Other Physical Elements B. Structural Elements
6 Defects Inspection	C. Fire Safety Elements D. Drainage System
References	Relevant documents reviewed and their links
Appendixes	1. List of General Tools and Equipment for Visual Inspection 2. Typical Floor Plans and Elevations for Buildings of different vintages 3. Legislative Extracts

2.5 PREPARATIONS FOR THE INSPECTION

The MBIS CoP 2012 provides a very brief pre-inspection preparation section (s.3.2 and Appendix II of the MBIS CoP 2012) that specifies the relevant documents to be retrieved before carrying out an inspection and a chapter on supervision and control (Chapter 5 of the MBIS CoP 2012) that covers rectifications and repair works.

However, no professional guidance is given for how to prepare to carry out inspections beyond the retrieval of documents. This Guide, therefore, intends to fill the gap by providing professional guidance on the preparations for inspection, such as arranging the inspection method(s) and data to be collected for diagnosis; readying and calibrating the equipment and tools; safety and security measures; the provision of scaffolding and means of access; insurance policies; contractual arrangement(s); supervision; emergency handling, etc. (Table 2.5.1).

Table 2.5.1 Preparations for the Inspection

No.	Descriptions of the Preparation Tasks
1	Desk Preparation of: a. drawings, documents, and references b. statutory & client's requirements c. ownership boundary of the inspection d. the scope and scale of the inspection
2	Preparation of inspection method(s) and data to be collected for diagnosis
3	Preparation and calibration of equipment and tools for the inspection
4	Safety and precautionary measures for the inspection
5	Security measures during the inspection
6	Preparation for the erection of scaffolding and means of access to carry out the inspection
7	Preparation for any necessary insurance policies, protection, and environment concerns due to the inspection
8	Preparation for the contractual arrangement(s), costs, and liability issues of the inspection works
9	Supervision and monitoring of the inspection process
10	Emergency handling, contingency planning, licence application, etc., for the temporary occupation of government land for inspection works and/or material storage

2.6 LEGAL STATUS CHECK

Table 2.6.1 shows the items concerning the legal status of the building and building works to be checked, including: (1) authorised/compliance items and any (2) unauthorised building works (UBWs) / contraventions.

Table 2.6.1 Items of the Authorisation Check

No.	Descriptions of the Authorisation Check
1	<p>Authorised / Compliance Items / Legal Status</p> <p>a. Design approval: approved building plans (s.14 BO)</p> <p>b. Occupation approval: occupation permit (s.21 BO)</p> <p>c. Any discrepancy in building use (s.25 BO)</p> <p>d. Any special exemption in the design and construction authorised by BA (s.42 BO)</p> <p>e. Any outstanding orders from BA (s.24, s.26, s.26A, s.28 BO)</p> <p>f. Any authority to erect shoring, if any (s.18 BO)</p> <p>g. Any approved previous inspection / investigation / repair</p> <p>h. Any authorised alteration or addition (s.14 BO)</p> <p>i. Any exempt alteration or addition (s.41 BO)</p> <p>j. Any validated / authorised minor works (B(MW)R)</p>
2	<p>Unauthorised Items / Contraventions</p> <p>k. Any non-exempt alteration or addition (UBW)</p>

2.7 CONDITION SURVEY - COMPLIANCE & PERFORMANCE

When a professional checks the specifications' compliance/performance against the statutory requirements/standards, the version of the legislation/standards he or she uses is of paramount importance, especially for the inspection of surviving buildings. Unfortunately, Section 5 of the Building (Inspection and Repair) Regulations is brief on this aspect, and no elaborations can be found elsewhere. It can result in professional negligence if an irrelevant set of legislation/standards is relied on to check for compliance.

In general, the governing legislation/prevaling standards at the time the building was built should be referenced to check the specifications' compliance with or performance of the design and construction of the building – unless the client specifies otherwise. However, there are laws/standards that are explicitly stated to be retroactively applied to existing (pre-1980) buildings built before the enactment of the legislation or publication of the standards.

Besides, some laws/standards may govern the use, maintenance, and management of a building and would generally be applied to surviving buildings as well. Members are reminded to be cautious when referencing the relevant legislation/standards for compliance checking.

Section 2.7.1 below further discusses the general categorisation of the completion periods of buildings in Hong Kong for compliance checking. Section 2.7.2 discusses the compliance checking against the latest requirements. Section 2.7.3 addresses the typical designs and construction methods of existing (pre-1980) residential and composite buildings in Hong Kong.

2.7.1 Inspection against the Statutory Requirements at the Time the Building was Built

There are several milestones in the development of the statutory control of building works in Hong Kong over the past century. The major and more recent legislative changes can be divided into the following three major periods along this timeline:

1. Pre-1946 (or pre-war)

Existing pre-war residential buildings were mainly built according to BO 1939, and most of their approved plans are now lost. They are generally low-rise (three-storeys) and their required specifications were more lenient than current ones. The building plans approval process was also very different from the one in use today, which creates difficulties in the identification of UBWs in these buildings.

2. 1946 (or post-war) to 1968

Residential and composite buildings built after 1945 and before 1955 were still governed by BO 1939 during this period and approved plans for them are generally available today. BO 1955 was then enacted to take into account the advancement of modern building technologies, in particular the structural use of steel and concrete. High-rise buildings were then developed and development intensity control was totally revamped from volume control to plot ratio, site coverage, and height limits. Subsidiary regulations were gradually enacted and implemented from 1955 to 1968. The typical building form, along with construction methods and building features, changed drastically from the pre-1946 era due to changes in development control legislation.

3. 1968 to pre-1980

Residential buildings built after 1968 and before 1980 (buildings that were over 30 years old in 2012) were generally high-rises with framed structures of reinforced concrete. Major codes of practice were released during this period, such as the CoPs on Means of Escape and Fire Resisting Construction. Amendments to the BO and its subsidiary regulations during this period also affected the required specifications of the buildings.

If a building was designed and approved by means of a performance-based approach, including a fire-engineering approach, the inspector must re-check and compare its current performance achievements to the approved or presumed performance requirements in the design/ approval regardless of its presence in or absence from the original design or A&A works. The availability and quality of the building's management specified in the fire engineering report must also be checked. While a failure of some of the performance requirements, such as the serviceability of structures, may not result in any observable defect in the building elements, Members ought to check and compare the elements' performance achievements.

2.7.2 Inspection against the Latest Required Specifications

Some of the enacted laws, such as the Fire Safety (Buildings) Ordinance, apply to existing (pre-1980) buildings retrospectively. Therefore, the inspection and assessment must check for compliance with the latest requirements rather than with the ones that were in place when the building was built. Furthermore, if large scale alterations and/or additions were made to the building, the latest statutory requirements may also apply to the building. Members are reminded to be careful when determining the benchmark sets of requirements for carrying out the prescribed inspections.

2.7.3 Special Construction Methods and Features of the Prescribed Existing (pre-1980) Buildings

Due to legislative changes and advancements in building technology, construction methods and building features have differed considerably during different time periods.

For example, cantilevered balconies over streets are common in residential and composite buildings built before 1968. The inspector's thorough understanding of the construction methods behind such features and their risk of failure, etc., are a prerequisite for the inspection of these special features.

2.8 DEFECT INSPECTIONS

The MBIS CoP 2012 addresses in detail the inspection of building defects. Members may refer to the CoP for their MBIS inspections.

Defects are sometimes symptoms rather than the causes of a building's problems. Members are reminded NOT to jump from identifying defects to formulating repair/remedial measures before carrying out a defect diagnosis to identify the cause(s) behind each defect. The same type of defect can be a result of different causes. The diagnostic process is a scientific approach to identify the real causes of a defect and the remedial measures can do more harm than good if the real causes for the defect are not found.

Sometimes a building inspection alone (a visual inspection with simple equipment, see Appendix 1) cannot ascertain the extent, seriousness, and cause of a defect. Members are required to exercise professional judgment when deciding on whether or not to conduct a detailed investigation and which investigative approach is required and appropriate.

Lists of the factors to be considered when diagnosing various common building defects are provided in Chapter 6 of this Guide, but they are not exhaustive and applicable to every type of building. Members are reminded to exercise due diligence and care when making their decisions.

3 Preparing for the Building Inspection

The success of a building inspection very much depends on how well the preparation tasks for it are carried out. The following are the TEN recommended preparation tasks for Members' reference, but they are not exhaustive and do not perfectly fit all inspection situations. Members are reminded to plan and prepare in advance before carrying out any inspection.

The TEN preparation tasks are: (1) desk preparation of documents and scope, etc.; (2) preparation of inspection method(s); (3) preparation of equipment; (4) preparation of precautionary measures; (5) preparation of security measures; (6) preparation of access measures; (7) preparation of protective measures; (8) preparation of a contract; (9) preparation for supervision; and (10) preparation for contingencies.

3.1 DESK PREPARATIONS

Apart from the following, Members may also refer to the established checklists when preparing to conduct a survey in other countries.

3.1.1 *Preparing to Meet the Statutory & Client's Requirements*

1. Members are reminded to discuss with their clients the detailed requirements for the inspection, preferably in the form of a written client brief, and explain clearly to their clients the statutory requirements for the inspection, if any, before carrying out an inspection.
2. Members shall hold open and frank discussion(s) with their clients on the previous works carried out in the subject building, including all maintenance and repairs works and A&A works regardless if they were authorised or not.
3. A standard pamphlet, general guidelines, and the code of practice explaining the statutory requirements of the MBIS are available at:
<http://www.bd.gov.hk/english/documents/pamphlet/MBIS.pdf>,
<http://www.bd.gov.hk/english/documents/guideline/GGMBISMWIS.pdf>,
http://www.bd.gov.hk/english/documents/code/CoP_MBIS_MWISe.pdf.
4. Members should remember the differences between the statutory requirements and the contractual requirements of clients. Members may seek legal advice on the implications of these differences.
5. Members must prepare an agreement citing the client's requirements for the building's inspection and other terms and conditions. There are some well-prepared templates for drafting the Client's Authorisation and Agreement of Building Inspection available for Members' reference.
6. Old regulations, codes of practice, and practice notes related to the inspection of surviving buildings in Hong Kong are not readily available to the general public at the moment. Members may seek help from the BD in case they have difficulty retrieving them.

3.1.2 *Preparing for the Ownership Boundary of the Inspection*

1. It is of utmost importance to identify the correct address of the subject building to be inspected, the defined boundary of the inspection, and the ownership of the subject building.
2. In general, an inspection of a building can only be carried out under the instruction of its owner (or all of the co-owners), or under the instruction of the BA authorised by the BO.
3. Members must remember to carefully check the boundaries of the areas to be inspected and shall not trespass into any unauthorised areas. For example, if the IO is the client, the inspection is generally limited to the common parts of the building. Members shall refer to the documents listed in Paragraphs 3.1.2 and 3.1.3 to verify the ownership and boundaries of the common parts of the building, including the building's Deeds of Mutual Covenant (DMC) and Schedule 1 (Common Parts) of the Building Management Ordinance, Cap. 344. In case of any confusion over the boundary of the site, Members must seek legal and professional advice, in case of doubt.
4. Members should also check the DMC and the relevant practice notes on it issued by the Lands Department to verify the demarcation of the common parts and the rights and responsibilities of co-owners. Members should also remember that there can be discrepancies among the approved building plans, the layout plans in the DMC, and the assignment plans.
5. Members shall check the address and ownership of the building by employing a land search with the Integrated Registration Information System (IRIS) of the Land Registry, HKSAR Government: <https://www1.iris.gov.hk/eservices/>.
6. Members shall check the boundaries of the building by referring to the Lot Index Plan in relation to the land lease or conditions of sale.
7. Members shall check the ownership and boundaries of the slopes, if any, on-site by consulting the Lands Department's Slope Maintenance Responsibility Information System (SMRIS): <http://www.slope.landsd.gov.hk/smr/smr/index.html>. They should also consult the Slope Information System kept by the Geotechnical Engineering Office (GEO), HKSAR Government.

3.1.3 *Preparing the Drawings, Documents, and References*

Members shall retrieve, among others, the following documents of the building from the Building Department's Building Records Access and Viewing On-line (BRAVO) System: <https://bravo.bd.gov.hk/wrbr/welcome.jsp> (or in person at the BD):

1. Approved General Building Plans (to check the approved building design and layout) - Members should note that there were Approved Plans but no Record Plans for buildings built before the mid-1980s.
2. Structural Calculations (to check the approved structural design and calculations)
3. Approved Drainage Plans (to check the approved drainage design)
4. Approved A&A Works Plans (to check the approved A&A design)
5. Completion Records of A&A Works / Minor Works (to check the authorised design changes)
6. Completion Records of Fire Safety Provisions/Improvement Works (to check the fire resisting construction provisions and improvements)
7. Occupation Permit (to check the completion of works, authorised uses, etc.)
8. Completion Certificate and Acknowledgement Letter for the Completion of Remedial Works on the Building (Building Safety Inspection Scheme)
9. Acknowledgement Letter for Material Change in the use of any part of the building, if any.

3.1.4 *Preparing for the Scope and Scale of the Inspection*

1. Members shall explain clearly to their clients the scope and scale of the inspection, preferably in both verbal and written forms.
2. Members MUST clearly explain to their clients, preferably in both verbal and written forms, that a building inspection does NOT include repairs and remedial or rectification works. The client is NOT bound to employ the building professional who engages in the inspection for the repair, remedial, or rectification works as well, unless otherwise agreed.
3. Members shall state clearly the following in relation to the scope and scale of the inspection:
 - a. Purpose of the inspection (to identify defects, comply with regulations, assess conditions, check on UBWs, etc.)
 - b. Areas, boundary, and scope of the inspection
 - c. Age of the building (commencement date, sectional completion dates, completion date, etc.)
 - d. Duration of the inspection
 - e. Type of inspection (visual or detailed) and the use of equipment and laboratory tests
 - f. Inspection standards (statement of the policy on building inspection, standard form of contract, etc.)
 - g. Auxiliary tasks (precautionary measures, protection, security, etc.)
 - h. Deliverables (inspection report, photos, video clips, samples, data analyses report, diagnosis report, remedial proposals, etc.)
 - i. Follow-up actions (report of UBWs to the BA, make-good on defects, site clearance, etc.)
 - j. Limitations (inaccessibility, hidden defects, elements and installations excluded, etc.)
4. Members shall refer to the HKIS's (2008a) Reference Conditions for Appointing Consultants (Building Maintenance)
http://202.65.206.164/hkis/html_bsd/upload/HomeHeadline/hhlnk59_0.pdf.
5. Members may refer to the HKIS's (2008b) Guide to Take-over Domestic Unit for Prospective Homebuyer and HKIS (2013b) Guide to Prospective Homebuyers Care on Purchase, Take Over & Fit-out:
<http://www.hkis.org.hk/ufiles/BSDFlat-InspectE.pdf>,
http://www.hkis.org.hk/ufiles/HKIS-FlatGuide_en.pdf
6. Members may also refer to the Australian Standards of Building Inspection, AS 4349.0-2007, Inspection of buildings – General requirements, which provides information on what should be included in inspection agreements and building inspection reports.
7. Members must prepare a policy statement for building inspections that detail the scope and scale of the building inspection and other caveats and limitations, etc. There are some well-prepared templates for drafting a Statement of Policy for Standard Building Inspections available for Members' reference.
8. Members must refer to the building maintenance manual for design, construction, and maintenance information before conducting their inspections. If no such manual is available, Members shall refer to the HKIS's (2010) Guide to Prepare a Building Maintenance Manual.

3.2 PREPARATION OF THE INSPECTION METHOD(S)

1. Formulate the most appropriate inspection method(s) for the task.
2. Plan for the required data to be collected for diagnosis.
3. Prepare the sampling method for the inspection, if required.
4. Verify the existing on-site layouts and designs against the approved plans, and seek the relevant authority and clients' responses concerning any discrepancy or uncertainty before formulating the inspection methods.
5. Do NOT rely solely on standard templates, checklists, and general guidance, as the situations and designs in each apparently similar case can be unique. Remember to double-check and exercise professional judgment when making decisions.

3.3 PREPARATION OF THE EQUIPMENT FOR THE INSPECTION

1. Plan and prepare the equipment and tools that will be used in the inspection.
2. Calibrate the equipment and tools to be used and refer to the ISO 9000 requirements, if necessary.
3. Arrange for independent laboratory test services if laboratory and/or on-site tests are required during the inspection.
4. Consider wearing protective clothing, such as safety shoes, safety helmets, and safety clothing, to conduct an inspection.
5. Appendix 1 lists the general tools and equipment required for a typical visual building inspection. Other standard lists of common equipment and tools required for a visual inspection are also available in Noy (2005) and Glover (2009).

3.4 SAFETY AND PRECAUTIONARY MEASURES FOR THE INSPECTION

1. Prepare site safety and precautionary measures for the inspection.
2. Carry out a risk assessment, risk measurements, and risk controls before embarking on a building inspection. Refer to Noy (2005) for guidance on risk assessment.
3. Refer to the Occupational Safety and Health Ordinance (Cap. 509).
4. Refer to the Code of Practice for Health and Safety at Work (Land-based Construction), published by the Labour Department, HKSAR Government:
<http://www.labour.gov.hk/eng/public/os/B/fall.pdf>.
5. If asbestos is present in the building, refer to the Labour Department's Code of Practice: Safety and Health at Work with Asbestos :
<http://www.labour.gov.hk/eng/public/os/B/asbestos.pdf>.
6. In case of any other situation that may impose high risk to the inspector, such as fire when a door is open, electrical shock when the wall is drilled, or inhaling toxic gas when entering enclosed spaces, Members are advised to conduct safety tests to determine the possible presence of these dangers before carrying out their inspections.
7. When appropriate, seek advice from Registered Safety Officers.

8. If necessary, refer to the Code of Practice for Site Supervision and the Technical Memorandum for Supervision Plans (even in the absence of a building inspection section) published by the BD: http://www.bd.gov.hk/english/documents/code/SS2009_e.pdf and http://www.bd.gov.hk/english/documents/code/TMSS2009_e.pdf.
9. The level of supervision should crosscheck with s.6 of the Code of Practice for the MBIS at: http://www.bd.gov.hk/english/documents/code/CoP_MBIS_MWISe.pdf.
10. Remember potential dangers that could appear during the inspection. Some examples are:
 - a. the existence of termites within timber components, which may be susceptible to collapse;
 - b. the existence of animals or insects within building components, which may attack inspectors when they examine these components.
 - c. the existence of asbestos, toxic liquid/gas, and radioactivity, which can cause serious health damage;
 - d. the existence of water ponding or water-containing elements or features, which can cause electric shock or drowning;
 - e. weak or overloaded parts that may suddenly disintegrate when the additional loads of the inspector and his or her equipment are added;
 - f. unstable parts, such as ceilings, overhanging objects, loose luminaires, signboards, railings, and balustrades, which can collapse when touched; and
 - g. potential dangers such as the inspector falling from heights; the lack of railings on the roof/canopy/flat roof; the lack of safety measures on cat ladders; sharp angles or corners; slippery surfaces; tough access to certain areas, which could result in injury; etc.

3.5 SECURITY MEASURES DURING THE INSPECTION

1. Inspectors should be granted access to a building at the time of its inspection. They should organise effective security access measures to control personnel access.
2. The inspection of external elements normally involves the use of scaffolding or gondolas for a period of time. Plan for security measures to protect the building against burglars and trespassers.
3. Seek advice from security experts.

3.6 PREPARATION FOR THE ERECTION OF SCAFFOLDING AND MEANS OF ACCESS TO CARRY OUT THE INSPECTION

1. If bamboo scaffolding is involved, refer to the Labour Department's Guidelines on the Design and Construction of Bamboo Scaffolds published by the BD (<http://www.bd.gov.hk/english/documents/code/GDCBS.pdf>) and the Code of Practice of Bamboo Scaffolding Safety: <http://www.labour.gov.hk/eng/public/os/B/Bamboo.pdf>.

2. If metal scaffolding is involved, refer to the Labour Department's Code of Practice of Metal Scaffolding Safety: <http://www.labour.gov.hk/eng/public/os/B/mss.pdf>.
3. If a gondola or suspended working platform is used for the inspection, check the validity and coverage of the insurance policy for the operation of either device and refer to the Labour Department's Code of Practice for Safe Use and Operation of Suspended Working Platforms: <http://www.labour.gov.hk/eng/public/os/B/platform.pdf>.
4. Clearly mark down in the inspection report the date and time you tried to access areas that turned out to be inaccessible.

3.7 PREPARATION FOR ANY NECESSARY INSURANCE POLICY, PROTECTION, AND ENVIRONMENTAL CONCERN AS A RESULT OF THE INSPECTION

1. If the common parts of the building are included in the inspection, remember to check they are covered by third party insurance, which is required under the Building Management (Third Party Risks Insurance) Regulations, and if the insurance terms apply to the case in question. The minimum insured amount of each policy shall be \$10 million per event.
2. Consider purchasing professional indemnity insurance for the inspection.
3. Check the coverage of the professional indemnity insurance for the inspection, such as the inclusion of consequential loss (or lack thereof) and what it does not cover.
4. Plan in advance the measures to protect inspectors, occupants, the general public, the property, adjoining properties, equipment and tools, and the environment.

3.8 PREPARATION FOR THE CONTRACTUAL ARRANGEMENT, COST, AND LIABILITY ISSUES OF THE INSPECTION WORKS

1. Refer to the HKIS for advice on how to engage building professionals for building maintenance:
http://202.65.206.164/hkis/html_bsd/upload/HomeHeadline/hhlnk59_0.pdf.
2. Refer to the HKIS's proposed fee scale for building inspections.
3. Refer to the DMC of the building for the rights and liabilities of co-owners.
4. Refer to the Code of Practice on the Procurement of Supplies, Goods and Services and Building Management & Maintenance, published by the Home Affairs Department for procurement and maintenance issues:
http://www.buildingmgt.gov.hk/file_manager/en/documents/code_of_practice/codes_of_practice_en.pdf.
5. Consult the ICAC's (2010) Building Maintenance Toolkit to reduce your chances of engaging in corruption (even unwittingly) when procuring building inspection services:
[http://www.bm.icac.hk/bm_wcms/UserFiles/File/tc/CMS/education_publicity/BM_Toolkit\(Mar10\).pdf](http://www.bm.icac.hk/bm_wcms/UserFiles/File/tc/CMS/education_publicity/BM_Toolkit(Mar10).pdf).

6. Also consult the ICAC's Preventive Measures on Appointing Consultants for Building Maintenance:
http://www.bm.icac.hk/bm_wcms/UserFiles/File/en/CMS/Preventive_Measures/appointing_consultants/Preventive_Measures_BM.pdf.
7. A sample form of the ICAC's Declaration of Conflict of Interest is available at:
http://www.bm.icac.hk/bm_wcms/UserFiles/File/en/CMS/sample_documents/5_Sample_Form_for_Declaration_of_Conflict_of_Interest.pdf.
8. Sample Ethical Commitment Clauses for Inclusion in the Consultancy Agreements on building maintenance works are provided by the ICAC at:
http://www.bm.icac.hk/bm_wcms/UserFiles/File/en/CMS/sample_documents/2i_Ethical_Commitment_Clauses_for_Inclusion_in_the_Consultancy_Agreements.pdf.
9. A full list of sample documents for building maintenance provided by the ICAC is available at: http://www.bm.icac.hk/en/sample_documents/sample_documents.aspx.
10. Refer to HKIS (2008c) Standard Form of Contract for Decoration, Repair and Maintenance Works (\$20/set): http://www.hkis.org.hk/en/publication_sales.php.
11. Consult HKIS (2009) General Specification for Building Maintenance Works in Residential Buildings: <http://www.hkis.org.hk/ufiles/BSD-GSMainFull.pdf>.
12. Read the HKIS's "Rules of Conduct for Members" to learn about professional ethics requirements when carrying out inspection tasks:
http://www.hkis.org.hk/en/pdf/rule_of_conduct.pdf.
13. Check out a typical Statement of Policy of Standard Building Inspection provided by reliable authorities.
14. Refer to a typical Standard Form of Building Inspection Authorisation and Agreement provided by reliable authorities.
15. Seek legal advice on the consequences of professional negligence during inspections and any legal liability on your part under the Buildings Ordinance for failing to identify a UBW.

3.9 SUPERVISING AND MONITORING THE INSPECTION PROCESS

1. Consult the Code of Practice for Site Supervision and the Technical Memorandum for Supervision Plans (regardless of the absence of a building inspection section) published by the BD: http://www.bd.gov.hk/english/documents/code/SS2009_e.pdf and http://www.bd.gov.hk/english/documents/code/TMSS2009_e.pdf. The level of supervision shall crosscheck with s.6 of the Code of Practice for the MBIS at: http://www.bd.gov.hk/english/documents/code/CoP_MBIS_MWISe.pdf.
2. In case you need to appoint a subordinate or assistant for the inspection, remember to look after their safety by providing them with the necessary equipment, safety measures, protections, and relevant training and briefings before commencing the inspection.

3.10 EMERGENCY HANDLING, CONTINGENCY PLANNING, AND THE LICENCE APPLICATION FOR THE TEMPORARY OCCUPATION OF GOVERNMENT LAND OR OTHER OWNERS' LAND FOR INSPECTION WORKS AND/OR MATERIAL STORAGE

1. The inspection may involve a temporary occupation of government land, such as the erection of scaffolding, propping, or gondolas on public pavements, and/or the temporary storage of inspection materials, equipment, and tools.
2. Refer to the LAO Practice Note No.2/2009 published by the Lands Department for short term tenancy application for the temporary occupation of government land to facilitate building maintenance: <http://www.landsd.gov.hk/en/images/doc/2009-2.pdf>.
3. 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.
4. 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.
5. 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.
6. Develop a contingency plan in case something goes wrong during the inspection.
7. Prepare an emergency plan, including:
 - a. Obtaining the emergency contacts of owners, IO representatives, inspectors, laboratories, government departments, contractors for emergency handling, etc.
 - b. Emergency escape routes
 - c. Plans for specific incidents that occur during the inspection, such as asbestos exposure, flooding, blockage, installation breakdowns, serious structural damage, and fire.

4 Checking for Legal Status

1. One of the main purposes of a building inspection is to check its legal status - i.e., whether the building and the works therein comply with the relevant legislation.
2. The legal status check is divided into FOUR main sections, namely: (1) an authorisation check on the building's design, construction, and occupation, which refers to the document check on the authorised items, such as an occupation permit, previous inspections and repair works, etc.; (2) UBWs against the legislation when the building was built; (3) UBWs against the latest legislation; and (4) the special situations of UBWs. The information provided in this Guide is for Members' reference only and is not exhaustive or applicable to every inspection situation. Members must seek further information and advice when necessary.
3. The legal status check is not an inspection of physical defects, but on a building's legality. Unauthorised items may not immediately and directly result in physical defects, but can be latent defects that could surface later, as the design, materials, specifications, and workmanship of the unauthorised items are mostly unknown.
4. The purpose of the legal status check during a building inspection is not enforcement, as enforcement authority is vested in the BA. Members must inform the client and the BA of their findings and if further investigations or actions are necessary.
5. Members should understand that deviations from approved plans do not necessarily mean contraventions. They must consider all the factors, including any necessary check, test, and assessment of the conditions and their effects on safety, hygiene, and the environment. Members may have to refer to the then-prevailing standards and requirements during their inspections. In case of uncertainty, consult with the BA beforehand.

4.1 AUTHORISATION CHECK ON BUILDING DESIGN, CONSTRUCTION, AND OCCUPATION

4.1.1 Authorised Items

1. The authorisation of a building's design is shown in its approved building plans (s.14 BO).
2. The authorisation for occupation is shown in the occupation permit (s.21 BO).
3. The authorisation for the use of the building is shown in the occupation permit (s.25 BO).
4. The authorisation of any special exemption from the design and construction of a building can be referenced in s.42 BO.
5. The authorisation of erecting shoring, if any, can be referenced in s.18 BO.
6. The authorisation and acceptance of any previous inspection / investigation / repair can be referenced in s.26 and s.26A of the BO.
7. The authorisation of alterations and additions is shown in the approved alterations and additions plans (s.14 BO).
8. Exempt alterations and additions are considered authorised if they fulfill the exemption criteria (s.41 BO).
9. The authorisation of minor works and validated items can be referenced in the B(MW)R. Members should remember that minor works and A&A works are now mutually exclusive categories and determined by the BA.

4.1.2 Unauthorised / Contravention Items

1. Any outstanding investigation, repair, and demolition of and drainage orders for a building is shown in the land registry (s.24, s.26, s.26A, and s.28 BO)
2. Unauthorised Building Works (UBWs)
 - a. Remember to refer to Section 3.7, Unauthorised Building Works of the MBIS CoP 2012, especially for: (1) the inspection methods; (2) the common defects; and (3) the roles of the RI.
 - b. Note that the authority to ascertain and rectify UBWs is vested in the BA. The RI can only report any suspected UBW to the authority and the client.
 - c. Identifying a UBW is not always straightforward. It is common practice to compare the existing building components with those shown in the approved building plans and assume that any component absent or different from that in the approved building plans is a UBW. For more information, refer to s.14 of the BO.
 - d. However, there are some subtleties you should note:
 - Is s.14 of the BO or its earlier equivalents applicable to the subject building? (See s.4.2.1.)
 - Are they exempted works / designated works / minor works / validated works? (See s.4.3.1.)
 - Are the approved building plans available? (See s.4.4.1.)
 - e. Remember that a questionable structure's non-compliance with the BO or its subsidiary regulations does not necessarily render it a UBW because the non-compliance might have already been noted in the approved building plans. Although the latest B(MW)R Sch. 1 defines "unauthorised" as any building work that contravenes any provision of the BO, current practices and the decision in the Nelson v. Victory Mark case make enforcement of this definition far from absolute. In cases where there is non-compliance, but not UBWs, for which the RI is obligated to report the potential hazard of its continued existence, you should report this separately in the inspection report.

4.2 INSPECTION OF A UBW AGAINST THE LEGISLATION IN FORCE AT THE TIME THE BUILDING WAS BUILT

4.2.1 Applicability of s.14 of the BO or its Earlier Equivalents

1. Pre-1946 buildings
 - a. Since almost all approved building plans for pre-1946 buildings are lost, there is no reference for identifying UBWs in them.
 - b. Yet, hazardous incompliances may still be found and they should be reported separately.
2. 1946 - 1955 buildings
 - a. Approved building plans are normally available, but the applicable BO is BO 1935.
 - b. S.6(1) of BO 1935 is more or less equivalent to the current s.14 of the BO, which requires a BA approval of building plans. However, the last sentence of s.128(3) of BO 1935, "In the case of minor alterations or repairs the Building Authority may dispense with the submission of plans by an authorised architect," was considered (in Lo Yin Ming v. BAT and BA) exempt from the submission of amended building plans for minor alterations or repairs (see excerpts of s.128(1-3) of BO 1935 in Appendix 3.1).

3. 1956 - 1959 buildings
 - a. S.9(1) of BO 1955 applies (see excerpts of s.9(1) in BO 1955 in Appendix 3.2).
 - b. S.16, s.22 - s.25 of the 1956 B(A)R also spells out the requirements for the submission and approval of building plans (see excerpts of s.16 and s.22-s.25 of the 1956 B(A)R in Appendix 3.3).

4. Post-1959 buildings
 - a. S.9(1)(b) was added and requires the BA's consent in prescribed form to commence the building or street works shown in the approved plan (see excerpts of s.9 of BO 1959 in Appendix 3.4).
 - b. The changes made to s.9 between the 1955 and 1959 versions of the BO implied that the consent requirement for the commencement of building works was different before and after 1959. After 1959, consent is required for the building works shown in the approved plan.

4.3 INSPECTION OF A UBW AGAINST THE LATEST LEGISLATION

4.3.1 General Inspection of a UBW

1. In s.40 of the BO concerning exemptions, for example, government buildings and buildings built on government land are exempt from the governance of the BO. Small houses in the New Territories built under the Small House Policy are also exempt, but are governed by the B(ANT)O.
2. In s.41 of the BO for exempted works, there are six criteria for a building to gain exemption, namely: (a) are the works in question building works; (b) are the works in question carried out in(side) the building; (c) are the works in question carried out in a building or not; (d) do the works in question involve the structure of a building; (e) do the works in question contravene any other regulations; and (f) are the works governed by s.41(3) BO? The following issues are also related to exempted works, which users should refer to:
 - a. S.2 of the BO for building works classifications.
 - b. B(MW)R for minor and designated works.
 - c. S.39C of the BO for validated works.

4.4 OTHER SPECIAL SITUATIONS OF UBWs

4.4.1 Approved Building Plans not Available

1. Almost all the approved building plans for pre-1946 buildings are lost.
2. The approved building plans for some post-1946 buildings may have also been lost.
3. If the approved building plans of other similar units of the same building or development are referred, then the caveats should be clearly stated in the report.
4. Check the Fairview Park cases for more information.

5. Remember the complications of checking for UBWs in buildings located in the New Territories, which were built before the Buildings Ordinance (Application to the New Territories) Ordinance (BO(ANT)O) took effect and may not be governed by the BO. After the BO(ANT)O commenced, some buildings in the New Territories may be exempted from the BO under certain conditions. Remember to seek professional and expert opinion on this issue.

4.4.2 UBWs Authorised by the Courts

Some UBW cases might have been allowed by the Building Appeal Tribunal (BAT) or the courts and should be noted with evidence in the report, if they are relevant.

4.4.3 UBWs Tolerated by Amnesty Letter

1. The District Office of the New Territories issued an amnesty letter to tolerate rooftop UBWs in high-rise buildings in the New Territories built before 27 February 1975.
2. The amnesty letter was accepted by the courts in at least two cases, BA v. BAT and Siu Kwok Wah and HKSAR v. Chan Sun Cheung.
3. Note that the BA contended in the cases that public safety must override the tolerance granted by the amnesty letter.

4.4.4 Enclosing Balcony over Street before 1992

1. S.11(b) of the 1956 B(P)R explicitly allowed for the following five ways to enclose the two sides of any balcony over a street, and the 1984 version also allowed balconies to be enclosed on both the front and sides. The latter section was repealed in 1992.
"s.11. Where any balcony is erected over a street -
...
(b) the [front and] sides of any such balcony may be enclosed by -
(i) glazed windows of metal or hardwood;
(ii) glass blocks;
(iii) bricks or building-blocks;
(iv) concrete; or
(v) such other materials as may be approved by the Building Authority."
2. As a balcony is allowed statutorily, the approved building plans may not show that one over a street is enclosed. The RI must use his or her professional judgment to determine if the enclosure is a UBW, as the exact date the balcony was enclosed/alterd is hard to determine.

4.4.5 Details not Shown on Plans

Some UBWs may not be easily identified by merely comparing the existing structures and components to the approved plans, as the plans may not have all the details. For example, railings might have been replaced without the BA's formal approval. Members must remember to check whether the components are originals or replacements. Another example is that the floor slabs of flat roofs are sometimes substantially thickened without prior approval from the BA, resulting in increased dead load on the structure. Members must always exercise professional judgment when carrying out their inspections.

5 Checking for Conditions and Performance

1. It is hard to ascertain the properties (such as fire-resistance) of building materials or the performance of building components (such as compressive strength) in a surviving building by visual inspection only. Members are reminded to clearly spell out in their inspection reports any assumption of the properties of a building material or the performance of a building component.
2. The baseline for the condition and performance inspection is the statutory requirements in effect at the time the building was built, unless otherwise specified.
3. Before BO 1955 was enacted, the previous one was BO 1935, which was implemented on 1st January 1936 and later amended seven times. BO 1935 was suspended during the Second World War. The number of amendments and their respective year of enactment are as follows:
 - a. 18 in 1935
 - b. 50 in 1935
 - c. 19 in 1936
 - d. 58 in 1936
 - e. 27 in 1940
 - f. 12 in 1941
 - g. 29 in 1949
 - h. 37 in 1950
4. The following discussions are mainly based on the final version (BO 1950).

5.1 EXTERNAL ELEMENTS

You may refer to Section 3.3, External Elements and Other Physical Elements, of the MBIS CoP 2012, especially on: (1) the inspection methods; (2) the common defects; and (3) the roles of the RI.

5.1.1 *Inspection against the Required Specifications at the Time the Building Was Built*

There are no specific requirements for the external finishes in the BO, but the external finishes can be hazardous to public safety in case the lamination fails. Thus, the RI shall refer to s.3.3 for defects diagnosis.

1. S.5-s.19 of BO 1935 addressed the construction of walls (this was similar to Part VIII of the current B(C)R):
 - a. S.11(2) required "Every external or enclosure wall which abuts against the earth shall be protected by a vertical damp-proof course..." (see also Regulation 41 in the B(C)R)).
2. S.20-s.22 of BO 1935 addressed the concreting of ground surfaces. Impermeable floors were required to be provided and made good.

5.1.2 *Inspection against the Latest Required Specifications*

Refer to the latest practice note on the requirements for external finishes, such as ADV-31 (PNAP 303) titled "Building External Finishes - Wet-fixed Tiles", available at <http://www.bd.gov.hk/english/documents/pnap/ADV/ADV031.pdf>.

5.1.3 *Inspection against the Performance Requirements*

There are at least two performance requirements for external finishes, namely providing: (1) a protective function to the receiving elements (such as external walls) and (2) adhesive strength to the receiving elements.

The following five symptoms are, thus, regarded as common defects of external finishes in the MBIS CoP 2012: (1) loose or missing tiles and rendering; (2) cracks; (3) bulging, bowing, separation, delamination; (4) corrosion of metallic parts embedded in external finishes; and (5) spalling. The existence of these symptoms either reflects a loss of the adhesive strength of the finishes or a loss of the protective function of the receiving elements.

The general performance requirement for tile adhesive strength to be 0.5 MPa, as indicated by a pull-out test, is still not a statutory requirement today, not to mention 30 years ago.

5.1.4 *Special Construction Methods and Features*

1. Rendering and painting were the most common external finishes before the 1960s. Since that time, mosaic and ceramic tiles have become more popular.
2. Cement mortar was more commonly applied to adhere tiles to external walls before the 1980s. Tile adhesive was not common until the 1990s. Members are reminded of the common practice of thickened mortar bedding in applying external wall tiles to surviving buildings, which can affect the safety performance of the tiling system.
3. Members are reminded of the common existence of exterior parts such as wells, yards, and lanes on surviving buildings.

5.2 **STRUCTURAL ELEMENTS**

Refer to Section 3.4, Structural Elements of the MBIS CoP 2012, especially the: (1) inspection methods; (2) common defects; and (3) roles of the RI.

5.2.1 *General Notes*

1. The structural requirements in force during each period were very different. Before the enactment of BO 1955, the statutory structural requirements were based on the design codes of the London County Council's (LCC) Bylaws of 1915, 1938, and 1952. With advancements made in structural engineering and technology, a new code of practice for the use of concrete, CP114, was released and the Building (Construction) Regulation was also enacted during the 1960s.
2. The differences in the governance of the structural requirements are significant. For instance, the minimum design-imposed load for residential buildings changed from an equivalent load of 3.35 kPa in the 1915 version of the London County Council Bylaws (LCC 1915) to 2.35 kPa in the LCC 1938, 1.90 kPa in the LCC 1952, 2.50 kPa in the Building (Construction) Regulations 1976, and, most recently, to 2.0 kPa in the Building (Construction) (Amendment) Regulation 2011."⁵
3. Remember the special designated uses of buildings built before the 1970s, such as composite buildings and industrial/residential buildings, which can make a substantial difference on structural requirements.

⁵ BD (2012)

4. It is hard to ascertain the properties of materials or the performance of building components through visual inspections alone. The specifications required by legislation, the specified properties, and specifications in the set of approved structural calculations can serve as references and cannot be treated as current due to possible deterioration over time and uncertainty over the initial properties and performance.
5. Some building components, especially timber components in pre-war buildings, may be covered by other materials. The inspection of these hidden components may require opening-up or the use of non-destructive technologies. Members should note the potential damage caused by termites in timber structures.
6. Also note the dangers of special and dubious designs in surviving buildings, like shared structures with adjacent buildings, tie-beams on roofs, etc. These are rare in current practice.

The following table from BD (2012) shows the timeline of the changes in the design standards for the structural use of reinforced concrete:

Table 5.2.1 Timeline of the changes in the design standards for the structural use of reinforced concrete

Period	Design Standards
1903~1934	Public Health and Buildings Ordinance 1903 (R.C. building, which belonged to the Exceptional Building, which, in turn, was subject to Building Authority approval)
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
1990~2003	B(C)R 1990; Code of Practice for the Structural Use of Concrete 1987 and BS 8110
2004~2008	B(C)R 1990 and Code of Practice for the Structural Use of Concrete 2004
2009~now	B(C)R 1990 and Code of Practice for the Structural Use of Concrete 2004 (2nd edition)

The following table from BD (2012) shows the timeline of the changes in the design standards for the structural use of steel:

Table 5.2.2 Timeline of the changes in the design standards for the structural use of steel

Period	Design Standards
1903~1934	Public Health and Buildings Ordinance 1903 (steel-framed building that belonged to the Exceptional Building, which was subject to the approval of the Building Authority)
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); and BS 449
1969~1974	London County Council Bylaws 1952 and subsequent amendments (for structural design prepared and signed by a qualified engineer); and BS 449
1975~1986	B(C)R 1975 (imperial version); B(C)R 1976 (metric version); and BS 449
1987~1989	Code of Practice for the Structural Use of Steel 1987 and BS449
1990~2004	B(C)R 1990, Code of Practice for the Structural Use of Steel 1987 and BS 5950
2005~2011	B(C)R 1990 and Code of Practice for the Structural Use of Steel 2005
2012~now	B(C)R 1990 and Code of Practice for the Structural Use of Steel 2011

The following table from BD (2012) shows the timeline of the changes in the design standards for the structural use of timber:

Table 5.2.3 Timeline of the changes in the design standards for the structural use of timber

Period	Design Standards
1903-1934	Public Health and Buildings Ordinance 1903 – some prescriptive requirements for timber floors
1935-1955	Buildings Ordinance 1935 – some prescriptive requirements for timber floors
1956-1968	Buildings Ordinance 1955 – B(C)R 1956 London County Council Bylaws 1938 or London County Council Bylaws 1952 and subsequent Amendments
1969-1974	London County Council Bylaws 1952 and subsequent amendments
1975-1989	B(C)R 1975 (imperial version)
1990-now	B(C)R 1990; BS 5268; and Code of Practice on Fire Resisting Construction 1996. Reference can be made to B(C)R 1976.

The following table from BD (2012) shows the timeline of the changes in the design standards for the structural use of masonry:

Table 5.2.4 Timeline of the changes in the design standards for the structural use of masonry

Period	Design Standards
1903-1934	Public Health and Buildings Ordinance 1903
1935-1955	Buildings Ordinance 1935
1956-1974	Buildings Ordinance 1955 – B(C)R 1956
1975-1989	B(C)R 1975 (imperial version)
1990-now	B(C)R 1990 and BS 5628. Reference can also be made to B(C)R 1976.

The following table from BD (2012) shows the timeline of the changes in the design standards for the minimum design imposed loads:

Table 5.2.5 Timeline of the changes in the design standards for the minimum design imposed loads

Period	Design Standards
1915-1955	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)
1975-1989	B(C)R 1975 (imperial version)
1990-7/2011	B(C)R 1990
8/2011-now	Building (Construction) (Amendment) Regulation 2011 Code of Practice for Dead and Imposed Loads 2011

The following table from BD (2012) shows the timeline of the changes in the design standards for foundations:

Table 5.2.6 Timeline of the changes in the design standards for foundations

Period	Design Standards
1903-1934	Public Health and Buildings Ordinance 1903
1935-1955	Buildings Ordinance 1935
1956-1974	Buildings Ordinance 1955 – B(C)R 1956
1975-1989	B(C)R 1975 (imperial version)
1990-2003	B(C)R 1990
2004-now	B(C)R 1990 and Code of Practice for Foundations

5.2.2 Inspection against the Required Specifications at the Time the Building Was Built

5.2.2.1 Pre-1955 buildings

1. S.5-s.19 of BO 1935 addressed the construction of walls. An equivalent can be found in Part VIII of the current B(C)R:
 - a. S.11(2) required "Every external or enclosure wall which abuts against the earth shall be protected by a vertical damp-proof course..." (see also the regulations of the current B(C)R).
 - b. S.15 addressed the requirements for party walls, which were very common in those days, but are now rare without any equivalent in the current B(C)R. It required that "Every party wall shall unless exempted by the BA be carried up above the upper surface of the roof of every building to a height of at least 18 inches, measured at right angles to the slope of the roof, and every such party wall and every parapet wall shall be properly coped with a coping composed of cement and sand in the proportion of not less than one part of cement to every two parts of sand, or of such other material as the BA may approve, or shall be otherwise protected in order to prevent water soaking into such wall."
 - c. S.16 further controlled the openings through party or external walls, etc. S.16(1) stipulated that "openings may only be made in party walls to an extent not exceeding one half of their area on each storey ..."
2. S.23-s.28 of BO 1935 addressed the requirements for floors.
3. S.32 of BO 1935 addressed the requirements for cocklofts, which were very common for buildings built during this era, but are now rare in new buildings. They also have no equivalent in the current regulations. For example:
 - a. S.32(7) stipulated that "No cockloft shall be used for any purpose other than storage unless with the consent in writing ..."
 - b. S.32(8) required that "Every cockloft shall, unless the BA shall otherwise permit, be supported directly from the ground by pillars or columns to the satisfaction of the BA in such manner that no additional load is placed upon any wall of the building in which such cockloft is situated..."
4. S.33 of BO 1935 addressed the requirements for staircases. For example:
 - a. "Every main staircase hereafter erected shall be so arranged as to have a tread of not less than 9 inches from the face of one riser to the face of the next and no riser shall be of a greater height than 7 inches: ..."
5. S.37 of BO 1935 required that all corbelling for the support of floors or roof timbers must be done in stone cut on flat beds or in red brick of at least nine inches in length and set in cement-mortar. The entire thickness of the walls for such corbelling shall also be built into the cement-mortar. No corbelling course of brick shall project beyond the course immediately beneath it for more than 2-1/4 inches.
6. S.38-s.42 of BO 1935 addressed the requirements for roofs. The sections are excerpted in Appendix 3.5.
7. S.45 of BO 1935 specified the limitations of projections. For example, "No encroachment or projection whatsoever, excepting eaves, cornices and mouldings not exceeding 18 inches projections, shall extend over any street ...".

8. S.48 of BO 1935 further elaborated on the limitations of building verandahs and balconies over streets, which were very common in buildings built during this era, and attracted exemptions from encroachment over streets. They are excerpted in Appendix 3.6.
9. S.53 of BO 1935 covered partitions, obstructions, and enclosures in verandahs or balconies:
 - a. No partition (other than such as may be necessary for the separation of the verandah or balcony of any building from the verandah or balcony of any adjacent building) shall be erected in any verandah or balcony over unleased Crown land or over any street, nor shall any such verandah or balcony be obstructed or enclosed wholly or in part (except by a balustrade not exceeding three feet in height) or used as a bathroom, urinal, water closet, sleeping apartment, storeroom, or kitchen, nor shall any rain or other water be discharged therefrom save in the manner hereinbefore provided...
10. S.54-s.62 of BO 1935 governed the provisions of kitchens, fireplaces, and chimneys. The sections are excerpted in Appendix 3.8
11. S.77-s.80 of BO 1935 addressed the limitations of the vertical height of buildings.
12. S.110-s.126 of BO 1935 addressed the rights of building and adjoining owners and have been retained in the current BO (see Schedule II of the BO).

5.2.2.2 1956-1980 buildings

1. Since the release of the B(C)R 1956, there has been more systematic control of the properties of building materials and the performance of building components.
2. For example, s.25 stipulated the minimum imposed loads in B(C)R 1975, which are equivalent to that stated in the current s.17 of the B(C)R.

5.2.3 *Inspection against the Latest Required Specifications*

5.2.3.1 General Structural Elements

Members shall refer to the latest codes of practice and practice notes for the latest required specifications of the structural elements.

5.2.3.2 Alterations and Additions

1. New building works, whether they are alterations or additions (A&A) on surviving buildings, may be subject to the latest statutory requirements even if the building itself was built before the implementation of such legislation.
2. Members shall refer to APP-117 (PNAP 249) issued by the BD, <http://www.bd.gov.hk/english/documents/pnap/APP/APP117.pdf>, where the following clarifications are set out for A&A works on surviving buildings:
 - a. An assessment of the effects of the A&A works on the existing structure must be carried out for the structural plans submissions. Structural condition tests of the existing elements should also be considered.
 - b. All new structural elements in the A&A works should be designed in accordance with the current building regulations and relevant codes of practice. They would be regarded as new buildings.

- c. The practice note lists 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.
3. For cases in which the original approved plans are not available, justification of the structural design of the A&A works by means of comparing the effects of the new and original loadings, bending moments, and shear forces of the structural members may be accepted.
 4. If necessary, it pays to open up the affected structural elements to ascertain the amount of reinforcement and concrete strength that should be added.

5.2.4 Inspection against the Performance Requirements

5.2.4.1 General Structural Elements

1. The long-term performance change of an existing structural element is revealed by a durability analysis of the structural element.
2. The durability risk factors can help one understand the degradation process of the structural element.

5.2.4.2 Durability Risk Factors

Sarja and Vesikari (1996, p.68) identified a procedure with factors to be considered in the durable design of concrete structures, which implies durability risk factors (Figure 5.1). Table 5.2.7 also elaborates on the degradation factors and processes:

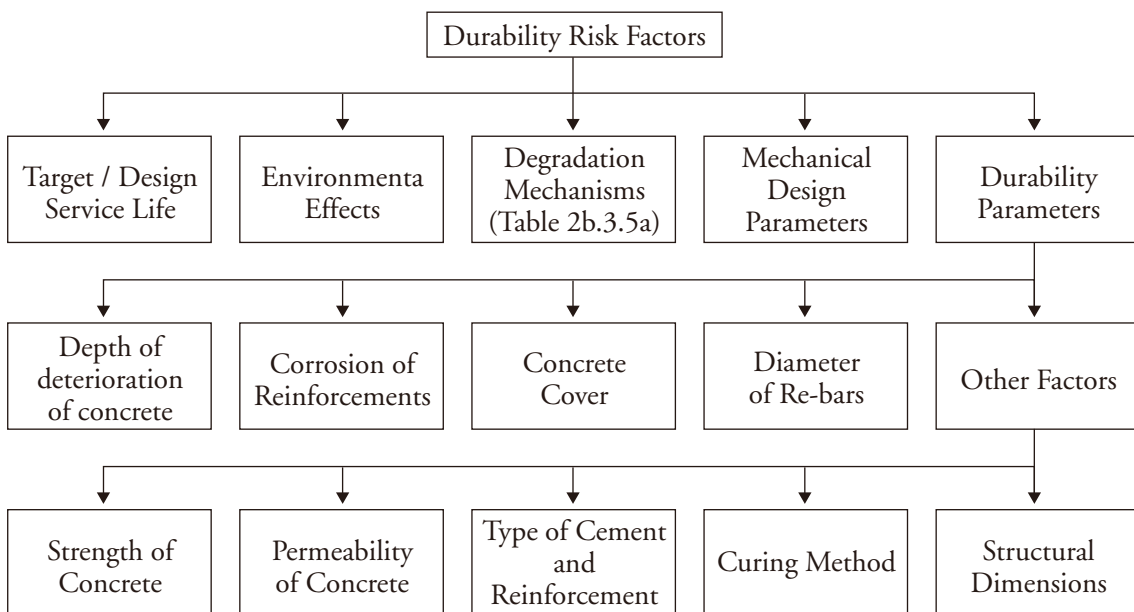


Figure 5.1 Durability Risk Factors of Concrete Structure Design

Source: developed from Sarja and Vesikari (1996, p.68)

Five factors are considered durability parameters: (1) depth of the deterioration of concrete, (2) corrosion of the reinforcements, (3) concrete cover, (4) diameter of the re-bars, and (5) other factors, which is further sub-divided into five sub-factors, notably: (1) strength of the concrete, (2) permeability of the concrete, (3) type of cement and reinforcement, (4) curing method, and (5) structural dimensions. These factors will not be discussed in this Guide, but it is worth noting that the durability of a concrete structure depends on these parameters.

Apart from the quality and specifications of the concrete structures themselves, external effects and required performance are also crucial to a durability risk analysis. The above Figure 5.1 identified four risk factors on durability in addition to the durability parameters: target service life, environmental effects, degradation mechanisms, and mechanical design parameters. The degradation mechanism is elaborated on in Table 5.2.7.

Table 5.2.7 Degradation Risk Factors

Mechanical		
Static loading	Deformation	Deflection, cracking, failure
Cyclic loading	Fatigue, deformation	Deflection, cracking, failure
Impact loading	Fatigue	Vibration, deflection, cracking, failure
Biological		
Micro-organisms	Acid production	Leaching
Chemical		
Soft water	Leaching	Disintegration of concrete
Acid	Leaching	Disintegration of concrete
Acid	Neutralisation	Steel depassivation
Acidifying gases	Neutralisation	Steel depassivation
Carbon dioxide	Carbonation	
Sulphur dioxide		
Nitrogen dioxide		
Chlorides	Penetration, destruction of passive film	Steel depassivation
Steel depassivation, oxygen, water	Corrosion	Expansion of steel, loss of diameter in -bars, loss of bond
Stress / chlorides	Stress corrosion	Failure in pre-stressing tendons
Sulphates	Crystal pressure	Disintegration of concrete
Silicate aggregate, alkalis	Silicate reaction	Expansion, disintegration
Carbonate aggregate	Carbonate reaction	Expansion, disintegration
Physical		
Temperature change	Expansion	Shortening, lengthening, restricted deformation
RH change	Shrinkage, swelling	Shortening, lengthening, restricted deformation

Low temperature, water	Ice formation	Disintegration of concrete
De-icing salt, frost	Heat transfer	Scaling of concrete
Floating ice	Abrasion	Cracking, scaling
Traffic	Abrasion	Rutting, wearing, tearing
Running water	Erosion	Surface damage
Turbulent water	Cavitation	Caves
<hr/>		
Use		
<hr/>		
Normal use	Wear and tear	
Maintenance / upkeep	Deterioration and obsolescence	
Management	Deterioration	
Abuse / vandalism	Cannot be ascertained	
<hr/>		
Human errors and uncertainties		
<hr/>		
Design Uncertainties	Cannot be ascertained	
Communication Errors	Cannot be ascertained	
Uncertainties in manufacture and execution	Cannot be ascertained	
Errors in mathematical and statistical modelling	Cannot be ascertained	
<hr/>		

Source: developed from Sarja and Vesikari (1996, p.102)

Degradation mechanisms can be sub-divided into six categories: (1) mechanical, (2) biological, (3) chemical, (4) physical, (5) use, and (6) human error and uncertainty. Examples of these mechanisms are shown in Table 5.2.7 for further studies of durability risk factors and will not be discussed here.

5.2.5 *Special Construction Methods and Features (refer to the drawings in Appendix 2 for the features)*

1. As verandahs projecting over public streets were allowed (with conditions) before World War II, columns supporting the verandahs were very common for these buildings.
2. Balconies projecting over public streets were allowed (with conditions) in the old days. With advancements in concrete technology, cantilever-type balconies projecting over streets became very common in buildings built after the war. After 1968, the cantilever-type canopy projecting over street dominated, as a balcony was no longer allowed to project over a public street.
3. A party wall was also very common in the newly-constructed housing of the time. It normally ran down the middle of a flat, splitting it into two units. It became so common that one unit could be redeveloped, thereby leaving the party wall intact.
4. A chimney was usually included for buildings constructed during this period.
5. Timber floor slabs, staircases, and roofs can still be found in some of the surviving buildings.

6. Some structural walls were made of brick and sand (), which were sometimes used instead of Portland Cement.
7. During the periods when potable water supplies were suspended (1960s-1970s), concrete mixing was sometimes done with salt water, which might have adversely affected its quality and performance.
8. Load-bearing walls are common in surviving buildings from this period. Note that symptoms such as cracks and bulges along load-bearing walls, which can have crucial implications for safety.
9. Cantilevered structures along the exterior of a building are of particular concern, as the consequences of their failure can be disastrous. There have been several incidents in Hong Kong involving the collapse of cantilevered structures (see BD, 1994, 1998a, 1998b). The conditions of their top surfaces are of particular importance, as water and contaminants can easily seep into the cracks and defects along the top surface. Overloading and misuse are generally found on the top. There were also cases in which re-bars were misplaced at the bottom of the cantilevered structures and helped cause their collapse.
10. Asbestos was a commonly-used construction material before the 1980s. The following asbestos-containing items are still present in surviving buildings: (1) cement water pipes, (2) corrugated cement sheets, (3) fibre materials for heat insulation, (4) noise insulation or fire-resistant materials, (5) friction materials, and (6) vinyl floor tiles (EPD, 2011). In addition, asbestos lags, walls, ceiling insulation, pipes, and fittings can also be found in older buildings (EPD, 1993). Note that even if the original design and construction of the building did not include asbestos, UBWs or exempt building works, if any, might have used it. For example, asbestos-laden corrugated cement sheets are common in unauthorised cages, canopies, and roofing structures. Members should be cautious when inspecting such buildings.

5.3 FIRE SAFETY ELEMENTS

5.3.1 General Notes

1. Refer to Section 3.5, Fire Safety Elements of the MBIS CoP 2012 on the: (1) inspection methods; (2) common defects; and (3) roles of the RI.
2. Remember the special designated uses of buildings before the 1970s, such as composite buildings and industrial/residential buildings, which can make a substantial difference in the fire safety requirements.
3. It is hard to ascertain the fire safety performance of materials and components without conducting fire tests. The specifications required by legislation and the specified properties and specifications in the approved building plans can only serve as references and cannot be regarded as the status in existing properties owing to deterioration over time and uncertainty over the initial properties and their performances.

4. Most of the fire safety-related codes of practice were first issued during the 1950s and 1960s. The following table shows the timeline of the changes in the fire safety requirements for buildings:

Table 5.3.1 Timeline of the changes in the fire safety requirements

Period	Legislation and Codes of Practice
1954	Fire Services Ordinance (No.32 of 1954) was enacted
1959	MOE code was first issued B(C)R included fire resisting construction requirements
1964	CoP for the Min. FSI&E was first issued in February
1986	MOE code was revised
1989	MOA code was first issued in October 1989 FRC code was first issued
1995	MOA code was revised in May 1995
1996	FRC code was revised & with effect from August 1, 1996 MOE code was revised with commentaries
1997	Fire Safety (Commercial Premises) Ordinance (Cap. 502) was enacted (extended to specified commercial buildings in 1998)
2002	Fire Safety (Buildings) Ordinance (Cap. 572) was enacted (implemented on July 1, 2007)
2011	the MOE, FRC, and MOA codes were integrated and replaced by the Code of Practice for Fire Safety in Buildings (FS Code) MBIS/MWIS CoP were first issued

Note that the Fire Safety (Commercial Premises) Ordinance and Fire Safety (Buildings) Ordinance retrospectively apply to specific buildings. For example, the FS(B)O applies to all composite buildings and domestic buildings of more than three storeys that were constructed on or before 1 March 1987. In other words, the fire safety installations of designated surviving buildings must be upgraded according to these two laws, when the order is received.

5.3.2 Inspection against the Required Specifications at the Time the Building Was Built

5.3.2.1 General Notes

1. The general requirement of a means of escape in case of fire and emergency and the provisions of fire resisting construction and a means of access for fire-fighters were included in the regulations prior to the publication of the relevant codes of practice.
 - a. For example, s.37(a) of the 1956 Building (Planning) Regulations [or s.41(1) of the 1976 B(P)R] specifically required a means of escape. S.33 of the BO 1935 specifically required fire resisting construction and a means of escape.
 - b. The requirement of a means of access for fire-fighting and rescue purposes was stated in s.41A-D of the 1992 Building (Planning) Regulations.
2. The FS(B)O requires upgrades to FSIs and fire safety construction in the buildings it covers so that they can meet the standards set out in the codes of practice specified in the legislation. See:
http://www.buildingmgt.gov.hk/file_manager/en/documents/Fire_Safety_Bldgs_Pamphlet_E.pdf.
3. Note that retrospectively applied requirements may not be the latest requirements and are subject to changes over time. For example, 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].
4. 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. Members must keep updating the requirements when carrying out their inspections.
5. As 2016 is the deadline for Phase I for the requirements of FS(B)O to be implemented, Members must remember to exercise professional judgment when deciding if the latest fire safety requirements should be consulted in their inspections of surviving buildings.

5.3.2.2 Pre-1955 buildings

1. Although there was no FRC code, fire resisting construction was explicitly required in the legislation for specific elements. For example, s.33(3) of BO 1935 required "Every staircase hereafter erected shall, unless exempted by the BA, be enclosed by walls of fire resisting material..." and s.33(6) required:

Every main staircase, including the treads, risers, strings and other supports, and all landings, enclosure walls, lobbies and passages from one flight to another, hereafter erected in any building which is constructed or adapted or converted to be used either wholly or in part as a public building, a tenement house for separate families or for offices, shall be of fire resisting materials to the approval of the BA. 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 or by some other method equally satisfactory to the BA.

2. Although there was no MOE code, a means of escape in case of fire was explicitly required in the legislation for some specific elements. For example, s.33(5) of BO 1935 required:

Every building hereafter provided with stairs shall have a staircase giving direct access to a street or lane, or to an open space leading thereto, to the satisfaction of the BA, and in the case of a building of more than two storeys in height, or in which any floor is more than 23 feet above the level of the street, such staircase shall be continued to give egress on to the roof of the top storey or there shall be provided to the satisfaction of the BA an additional staircase from the floor of the second floor storey giving egress on to the roof of the top storey or some other satisfactory means of escape in the case of fire.
3. S.35 Of BO 1935 further addressed the requirement of a means to escape a fire other than the staircase. For example:

Every existing building and every building hereafter erected which has a storey the floor of which is more than 35 feet above the level of the street or ground surface adjoining the front of such building shall be provided on every storey with such means of escape in the case of fire, for the persons using, dwelling or employed therein, as the BA may require.
4. The emphasis on "existing building" in this section implies that the requirements retrospectively applied to buildings built before the date of the law's enactment.
5. S.54-s.62 of BO 1935 governed the provisions of kitchens, fireplaces, and chimneys. The sections are excerpted in Appendix 3.8.S.101 of BO 1935 restricted inflammable structures. For example: "It shall not be lawful for any person to erect or maintain any structure of wood, mats, palm leaves, thatch, or other inflammable material, without permission in writing from the BA..."

5.3.2.3 1956 - 1968 buildings

1. The first MOE code of practice was released by the then-Public Works Department in 1959. Its authority was vested in Regulation 37(a) of the 1956 Building (Planning) Regulations [equivalent to s.41(1) of the 1976 B(P)R]. It states "every building shall be provided with such means of escape in case of fire as may be required by the intended use of a building."
2. There are a lot of differences between the 1959 and 1986 MOE codes, but no commentaries to explain these differences.
3. Remember to carefully check the differences in the requirements during various construction vintages during the inspection of surviving buildings.
 - a. For example, a protected lobby was first defined in the 1959 MOE code as:

...a lobby enclosed throughout by partitions having an F.R.P. of not less than 1/2 hour and has all openings therein filled with fixed lights or self-closing doors having an F.R.P. of not less than 1/2 hour. And there are several situations that require a protected lobby, including the following one in Para 17:

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, or

- (b) a lobby open to the external air on at least two sides.

Provided that this paragraph shall not apply to a staircase to which access is from a balcony approach.

However, there was no mention on if the protected lobby should be a common area, and there have been cases in which the protected lobby was included in the exclusively possessed internal floor area.

- b. In the 1986 revision of the MOE code, the paragraph was revised as follows:

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, or
- (b) a lobby open to the external air on at least two sides.

Provided that this paragraph shall not apply to a staircase to which access is from a balcony approach.

This requirement is still in force in the MOE code 1996 and the latest FS Code (2011). Members must exercise sound, professional judgment when deciding if the exclusively possessed protected lobbies should be inspected when the client brief requires an inspection of the common areas only.

- 4. Note the complex relationship between the provision of exit staircase(s) and the number of storeys, etc., in a building. Cl. B6.1 of the latest FS Code (2011) specifies the conditions for buildings that are allowed to have only one required staircase, which restricts the building's height and usable floor area. However, Paragraph 6(g) of the MOE (1959) specified that:

...buildings with single staircase in which the level of the highest floor is more than 42 feet (13m) above ground level, the staircase is required to be continued to the roof, and that **access shall be provided across such roof to the staircase of an adjoining property.**

At least one case has argued that such an arrangement of 'access across a roof to the staircase of an adjoining property' renders the building as NOT one that involves a single staircase (BA v Building Appeal Tribunal, HCAL3/2005).

- 5. Remember the requirement for 'access between the two required staircases' since the MOE (1996) or the latest FS Code (2011), where Paragraph 11.2 or Cl. B8.2 requires that:

...where two or more exit staircase are required, people using one staircase should be able to gain access to at least one of the other staircases at any time without having to pass through other person's private premises. **Such access should be provided either at each floor, ... or, where refuge floors are provided, at the refuge floor(s) and the roof.**

However such a requirement was not stated in the MOE (1986) or before.

5.3.2.4 1968-1980 buildings

1. The second MOE code of practice was released by the then-Buildings Ordinance Office of the Buildings and Lands Department in 1986. Its authority was vested in Regulation 41(1) of the 1976 Building (Planning) Regulations. It requires that 'every building shall be provided with such means of escape in case of emergency as may be required by the intended use of a building.'
2. The differences between the 1986 and 1996 MOE codes are explained in detail in the commentaries for the 1996 code. Remember to read and understand the differences in the inspection of buildings from this era.
3. Although there was no FRC code before 1989, there was a statutory requirement for fire resisting construction in the B(C)R.
 - a. For example, Schedule III of the B(C)R 1975 provides tables on the "minimum requirements for construction and materials to be capable of resisting the action of fire for specified periods," which are in a similar format to the one in the current FS code.
 - b. Part XVI (s.182-s.190) of the B(C)R 1975 was titled "Fire Resisting Construction," which could be regarded as a former version of the FRC code.
 - c. Table XLIII specified the minimum FRP required for different uses of buildings, which are in a similar format to the one in the current FS code.
 - d. An excerpt of the whole Part XVI is in Appendix 3.9 for your reference.

5.3.3 *Inspection against the Latest Required Specifications*

5.3.3.1 General

The BD issued the first Code of Practice for Fire Safety in Buildings in September 2011. It is available at: http://www.bd.gov.hk/english/documents/code/fs_code2011.pdf and replaces the MOE, FRC, and MOA codes. It puts more emphasis on performance requirements and treats the prescriptive requirements as deemed-to-comply provisions. The structure of the Code is as follows:

Part A: Introduction

Part B: MOE

Part C: FRC

Part D: MOA

Part E: Fire Properties of Building Elements and Components

Part F: Fire Safety Management

Part G: Guidelines on Fire Engineering

Annex A: Licensing references

5.3.3.2 Alterations and Additions

1. New works on surviving buildings, whether they are alterations or additions (A&A), may be subject to the latest statutory requirements, even if the building itself was built before the implementation of the legislation.
2. Members shall refer to APP-85 (PNAP 202) by the BD:
<http://www.bd.gov.hk/english/documents/pnap/signed/APP085se.pdf>
 - a. 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.
 - b. 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.

5.3.4 Inspection against the Performance Requirements

1. Since 1996, the fire engineering approach has been one of the most acceptable performance-based approaches for designing a building's fire safety measures.
2. The fire safety performance requirements for a building are threefold: (1) life safety – to minimise casualties and injuries in case of fire; (2) property protection – to minimise damage to property in case of fire; and (3) fire risk management – to reduce the possibility of a fire and minimise the adverse effects of a fire.

5.3.5 Special Construction Methods and Features

1. An AP is required to certify the installation of fire resisting components. The certificates may be relevant to the inspection. Refer to Practice Note APP-118 (PNAP 251) by the BD:
<http://www.bd.gov.hk/english/documents/pnap/APP/APP118.pdf>
2. MOA requirements, in particular the provision of emergency vehicle access (EVA), are more recent requirements. Be careful when checking if the latest requirements apply to the building being inspected.

5.4 DRAINAGE SYSTEM

1. Remember to refer to Section 3.6, Drainage System of the MBIS CoP 2012, for the: (1) inspection methods; (2) common defects; and (3) roles of the RI.
2. Also remember the special uses for buildings, such as composite buildings and industrial/residential buildings, before the 1970s because they can make a substantial difference in the drainage requirements.
3. It is hard to ascertain the properties of the materials or the performance of each building component without conducting tests. The specifications required by law and the specified properties and specifications in the approved drainage plans can only serve as references and cannot be regarded as the status in existing properties due to deterioration over time and uncertainty over the initial properties and their performances.
4. The current Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations (B(SSFPDWL)R) were first enacted in 1959. Previous controls on the drainage provisions of buildings were based on the Drainage (General, Water Closets and Urinals, etc.) Regulations enacted in 1935. The following table shows the timeline of the changes in the drainage provision requirements for buildings:

Table 5.4.1 Timeline of the changes in the drainage provision requirements

Period	Legislation and Codes of Practice
1903~1934	Drainage Regulations in Schedule M under the Public Health and Buildings Ordinance of 1903 were enacted
1935~1958	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)
1959	Building (Standards of Sanitary Fitments, Plumbing, Drainage Works and Latrines) Regulations

5.4.1 Inspection against the Required Specifications at the Time when the Building Was Built

5.4.1.1 General Drainage System

Since the outbreak of SARS in 2003, dried or missing U-traps have been identified as suspected routes for spreading the virus, which might not have been known to building designers beforehand. For health and safety's sake, Members should take this issue into account when they inspect drainage systems regardless if it was required in the specifications when the building was built.

5.4.1.2 Pre-1960 buildings

1. The technology, materials, and specifications for building drainage systems built during this period were substantially different from those in the current legislation. Be careful in determining the set of requirements to follow when conducting an inspection assessment.
2. For example, s.17 of the regulations requires "any drain or sewer passing under 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," but the current B(SSFPDWL)R, s.54, requires:
"...any drain or sewer laid through any building, or where any building is constructed over any drain or sewer, relieving arches or beams shall be provided to protect such drain or sewer and to prevent any load from the building being transmitted to such drain or sewer."
3. No requirement for sanitary fitments was imposed in the BO before 1959 (see Paragraph 5.4.1.3 of this Guide).
4. No requirement for water supply to buildings was imposed in the BO before 1966 (see Paragraph 5.4.1.3 of this Guide).
5. S.79-s.85 of BO 1935 addressed the requirements for water closets and latrines.
S.85: "Every domestic building and every floor of a domestic building hereafter erected which is separately let for dwelling purposes shall be provided with adequate latrine accommodation to the satisfaction of the BA."
6. S.86-s.98 of BO 1935 addressed the requirements for drainage systems, storm-water channels, and nullahs.

5.4.1.3 1960 - 1980 buildings

1. Control over the provisions of sanitary fitments was first incorporated in the B(SSFPDWL)R, which was enacted in 1959.
2. The requirement of supplying buildings with water was first enacted in the Building (Amendment) Ordinance in 1966 and now included in Regulation 10A of the B(SSFPDWL)R.

5.4.2 *Inspection against the Latest Required Specifications*

Refer to the HKIS's (2003) Drainage Maintenance Booklet:

[http://www.hkis.org.hk/ufiles/DrainageMaintBooklet\(Jun2003Ed\).pdf](http://www.hkis.org.hk/ufiles/DrainageMaintBooklet(Jun2003Ed).pdf)

5.4.3 *Inspection against the Performance Requirements*

1. There is, thus far, no recognised performance-based approach for the inspection of a drainage system.
2. The basic performance requirement of a drainage system is the effective discharge of effluents (including soil, waste, rainwater, surface water, air-conditioning condensation, etc.) to public sewers in a sanitary and non-polluting manner.

5.4.4 Special Construction Methods and Features

1. In Hong Kong's oldest residences, such as the "Blue House" in Wan Chai, there was no drainage system installed. The soil and waste were disposed of manually as "night soil".
2. A hopper, an open receptor for several waste water pipes, was common in such vintage housing. Vegetation growth in the hopper was a common problem.
3. Leakage from the drainage system is a very common problem in buildings. Contributing factors include the connection design and method, pipe deterioration, etc.
4. Drainage pipes were sometimes designed to pass through structural and non-structural building elements such as walls, beams, and columns. Leaking pipes may accelerate the deterioration of the surrounding concrete. Refer to the HKIS's (2013a) Professional Guide for the Detection and Diagnosis of Water Seepage in Residential Buildings for more information.
5. Common drainage pipes and manholes were sometimes designed to pass through privately-owned (exclusively possessed) areas, which can make them hard to inspect and repair. Refer to Practice Note PNAP 211 for more guidance.
6. Smoke and air tests of a drainage system before accepting it should be certified by the AP.
7. Cast iron drainage pipes were more common in older buildings, while uPVC pipes are more common in newer buildings. Special attention should be paid assessing the condition of the junctions of different piping materials installed at different times.

6 Checking for Defects and Symptoms

6.1 EXTERNAL FINISHES

1. The following five symptoms are regarded as common defects of external finishes in the MBIS CoP 2012: (1) loose or missing tiles and rendering; (2) cracks; (3) bulging, bowing, separation, and delamination; (4) corrosion of metallic parts embedded in the external finishes; and (5) spalling. They either reflect a loss of adhesive strength in the finishes or a loss of protective function in the receiving elements.
2. There can be many different causes for external finishes defects, and the formulation of any rectification/repair strategies should be based on the results of thorough investigations and robust diagnoses. The causes of external wall finish defects are categorised into a four x three matrix in Figure 6.1. If a visual inspection alone cannot determine the cause(s) of a defect, a detailed investigation may be required.
3. The previous tests/ repair reports on the external finishes, such as pull-out tests, if available, should be consulted. They can help you ascertain the initial conditions so that you can identify the cause(s) of such defects and correct them.
4. If the cause of the defects is alleged to be a result of building structure/ substrate, refer to Section 6.2 of this Guide on Structural Elements.
5. It is now common to use non-destructive technologies (NDTs) like infrared thermography to facilitate the inspection of an external wall tiling system. But members MUST understand the limitations of the NDT and make sound, professional judgments when administering tests and interpreting their results. For example, ASTM 4788-03 (2007), the American Standard Test Method for Detecting Delaminations in Bridge Decks Using Infrared Thermography, highlights the difficulties of interpreting thermograms and applying the test, including the requirements of minimum thermal resolution of the camera, the minimum hours of direct sunshine on the subject surface, and the maximum wind speed, etc.

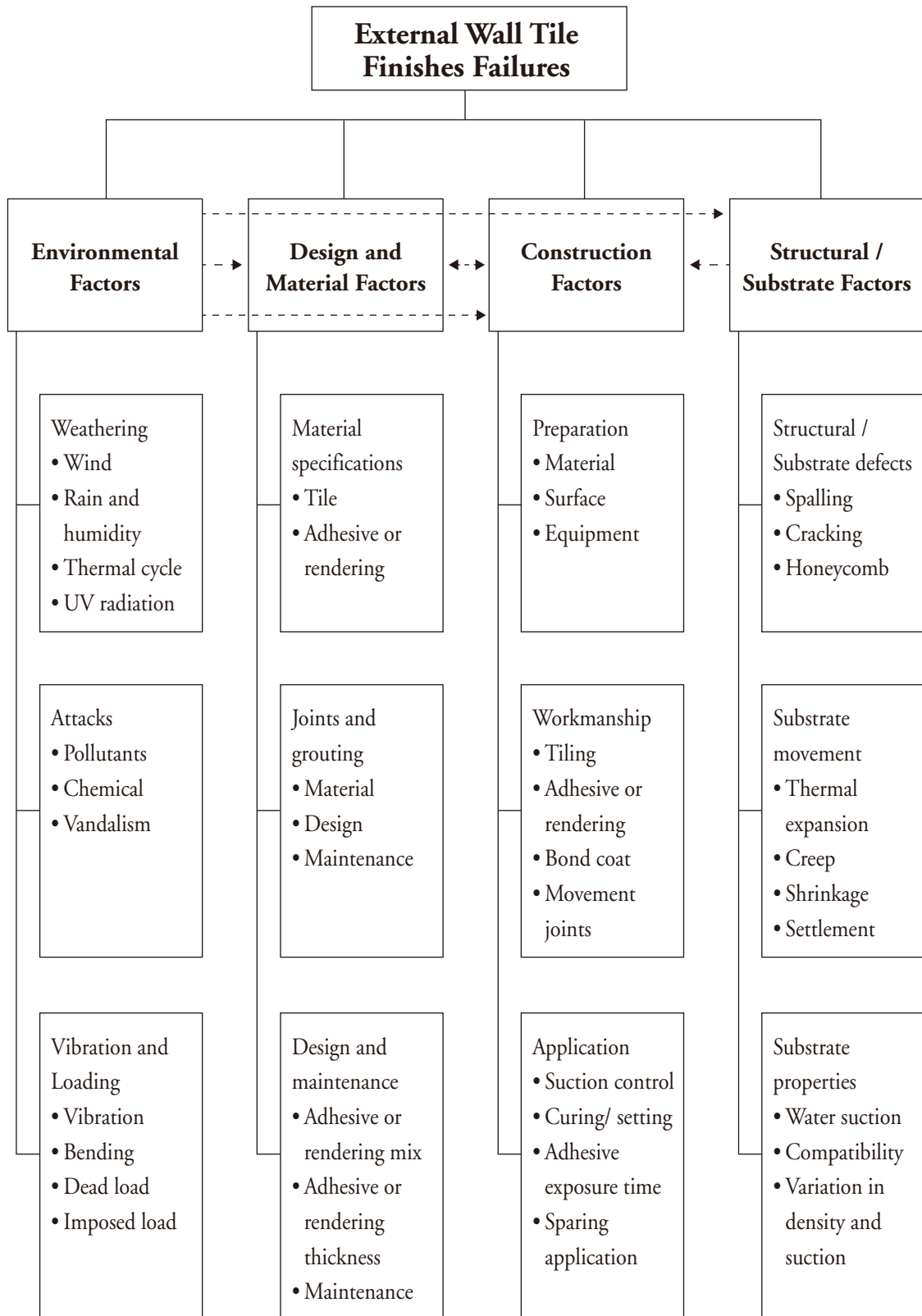


Figure 6.1 Causes of External Wall Finish Defects

Source: Ho, Lo, and Yiu (2005)

6.2 STRUCTURAL ELEMENTS

1. As most of the residential and composite buildings in Hong Kong are of reinforced concrete construction, this Guide focuses only on diagnosing the defects of concrete structures.
2. The following two symptoms are regarded as common defects of the structural elements in the MBIS CoP 2012: (1) spalling; and (2) corrosion of reinforcement bars.
3. There are many causes of structural element defects. The formulation of any rectification/repair strategy should be based on the results of thorough investigations and robust diagnoses. The causes of structural element defects are categorised into a four x three matrix in Figure 6.2. In case of uncertainty over the cause(s) of a defect, a detailed investigation may be required.
4. The previous tests and/or repair reports on the structural elements, such as a carbonation test, chloride contents, and a concrete strength test, should be referenced. They help one ascertain the initial conditions of the structure so that the cause(s) of such defects can be identified and rectified.
5. Refer to the BD (1995) and BD (1999) reports to better understand the general conditions of concrete structures from the various eras for Hong Kong's residential buildings. Although there might have been some changes in these conditions in the years since the reports came out, they provide an overall picture of the common causes of the defects, as well as the then-prevailing standards for designing concrete structures.
6. Members should differentiate between structural and non-structural cracks and structural and non-structural alterations, especially works that involve structural columns, beams, load-bearing walls, etc. If severe structural cracks and/or unauthorised structural alterations are found, Members should exercise sound, professional judgment in assessing the severity of the situation and determining whether immediate notification to the BA and/or propping or other precautionary measures against collapse are required. Refer to the BD's (2010) report on the Ma Tau Wai Road case for more information.
7. The following is a checklist for diagnosing the structural implications of cracks, but it is NOT exhaustive:
 - a. Any record of overloading during construction and occupation
 - b. Any structural member size that is less than that in the approved plans
 - c. Any sign of structural warnings such as a shear crack, flexural cracks, buckling, etc.
 - d. Any sign of foundation settlement
 - e. Any sign of excessive deflection
 - f. Any sign of large scale, low-strength concrete
 - g. Any live crack with repeated movements
 - h. Any sign of chloride and/or other chemical attack
 - i. Any sign of large area delamination
 - j. Any previous repair record of structural strengthening.

8. Pay particular attention to any structural defect on a cantilevered canopy or balcony over a street and note if it is authorised or unauthorised. Such structures are very common and can pose a severe hazard to their occupants and the general public. Refer to the BD's (1998a, 1998b) reports on the collapse of a balcony on Kwun Tong Road and Marble Road, respectively, for more information.
9. Be alert for the potential misplacement of the reinforcement bars (re-bars), especially in cantilevered structures such as overhanging canopies, and note if it is authorised or unauthorised. Refer to the BD's (1994) report on the Albert House case, which concluded that the misplacement of the reinforcement bars helped cause the collapse of its canopy. Structural cracks are often found on or near the top of the canopy (the tension side) if its reinforcing bars are misplaced. Remember to inspect not only the undersides, but also the tops, of canopies. Pay attention to the finishes on the top and sides of the cantilevered structure for signs of distress that could indicate defects in the concrete. A change of use, excessive loading, damage to the waterproofing membrane, water ponding, insufficient water fall, rusty stains and/or structural cracks, etc. should be taken into consideration when investigating and diagnosing a defect.
10. Structural defects, including spalling and the corrosion of reinforcement bars, can also be caused or aggravated by water, especially salt water seepage. Refer to the HKIS's (2013a) Professional Guide for the Detection and Diagnosis of Water Seepage in Residential Buildings (Investigation & Diagnosis) to investigate and diagnose water seepage problems. The following is an excerpt on a diagnostic analysis of water seepage problems from the HKIS's (2013a) Guide:
 - a. The analysis of water seepage shall be on the basis of site inspection, detail of seepage occurrence and duration, extents of the area of seepage, government records, and building professional's report.
 - b. Information provided by the complainants (if any), owners, occupants, and property managers shall be verified first and considered for reference only.
 - c. List all possible sources and causes.
 - d. Rule out the impossibilities on the basis of findings, reasoning, and judgment.
 - e. If there remains more than one possibility, suggest and/or carry out further tests to verify all the possible sources and causes.
 - f. One simple common test is to note the pattern and timing of occurrence of seepage. For example, consider whether the seepage is a continuous or a periodic one, or if the seepage is associated with rainy days or after normal bathing time, etc.
 - g. Judge the collected evidence to identify the source, cause, and path of the water seepage.
 - h. A method of making use of a scientific 'hypothesis-testing' approach may be used. Basically the professional building surveyor hypothesises the most likely source of seepage first. Evidence is collected and analysis is carried out to 'reject' such hypothesis. The process is similar to elimination of the probable causes, one by one, with evidence collected. If the hypothesis cannot be rejected, then the professional building surveyor has to conclude that this is one of the possible causes of the seepage.

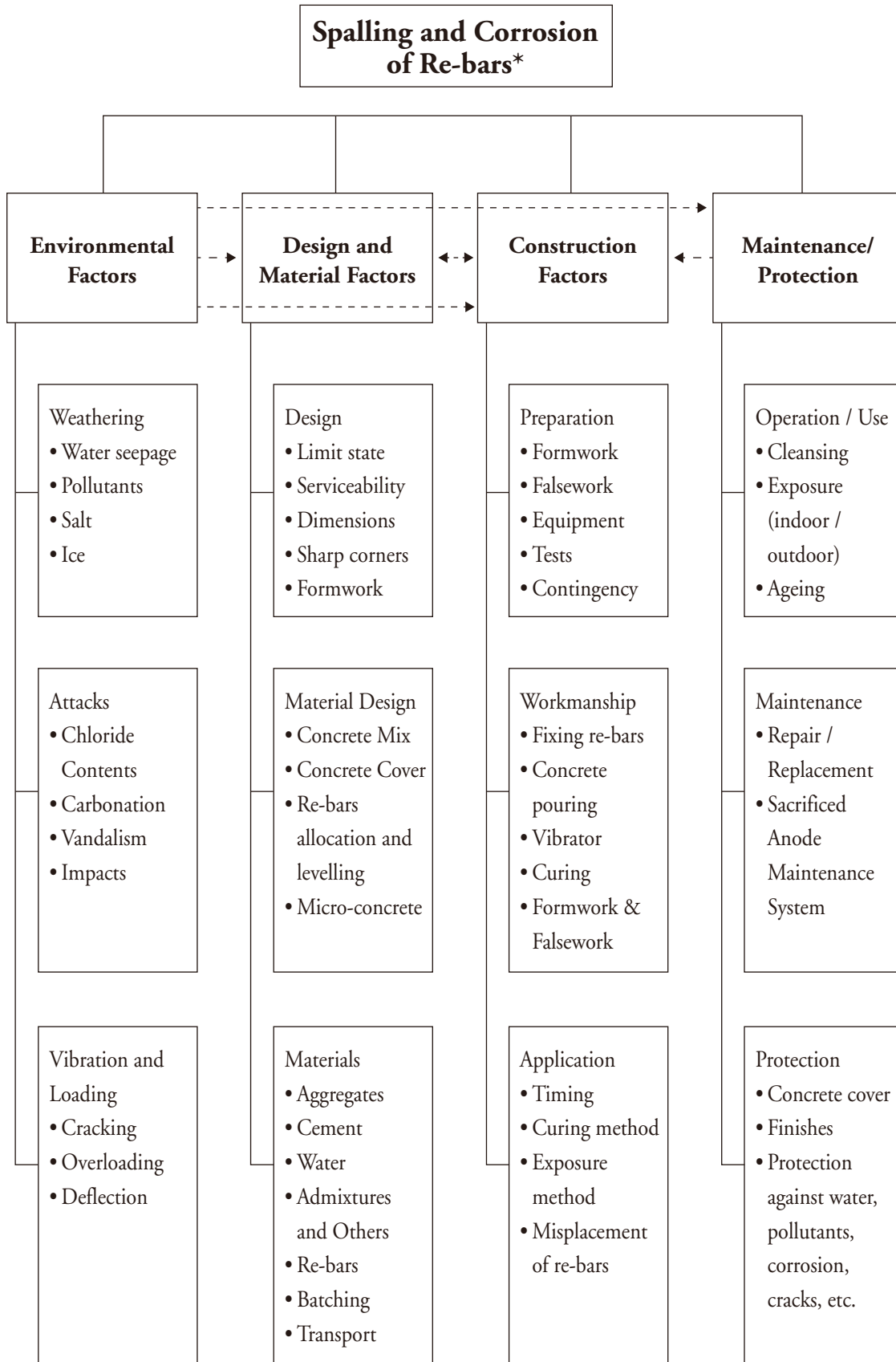


Figure 6.2 Causes of Structural Element Defects

* Re-bars stands for Reinforcement bars

6.3 FIRE SAFETY ELEMENTS

1. Refer to Volume II of this Guide for the inspection of fire services installations. This part focuses only on those building elements that relate to fire safety.
2. Refer to Paragraph 5.3 of this Guide for a condition survey of the fire safety elements. If there is no defect in these elements, then check for incompliance.
3. Defective fire doors (such as broken doors or widened gaps) or defective fire resisting building components are regarded as defective physical elements of a building.
4. It is hard to ascertain the fire-related properties, such as the fire resisting periods, of existing building materials without carrying out fire tests.
5. Fire certificates, if available, can only be taken as a reference, as it is hard to ascertain if the existing fire resisting elements correspond to the objects certified by the fire certificates. There may also be doubts concerning the degradation of the fire-resistant properties over the lifetime of the elements.
6. There can be many different causes for the incompliance of the fire safety elements. A formulation of any rectification strategy must be based on the results of thorough investigations and robust analyses of the causes. The potential causes of the incompliance of the fire safety elements are categorised into a four x three matrix in Figure 6.3. In case of uncertainty over the cause(s) of the incompliance, a detailed investigation may be required.
7. The following symptoms are regarded as common defects of the MOE in the MBIS CoP 2012 and others:
 - a. Defective or missing exit signs
 - b. Inadequate lighting
 - c. Defective balustrades and handrails along staircases and escape routes
 - d. Door swing obstructing the means of escape
 - e. Blocked or obstructed means of escape
 - f. Defective treads
8. The following symptoms are regarded as common defects of the MOA in the MBIS CoP 2012 and others:
 - a. Blocked means of access to the building, particularly along the rear lane
 - b. Blocked or obstructed means of access within the building, such as access to the fireman's lift lobby on the G/F
 - c. Dilapidated EVA
 - d. Defects in the integrity of the fireman's lift lobby
9. The following symptoms are regarded as common defects of the FRC in the MBIS CoP 2012 and others:
 - a. Defective or dilapidated materials resulting in inadequate fire resisting construction
 - b. Ventilation ducts or other building services passing through compartment walls or floors breaching the requirements for fire-resisting construction

- c. Broken hinges or glass panels on fire doors
 - d. Defective or non-provision of self-closing mechanisms on fire doors
 - e. Broken or dilapidated fire doors or fire resisting glazing
 - f. Inadequate fire resistance of the fire door or glazing
 - g. Non-emergency services such as electric wires, cables, and meters in the escape staircases and lobbies, without adequate fire protection;
 - h. Damaged staircase enclosures such as walls, windows, and doors, including those for the protected lobby
 - i. Obstruction to fire dampers or fire shutters for compartmentation
 - j. Defective or blocked staircase top vents
10. The following symptoms are regarded as common unauthorised alterations that affect fire safety in the MBIS CoP 2012 and others:
- a. Alterations to doors, gates, or roller shutters that obstruct escape routes
 - b. Unprotected openings along the enclosure walls of exit routes or compartment walls, floors, and ceilings
 - c. Structures on refuge floors
 - d. Door openings from cocklofts to exit staircases
 - e. Alterations to escape routes and protected lobbies or fire resisting construction that results in deficient fire safety
 - f. Structures on the main or flat roofs that obstruct the means of escape
 - g. Structures on the main or flat roofs with deficient fire resisting construction, such as inadequate fire separation between the structures in question and the main or flat roof that is designated a refuge floor
 - h. Structures blocking exits
 - i. Insufficient number of exits
 - j. Change in the provision of a fireman's lift or lobby along the fire-fighting and rescue stairway
 - k. Reduction in the width and height of the exit door/escape route or an increase in the travel distance to safety
 - l. Removal of fire doors, fire shutters, and other fire resisting structures
 - m. Any other unauthorised alteration and addition that affects the fire safety of the building being inspected
11. The following symptoms are regarded as common unsuitable changes that affect fire safety in the MBIS CoP 2012 and others:
- a. Change in the storage of hazardous materials
 - b. Change that results in the approved capacity of the means of escape and/or imposed load of a room or storey being exceeded.
12. The above are either defects of physical components that can result in deficient fire safety or non-compliance with the statutory fire safety requirements.

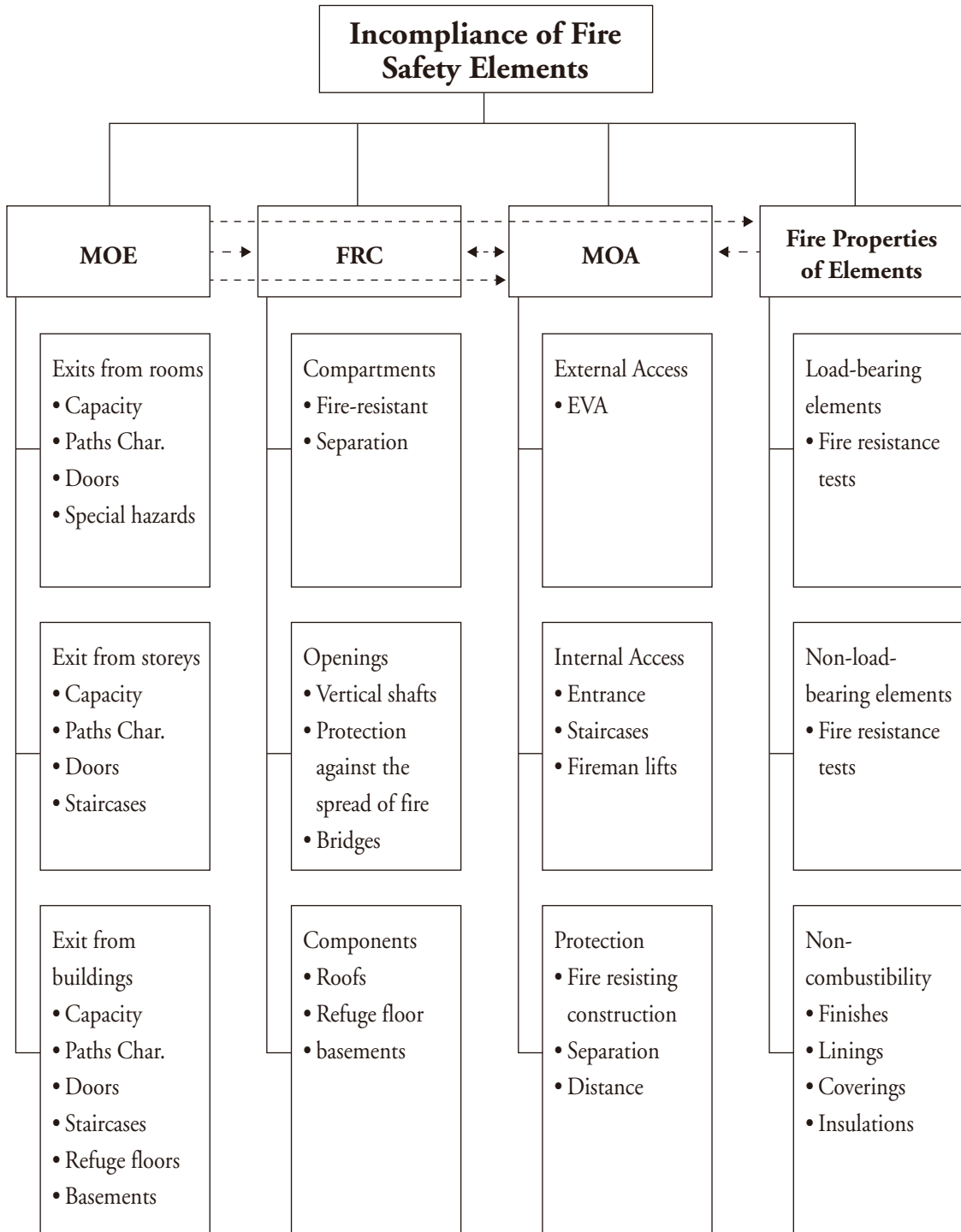


Figure 6.3 Causes for the Incompliance of the Fire Safety Elements

* Char. stands for Chacacteristics

6.4 DRAINAGE SYSTEM

1. We only focus on the aboveground drainage systems of buildings. Underground drainage, sewage, and water supply systems are beyond the scope of this Guide. Refer to other references for these systems.
2. The following six symptoms are regarded as common drainage system defects in the MBIS CoP 2012:
 - a. Corrosion, leakage, deformation, displacement, damage to and blockage of drainage pipes and traps, including underground drains
 - b. Corrosion, loosening, or breaking of metal brackets
 - c. Damage or blockage of manhole/septic tank
 - d. Broken and blockage of surface channel, gullies, and catch pits
 - e. Missing drainage pipes or grating on the top of ventilating pipes
 - f. Deterioration of the mica flap in the fresh air inlet
3. Pay attention to any design fault of traps and anti-siphonage pipes /valves in the drainage system.
4. The following four unauthorised alterations of a drainage system are highlighted in the MBIS CoP 2012:
 - a. Misconnection of waste water pipes to the surface water drainage system or the discharge of waste water to external parts of the building or open areas
 - b. Drainage alterations and additions that result in a discharge of untreated trade effluents, including hot water, into the drainage system, to the external parts of the building, or into open areas
 - c. Misconnection of the surface water to the foul water system
 - d. Any other unauthorised alteration of and addition to the drainage system that may adversely affect it
5. The so-called symptoms and alterations of a drainage system in the MBIS CoP 2012 are not defects, but causes of defects. Normally, the observable defects of a drainage system are commonly: (1) leakage; (2) blockage; (3) overflow/flooding/pollution; (4) dry traps/insufficient water seal; and (5) offensive odour.
6. There are many different causes of drainage system defects and the formulation of any rectification/repair strategy should be based on the results of thorough investigations and robust diagnoses. The causes of drainage system defects are categorised into a four x three matrix in Figure 6.4. In case of uncertainty over the cause(s) of a defect, a detailed investigation may be required.
7. Previous test and/or repair reports on the drainage system, such as a pressure test and smoke test, if available, should be referenced. They help one ascertain the system's initial conditions so that the cause(s) of such defects can be identified and rectified.
8. Water seepage may also be caused by drainage system defects. Refer to the HKIS (2013a) Professional Guide for Detection and Diagnosis of Water Seepage in Residential Buildings (Investigation & Diagnosis) for tips on investigating and diagnosing water seepage problems.

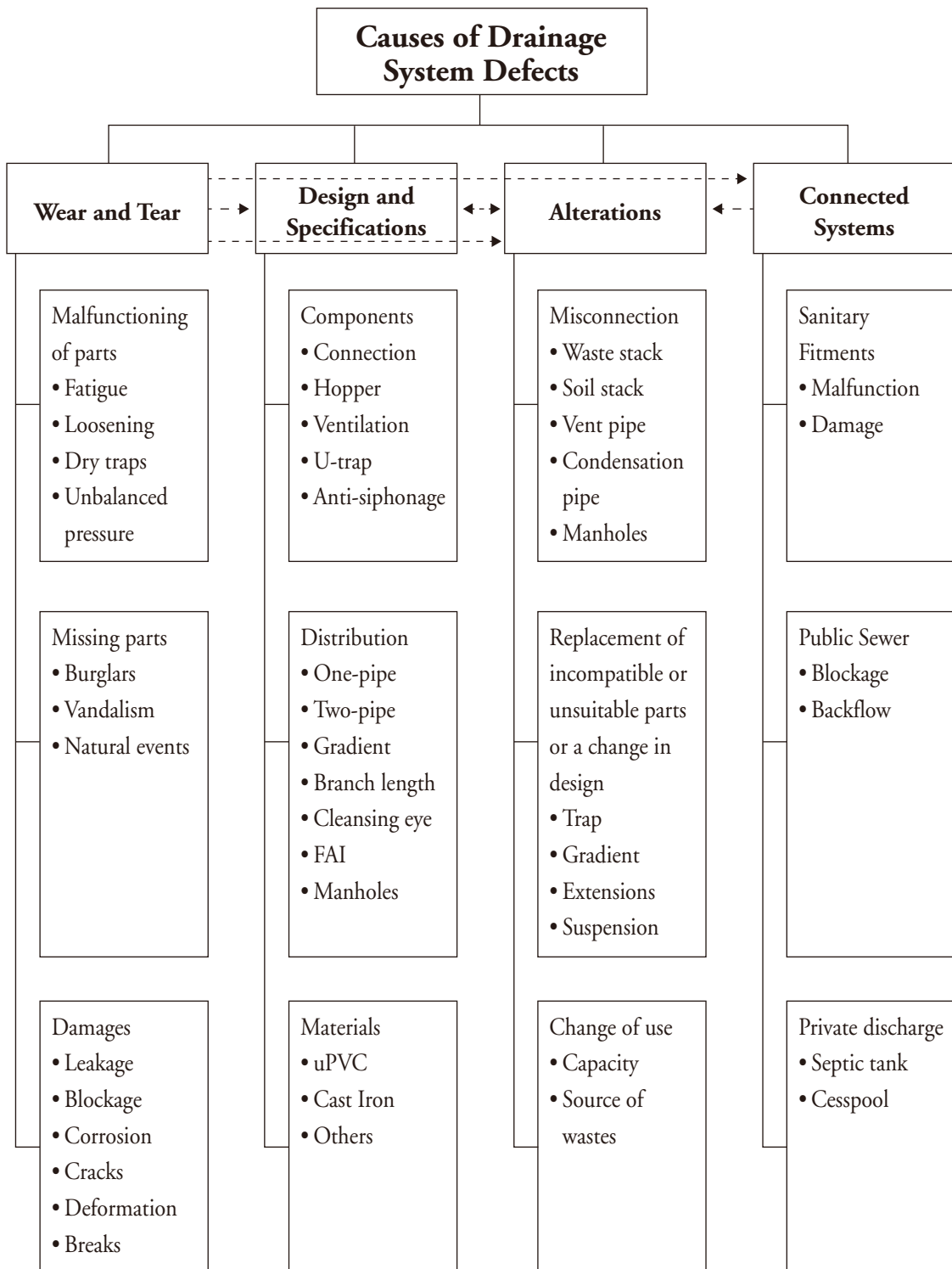


Figure 6.4 Causes of Drainage System Defects

6.5 FACTORS TO BE CONSIDERED FOR DETAILED INVESTIGATIONS

The following are some factors to be considered for further detailed investigation after the visual inspection. Note that the factors below are not exhaustive and depend on the unique situation of each case. Members are reminded to exercise professional judgment when recommending a detailed investigation.

1. When the defects / symptoms are non-trivial and clear and their cause(s) cannot be ascertained without further detailed investigation
2. When there are strong and reasonable suspects behind the latent defects, which cannot be ascertained without further investigation
3. When the age, environmental exposure, and/or use of the building puts it at a very high risk of developing defects
4. When the risk level of some latent defects of a particular category / building vintage is very high, in which risk = probability x consequence

Beware of over-diagnosis, i.e. suggesting detailed investigations or repairs when the situation does not justify them.

6.6 PROFESSIONAL ETHICS AND REFERENCES TO GOVERNMENT REPORTS

1. Remember to thoroughly read the HKIS's Rules of Conduct to understand the required ethical standards for delivering an inspection service:
http://www.hkis.org.hk/en/pdf/rule_of_conduct.pdf.
2. Ensure that the inspection is carried out and reported in a professional manner.
3. Ensure that the building inspection is carried out in person with full records verified on-site with evidence.
4. In case any premises or parts of premises cannot be accessed, immediately report this to the client. The possibility of imminent danger cannot be ruled out without carrying out an on-site inspection.
5. Members may refer to the following inspection reports published by the Buildings Department on some notable building incidents for reference:
 - a. BD (1993) Report on the Collapse of the Buildings at Nos. 28–30 Wing On Street, Hong Kong, Hong Kong.
 - b. BD (1994) Final Report on the Collapse of the 1/F Canopy Albert House, 12 Sai On Street and 20–28 Chengtu Road, Aberdeen, Hong Kong.
 - c. BD (1995) Report on Condition Survey of Private Reinforced Concrete Building Structures. By Taywood Engineering Ltd, Hong Kong.
 - d. BD (1998a) Investigation Report on the Collapse of the Canopy at 418A Kwun Tong Road (WKK Factory Building). November 1998, BD Report BD 1/98, Hong Kong.
 - e. BD (1998b) Report on the Collapse of 1/F Balcony at No.1P Marble Road, North Point, Hong Kong. November 1998, BD Report BD 2/98, Hong Kong.
 - f. BD (1999) Consultancy Study on Steel Corrosion and Material Deterioration of Buildings Completed between 1959 and 1980. By Taywood-Arup-Vigers JV, Hong Kong.
 - g. BD (2010) Report on the Collapse of the Building at 45J Ma Tau Wai Road, To Kwa Wan, Kowloon - K.I.L. 8627.

References

ASTM D4788-03 (2007) Standard Test Method for Detecting Delaminations in Bridge Decks Using Infrared Thermography, American Society for Testing and Materials (ASTM), US.

BD (1993) Report on the Collapse of the Buildings at Nos. 28–30 Wing On Street, Hong Kong, Hong Kong.

BD (1994) Final Report on the Collapse of the 1/F Canopy Albert House, 12 Sai On Street and 20–28 Chengtu Road, Aberdeen, Hong Kong.

BD (1995) Report on Condition Survey of Private Reinforced Concrete Building Structures. By Taywood Engineering, Ltd., Hong Kong.

BD (1998a) Investigation Report on the Collapse of the Canopy at 418A Kwun Tong Road (WKK Factory Building). November 1998, BD Report BD 1/98, Hong Kong.

BD (1998b) Report on the Collapse of 1/F Balcony at No.1P Marble Road, North Point, Hong Kong. November 1998, BD Report BD 2/98, Hong Kong.

BD (1999) Consultancy Study on Steel Corrosion and Material Deterioration of Buildings Completed between 1959 and 1980. By Taywood-Arup-Vigers JV, Hong Kong.

BD (2010) Report on the Collapse of the Building at 45J Ma Tau Wai Road, To Kwa Wan, Kowloon - K.I.L. 8627.

BD (2012) Practice Guidebook for Adaptive Re-use of and Alteration and Addition Works to Heritage Buildings, Buildings Department, HKSAR Government, HK.

EPD (1993) Code of Practice on the Handling, Transportation and Disposal of Asbestos Waste, Environmental Protection Department, HKSAR Government, HK.

EPD (2011) Controls on Asbestos Materials, Legislative Council LCQ11 replied on July 6, 2011, Environmental Protection Department, HKSAR Government, Hong Kong.

Glover, P. (2009) Building Surveys, 7th Edition, Elsevier, Amsterdam.

HKIS (2008a) Reference Conditions for Appointing Consultants (Building Maintenance)
(), The Hong Kong Institute of Surveyors, Hong Kong.

HKIS (2008b) Guide to Take-over Domestic Unit for Prospective Homebuyer, The Hong Kong Institute of Surveyors, Hong Kong.

HKIS (2008c) Standard Form of Contract for Decoration, Repair and Maintenance Works, The Hong Kong Institute of Surveyors, Hong Kong.

HKIS (2009) General Specification for Building Maintenance Works in Residential Buildings, The Hong Kong Institute of Surveyors, Hong Kong.

HKIS (2010) A Guide to Prepare a Building Maintenance Manual, The Hong Kong Institute of Surveyors, Hong Kong.

HKIS (2013a) Professional Guide for Detection and Diagnosis of Water Seepage in Residential Buildings (Investigation & Diagnosis), The Hong Kong Institute of Surveyors, Hong Kong.

HKIS (2013b) Guide to Prospective Homebuyers Care on Purchase, Take Over & Fit-out, The Hong Kong Institute of Surveyors, Hong Kong.

Ho, D.C.W., Lo, S.M. and Yiu, C.Y. (2005) A Study on the Causes of External Finishes Defects in Hong Kong, *Structural Survey*, 23(5), 386-402.

Noy, E.A. (2005, revised by James Douglas) *Building Surveys and Reports*, 3rd edition, Blackwell, UK.

Sarja, A. and Vesikari, E. (eds.) (1996) *Durability Design of Concrete Structures*, RILEM Report 14, E&FN Spon, London, UK.

Appendixes

APPENDIX 1 BUILDING INSPECTION EQUIPMENT

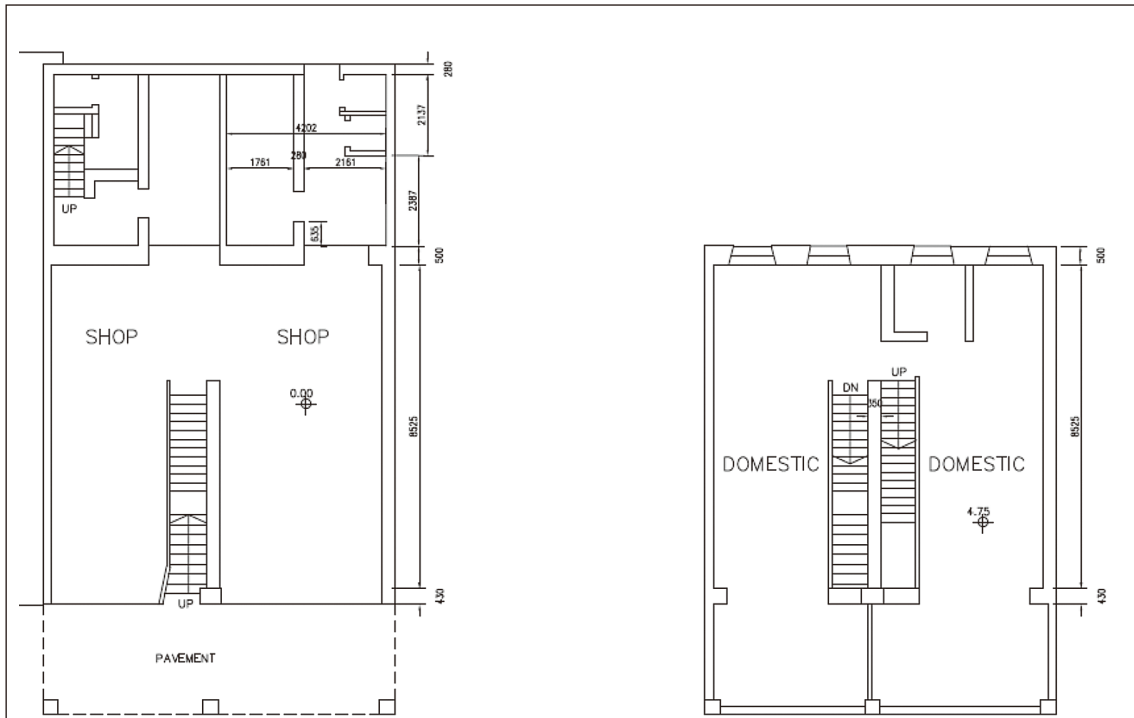
The following list of equipment to bring on an inspection is not comprehensive, but can serve as a guide. The equipment necessary for any survey naturally depends on the scope and depth of the investigation, which should be stated in the brief.

General Tools and Equipment for Visual Inspection

1. Camera ;
2. Tape rule ;
3. Hand torch ;
4. Pocket mirror ;
5. Tapping rod ;
6. Mallet ;
7. Philips head screwdriver ;
8. Electricity test driver ;
9. Metal detector
10. Laser pointer
11. Marker (felt-tip pen / , chalk , carpenter's pencil , etc.)
12. Steel wire brush / Brass wire brush
13. Nylon brush / Painter's brush ;
14. Stripping knife / scrapper
15. Foldable rule ;
16. Spirit level ; Plumb rule ; Plumb level ;
17. Golf ball / Soft ball; /
18. Binoculars ;
19. Magnifying glass ;
20. Compass ;
21. Filler gauge / Crack gauge ;
22. Vernier calipers (optional with depth gauge) ();
23. Micrometer screw gauge / ;
24. Inclometer (Inclinometer); / ;
25. Moisture Meter ;
26. Infrared Camera ;
27. Thermometer ;
28. Relative Humidity Meter ;
29. Concrete cover meter

APPENDIX 2 TYPICAL FLOOR PLANS AND ELEVATIONS OF DIFFERENT VINTAGE BUILDINGS IN HONG KONG

Appendix 2.1 Floor plans and elevations of a typical residential building in Hong Kong built before 1945



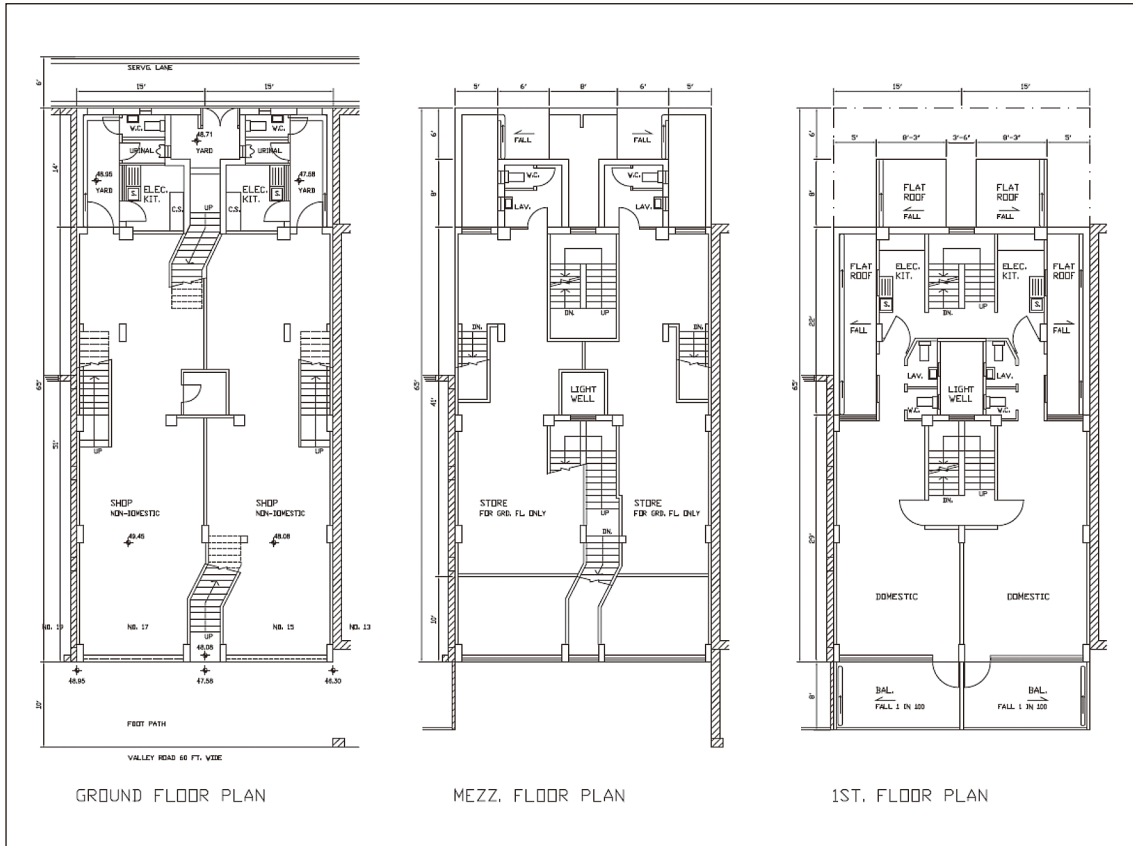
Typical Ground Floor Plan for Domestic Buildings built before 1945

Typical First Floor Plan for Domestic Buildings built before 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.

*Appendix 2.2 Floor plans and elevations of a typical residential building in
Hong Kong built between 1946 and 1967*



Typical Ground Floor Plan for Domestic Buildings built from 1946 to 1967

Typical Mezz. Floor Plan for Domestic Buildings built from 1946 to 1967

Typical First Floor Plan for Domestic Buildings built from 1946 to 1967

Typical special features:

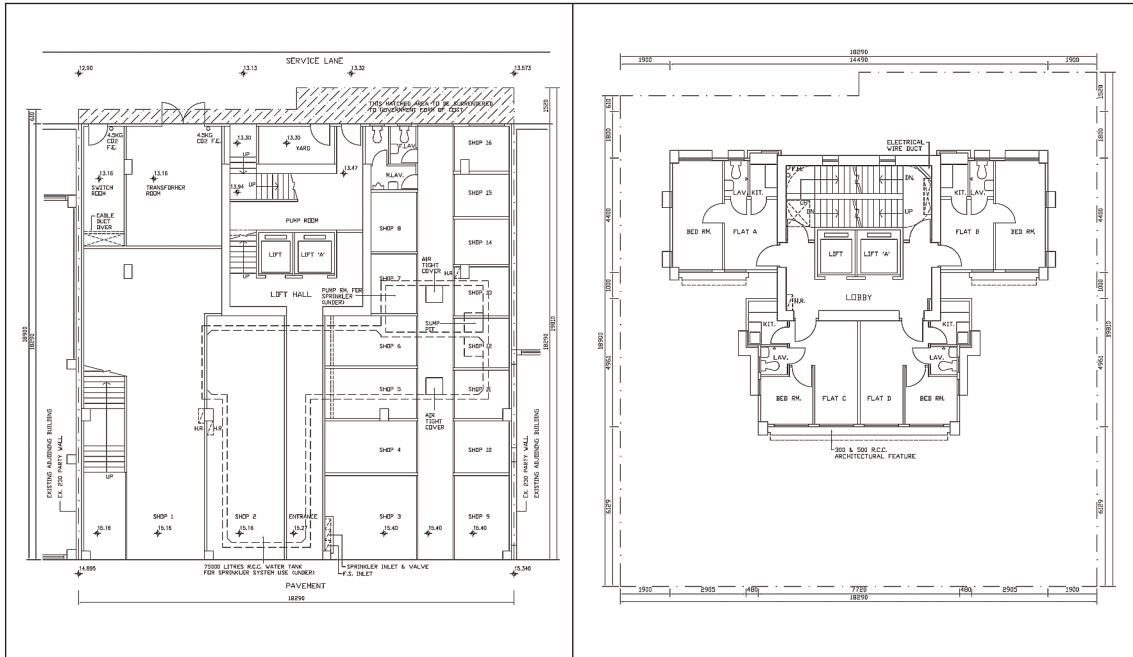
1. Cantilevered balcony projects over street without supporting columns on the street; the balcony might have been enclosed.
2. Two staircases serving two units per storey with one (enclosed) leading to the main street and the other (open) leading to the scavenging lane. The two staircases are connected via exclusive possessive areas. The fire safety provisions are different from those found in other vintage buildings.
3. A scavenging lane with two yards in the back.
4. Composite use with shops normally on the ground level and the mezzanine Floor (cockloft) and domestic use on the upper floors.
5. Similar blocks are built next to the building without building gaps.
6. Medium-rise of normally seven to 14 storeys.
7. Light-well and lift may be present.



Typical Front Elevation for Domestic Buildings built from 1945 to 1967

Typical Rear Elevation for Domestic Buildings built from 1945 to 1967

*Appendix 2.3 Floor plans and elevations of a typical residential building in
Hong Kong built between 1968 and 1980*

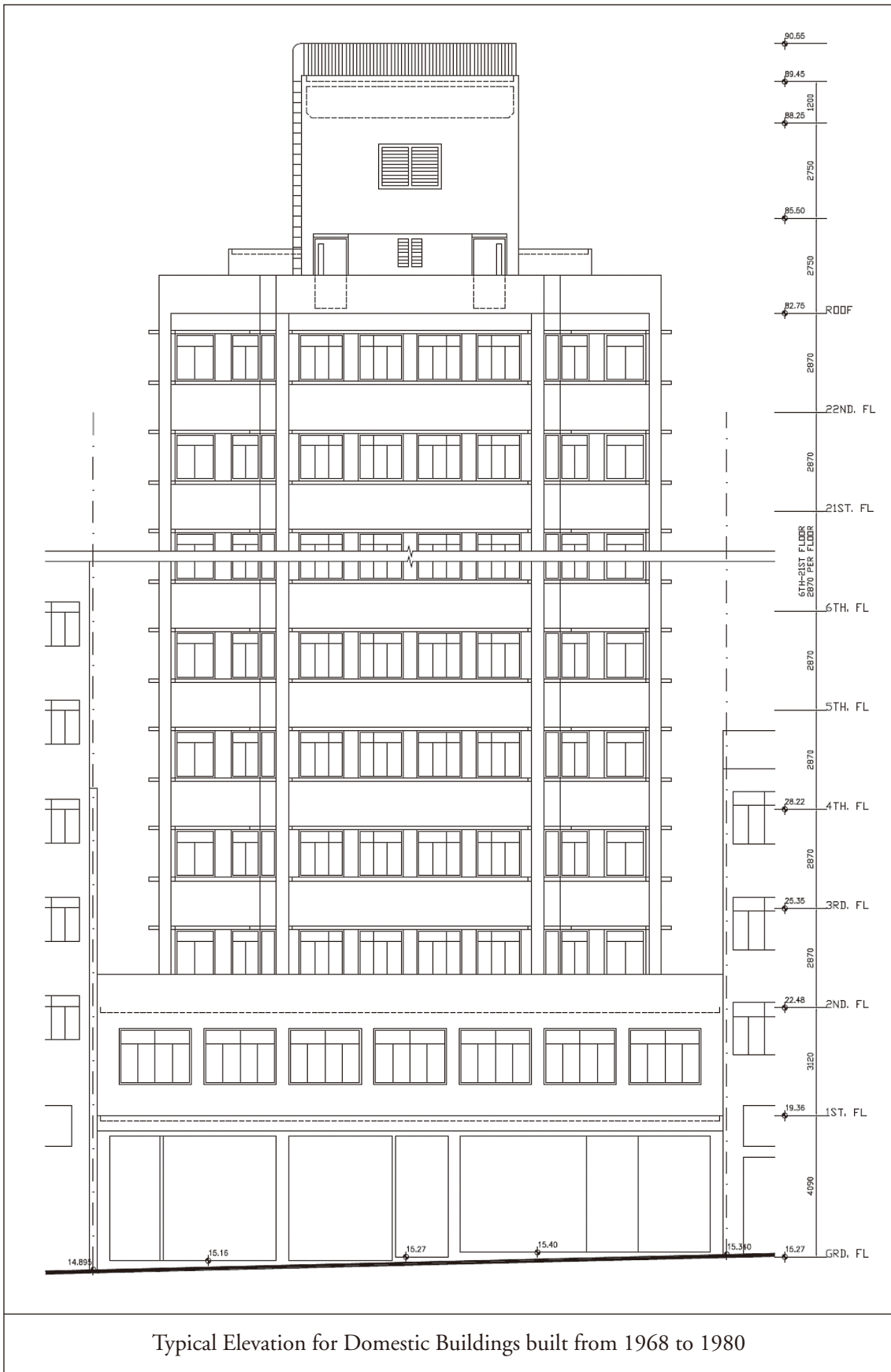


Typical Ground Floor Plan for Domestic Buildings built from 1968 to 1980

Typical First Floor Plan for Domestic Buildings built from 1968 to 1980

Typical special features:

1. All features except the canopy were built within the lot boundary with no veranda or balcony projecting over the street. The podium normally covered the whole lot and the domestic blocks covered a certain portion of the lot.
2. Two or more staircases served 4-8 units per storey. The two staircases were scissors-type, enclosed, and led to the street or to the podium. They were connected via common areas. The fire safety provisions were different from those of other vintage buildings.
3. Towers (blocks) were built on top of a podium with building gaps.
4. Composite use on the podium floors usually consisted of shops of no more than 15m in height and block(s) for domestic use on top of the podium.
5. High-rise of normally 15-30 storeys.
6. Lifts and an enclosed lift lobby were usually found in the common areas and a lift machine room was located on the roof top.



APPENDIX 3.1 – S.128 OF BO 1935

S.128 (1) It shall not be lawful to commence any building works without the consent of the Building Authority and the following procedure shall be followed-

- (a) Notice in writing in the prescribed form of the intention to commence any building works shall be given to the Building Authority by leaving the same at his office. Every such notice shall clearly state the locality of the intended building works and the number and section or sub-section of the lot on which it is intended to build and shall state any special or material particulars in connection with the same which it is not possible to denote on the plans. Such notice shall also state the name and address of the owner and occupier of the building or lot and shall be signed by such owner or occupier or by the duly authorised agent of such owner or occupier.

- (b) Proper plans of such building works signed by an authorised architect showing the position, form, description and dimensions of all portions thereof shall be submitted to the Building Authority with the aforesaid notice for his approval. If repairs, alterations or additions are intended to be made to any existing building they shall be clearly differentiated on the plan from the existing work intended to be left intact or utilised in carrying out such repairs, alterations or additions; and if the Building Authority shall consider it necessary so to do he may require further plans to be submitted of other portions of the existing building and of any adjoining buildings. Unless dispensed with by the Building Authority the details of any drainage to be constructed shall be shown on the plan. Every plan shall be drawn on tracing linen or other material approved by the Building Authority, to a scale of not less than one-tenth of an inch to the foot, and shall contain enlarged details with figured dimensions of the principal features of construction and shall also show the position and levels of the surrounding ground and buildings. In cases where several alterations are made in the original design during the carrying on of work involving the submission of amended plans, the Building Authority may require the submission of a complete set of new plans showing the building as completed.
In the case of minor alterations or repairs the Building Authority may dispense with the submission of plans by an authorised architect.

APPENDIX 3.2 – S.9(1) OF BO 1955

S.9(1) Except as otherwise provided by this Ordinance, no person shall commence or carry out building works without the consent of the Building Authority in the prescribed form. Such consent shall not be deemed–

- (a) to confer any title to land; nor
- (b) to act as a waiver of any term in any lease or licence; nor
- (c) to grant any exemption from the provisions of this Ordinance; nor
- (d) to permit any contravention of the Landlord and Tenant Ordinance.

(2) The Building Authority may refuse his consent to the carrying out of any building works where–

- (a) he has not received–
 - (i) notice in writing in the prescribed form;
 - (ii) such plans as may be prescribed by regulations; and
 - (iii) such other documents and information as may be so prescribed; or
- (b) the prescribed fees in respect of such plans have not been paid:

Provided that where plans are received within twelve months of the coming into operation of this Ordinance the Building Authority may give his consent to the carrying out of building works which conform to the provisions of the Buildings Ordinance.

(3) In giving his consent to the carrying out of any building works involving the structural use of steel, concrete or timber the Building Authority may, notwithstanding the provisions of any regulations, by order in writing require the building owner, authorised architect and registered contractor to comply with such conditions as he may prescribe concerning–

- (a) maximum loads and stresses;
- (b) tests of materials;
- (c) the use of materials;
- (d) standards of workmanship; and
- (e) qualified supervision.

(4) The Building Authority may refuse his consent to the carrying out of any building works which would result in a new building until he has received plans in respect of the whole building for such building works as in his opinion are necessary to make such building comply with the standard of structural stability and public health established from time to time by regulations.

APPENDIX 3.3 – S.16, S22-S.25 OF B(A)R 1956

- S.16(1) Except as otherwise provided or exempted by the Building Authority, plans shall be submitted in triplicate in respect of every proposed building work to show clearly–
- (a) a plan of every floor and roof of the building, on which shall be indicated full dimensions, thickness of walls, the positions of all windows, water-closets, urinals, water-storage tanks, baths, wash-basins, sinks and other sanitary fittings and the intended uses of the several parts of the building;
 - (b) all elevations of the building;
 - (c) one or more sections to indicate the foundations, the levels of the site and the lowest floor of the building, the height of the building, the clear height of every storey, the positions of windows and the floor and roof levels of any adjoining or adjacent building.
 - (d) the levels of adjacent streets in relation to a known datum and to the levels of the site and the building;
 - (e) the width of any streets adjacent to the site;
 - (f) a foundation plan, showing sizes and positions of foundations;
 - (g) a drainage plan to indicate sizes and depths of drains, connexions to a Government sewer, stormwater drain, or nullah or other method of the disposal of drainage, the positions of disconnecting traps and the means of ventilation;
 - (h) a block plan, indicating the size and position of the building, other buildings and premises in the immediate vicinity and neighbouring streets;
 - (i) a key plan showing the position of the site when such site is not sufficiently identifiable from the block plan;
 - (j) the position, depth and construction of any well;
 - (k) by means of a diagrammatic plan with full dimensions and calculations –
 - (i) the height, volume and disposition of such building in accordance with the provisions of regulations 17, 18, 19 and 20 of the Building (Planning) Regulations;
 - (ii) any open space required for such building in accordance with the provisions 22, 23, and 24 of the Building (Planning) Regulations.
- (2) (a) Plans showing structural details shall be submitted in duplicate together with one set of full calculations including stress diagrams where necessary for any –
- (i) building works involving the structural use of steel or the structural use of reinforced concrete,
 - (ii) retaining wall constructed of masonry or brick-work, and
 - (iii) other structure designed by calculation under any Code of Practice or London County Council By-laws permitted under these regulations.
- (b) A certificate in the prescribed form completed and signed by the authorised architect shall also be submitted for any building works involving the structural use of steel or the structural use of reinforced concrete.

- (3) In the case of any balcony, canopy, bridge or other similar projection over a street or unleased Crown land, one set of plans shall be submitted indicating clearly the nature and dimension of such projection.
- (4) The Building Authority may also require additional plans, enlarged details, documents, information regarding water supply, specifications and use of any special materials and any other particulars which he may deem relevant to the proposed building work.

S.22(1) When he is satisfied that any plans, which are submitted to him, comply with the provisions of the Ordinance and of any regulations, the Building Authority shall issue a permit in the prescribed form authorizing the commencement and execution of any building works shown on such plans. Such a permit shall not be taken as an acknowledgment that such plans comply with lease conditions or with the requirements of any other authority.

- (2) When issuing such a permit the Building Authority shall officially stamp, sign, date and return to the authorised architect—
 - (a) two sets of plans where such plans have been submitted in triplicate,
 - (b) one set of plans where such plans have been submitted in duplicate.

S.23(1) An officially stamped, signed and dated copy of every plan approved by the Building Authority shall be supplied by the authorised architect who has been engaged to supervise any building works, to the registered contractor employed on such works as provided in paragraph (2) of regulation 7.

- (2) It shall be the duty of such contractor to keep every such plan available on such works as provided in paragraph (2) of regulation 12 for inspection by the Building Authority or any officer deputed by him.

S.24 Subsequent to the approval of any plans, the Building Authority shall be notified in writing –

- (a) by a building owner before the commencement of any building works as required by paragraph (I) of regulation 3 and paragraph (I) of regulation 9;
- (b) by an authorised architect –
 - (i) within seven days of the commencement of any building works shown on such plans as required by sub-paragraph (a) of paragraph (4) of regulation 7;
 - (ii) within fourteen days of the completion of any building works shown on such plans as required by sub-paragraph (a) of paragraph (7) of regulation 7;
 - (iii) on completion of any drainage works in accordance with the provisions 31 and 32 of the Drainage (General, Water Closets and Urinals etc.) Regulations;
- (c) by a registered contractor before the commencement of any building works as required by paragraph (I) of regulation 12.

S.25 In any case in which several alterations are made in the original design of a building, for which amended plans have been submitted, the Building Authority may require a complete set of new plans showing the building as it has been completed.

APPENDIX 3.4 – S.9(1) OF BO 1959

S.9(1) Save as otherwise provided, no person shall commence or carry out any building works or street works without having first obtained from the Building Authority–

(a) his approval in the prescribed form of documents submitted to him in accordance with the regulations; and

(b) his consent in the prescribed form for the commencement of the building works or street works shown in the approved plan.

(2) Neither the approval of any plans nor the consent to the commencement of any building works street works shall be deemed–

(a) to confer any title to land;

(b) to act as a waiver of any term in any lease or licence; or

(c) to grant any exemption from or to permit any contravention of any of the provisions of this Ordinance or of any other enactment.

APPENDIX 3.5 – S.38-S.42 OF BO 1935: REQUIREMENTS OF ROOFS

- S.38: specified materials for roofs: "The roof of every building and of any minor superstructure placed above such roof except the doors, and frames of dormers or sky-lights, shall be externally covered with tiles, glass, metal, or other incombustible substance. All hatchways leading out to the roofs of buildings shall be provided with hatches or covers which, if not composed entirely of metal, shall be properly sheathed externally in sheet-zinc or other metal approved by the BA.
- S.39: No roof timbers of any one building shall approach nearer than 9 inches towards the roof timbers of any other contiguous building, and the space intervening between the ends of such timbers shall be properly and substantially built up solid with whole bricks or with stone laid in mortar.
- S.40: No platform, superstructure, staging, framework, wire, wire netting, bamboo, matting or structure whatsoever, shall be erected, maintained or fixed over or upon the roof of any building except with the permission of the BA or unless used solely for the purpose of drying clothes.
- S.41: The roofs of all buildings, including verandahs shall not, unless wholly constructed of incombustible materials, be built into the thickness of any wall, but shall either rest upon the top of the wall or upon corbelling or an offset, so arranged as to give a bearing of at least 4-1/2 inches for the roof.
- S.42: The roof of every building (including every verandah and balcony) and the floors of every verandah and balcony shall be so arranged and constructed, and so supplied with eaves-gutters and rain-water down-pipes properly connected with the side-channels as to prevent any water being discharged upon or over any public foot-path or roadway.

APPENDIX 3.6 – S.48-S.50 OF BO 1935: VERANDAHS AND BALCONIES OVER STREETS

S.48: No encroachment shall be made on, over or into any street whether public or private ... By any verandah or balcony, or by any area, or by any structure whatsoever - (a) unless with the previous consent of the Governor and subject to such conditions as he may see fit to impose; and (b) until the applicant for leave to make such encroachment shall have previously signed an undertaking in the prescribed form; and (c) unless in accordance with the regulations made hereunder; and (d) unless the building to which such verandah, balcony, area or structure appertains shall comply in all respects with every provision of this Ordinance."

- The prescribed forms were enclosed in Schedules E and F of the Ordinance, and the corresponding regulations governing verandah and balcony over streets were enclosed in Schedules G and H of the Ordinance. (Appendix 3.7)

S.49: No balcony shall, except with the consent of the Governor in Council, be hereafter erected or re-erected to project over any street, whether public or private, which is less than 25 feet in width.

S.50: No verandah or balcony shall, except with the consent of the Governor in Council, be hereafter erected or re-erected to project from any building which exceeds in height the width of the street over which such verandah or balcony is intended to project, nor shall any building from which a verandah or balcony projects be afterwards increased in height so as to exceed the width of the street over which such verandah or balcony projects.

- The number of storeys and the projection of verandahs or balconies projecting over any street shall be determined by measuring on the line of the wall abutting on such street a vertical height equal to the width of the street over which the verandahs or balconies are intended to project and from the point thus determined a line at an angle of 75 degrees with the horizontal shall be drawn and any part of a verandah or balcony except the balustrade, falling outside such line shall be deemed illegal, and no portion of any verandah or balcony shall project beyond the line of kerb of the footpath underneath such verandah or balcony provided that in no case shall the projection exceed 11 feet 6 inches from the lot boundary adjoining such verandah or balcony and if there be no footpath the projection of the verandah or balcony shall be determined by the BA.

APPENDIX 3.7 – SCHEDULE G OF BO 1935 – VERANDAHS AND BALCONIES REGULATIONS

(Ordinance No. 18 of 1935) [1st January, 1936]

1. Notwithstanding anything containing in these regulations no structural alterations shall be required to be made in any verandah, balcony or basement already constructed in compliance with the regulations in force at the time.
2. Except as hereinafter mentioned any verandah projected over any street from the ground storey of any building shall not be less than ten feet wide, between the face of the wall from which it is projected and the inside face of the base of the piers or columns upon which it is supported.
3. As far as practicable, unless the Building Authority shall otherwise direct, the external face of the base of the piers or columns shall align with the face of the kerb of the side walk.
4. Any such verandah shall not be less than eleven feet high measured from the top of the kerb-stone or, if there is no kerb-stone, from the level of the centre of the street to the underside of the bressummers or lintels, or, if arches are used, to the highest point of the underside of each arch.
5. Any balcony projected over any street shall have a clear height underneath every part thereof of at least eleven feet measured from the top of the kerb-stone, or, if there is no kerb-stone, from the level of the centre of such street.
6. Any such verandah, balcony, or part thereof, projected over any street from any storey higher than the ground storey of any building, shall not be less than ten feet high. Such height shall be measured from the floor of the verandah, or balcony, to the underside of the bressummers or lintels, or, if arches are used, to the highest point of the underside of each arch.
7. The ends of all such verandahs or balconies, which do not abut on any verandah or balcony existing at the date of their construction, shall be left open and shall be finished in all respects in a similar manner to the front elevation thereof.
8. Special plans and drawings of any such verandah or balcony shall be submitted to the Building Authority and shall be on tracing cloth and such plans and drawings shall be drawn to a scale of not less than one-tenth of an inch to the foot, and the details of all brackets, mouldings, caps, cornices, balustrades, and similar parts of the proposed structure, shall be drawn to an uniform scale of one inch to the foot. Such plans and drawings shall clearly show the lines and levels of existing kerbs and any proposed alterations to such lines or levels. Figured dimensions shall be given of such proposed alterations.

9. Any such verandah or balcony shall be constructed of iron, stone, brick or other incombustible material approved by the Building Authority, except that the piers of every verandah shall on the ground floor of any building be made of cut stone worked straight, the exposed faces of which shall be extra fine punched or of other incombustible material approved by the Building Authority.
10. All bressummers and lintels, in connection with any such verandah or balcony, shall be constructed of iron or other incombustible material approved by the Building Authority.
11. The roof and floors of any such verandah or balcony shall be provided, to the satisfaction of the Building Authority, with gutters laid to a proper fall and with downpipes to carry off water.
12. In the case of balconies any bracket, which is not built into any party or cross wall or main wall other than the wall from which it projects, shall have its top member extended for a length of at least three feet underneath the floor joists, or be otherwise anchored down in a manner satisfactory to the Building Authority.
13. The foot-path or roadway underneath any verandah or balcony over unleased Crown land or projecting beyond any such verandah or balcony out to the kerb-stone shall be paved with fine cement-concrete at least 4 inches thick, or finely dressed granite stones, not more than 18 inches square, closely jointed and laid on a bed of lime-concrete, or with such other materials as may be approved by the Building Authority, by the owner for the time being of the property from which such verandah or balcony projects, who shall maintain the same in good order, to the satisfaction of the Building Authority: Provided that wherever the Building Authority may consider it expedient to do so he may lay or repair any such foot-path or roadway at the expense of the owner, as aforesaid, who shall pay into the Treasury, within seven days of the date of notice, the amount certified by the Building Authority as being due in respect of the work done, and in default of such payment the Building Authority may recover such amount by an action in the Supreme Court in its summary jurisdiction.
14. No verandah or balcony shall hereafter be constructed over any street unless the building from which it projects has a clear and unobstructed courtyard, backyard, back lane, or other open space, belonging exclusively to such building and extending across the entire width and in the rear of such building and of a minimum depth of 8 feet: Provided that -
 - a) a bridge or covered way, not exceeding 3 feet and 6 inches in width, when such is necessary for giving access to buildings in the rear of the property, shall not be deemed an obstruction to such courtyard, backyard, back lane, or other open space, within the meaning of this regulation;
 - b) The Building Authority shall have power to modify this regulation in any case in which he may consider it expedient to do so.
15. These regulations may be cited as the Verandahs and Balconies Regulations.

APPENDIX 3.8 – S.54-S.62 OF BO 1935: KITCHENS, FIREPLACES, AND CHIMNEYS

- S.54: Every domestic building, and every floor of a domestic building which is separately let for dwelling purposes, shall be provided with adequate kitchen accommodation, the internal area of which shall not, except with the permission of the BA, as signified by the approval of the plan required under the provisions of this Ordinance, be less than 60 square feet, and every kitchen shall be provided with a properly constructed fireplace, and every kitchen shall be properly paved or floored with cement-concrete or other non-absorbent material approved by the BA. The internal surface of the walls, of every kitchen shall also be rendered in cement-mortar, or other non-absorbent material approved by the said Authority to the height of at least 4 feet from the floor level, and the thickness of such material shall not be less than half an inch.
- S.55: No kitchen of any tenement house shall, without the permission of the BA as signified by the approval of the plan required under the provisions of this Ordinance, hereafter be constructed so as to extend across more than one half of the width of such building if such building has other buildings abutting against it on both sides or is separated from any adjacent building or from land on which any building may be erected by a less space than 20 feet throughout one side. The width of a building shall be measured parallel to the principal front and shall be the average distance between the centres of the party walls or the outer faces of the lateral external walls of such building.
- S.56: Every fireplace shall be constructed with a proper chimney or smoke-flue and in such a manner as not to allow the smoke to escape through any window or hole in the walls or roof or through any vent other than such chimney or smoke-flue. The interior surfaces of every brick or masonry chimney or smoke-flue shall be smoothly rendered with mortar, or lined with earthenware pipes and no such chimney or smoke-flue shall have less than 28 square inches of internal sectional area, equivalent to a diameter of 6 inches in the case of circular pipes, unless with the approval of the BA. Except when required for heating purposes, smoke-flues shall be encased with brickwork properly bonded into the wall in connexion with which they are constructed, and, when added to existing buildings, such brickwork shall be built in cement-mortar: Provided that in the case of chimneys or smoke-flues requiring to be extended to a greater height than 5 feet above the roof, any extension in excess of that height may, at the discretion of the BA, consist of iron pipes.
- S.57: Whenever any fireplace is adapted for the use of charcoal or wood as fuel, such fireplace shall be provided with a hood of sheet-metal or other approved material of sufficient size connecting with a chimney or smoke-flue carried up above the level of the main roof.
- S.58: The upper surface of any floor under any oven, stove or fireplace shall be of incombustible materials, extending over the whole area covered by such oven, stove or fireplace and beyond to a distance of 9 inches at least on every side of such oven, stove or fireplace, and such floor shall have hearths of stone, tile or other incombustible material laid before every chimney-opening.
- S.59: No chimney or smoke-flue shall be constructed or fixed nearer than 9 inches to any wood-work or combustible material unless encased in non-conducting and incombustible material to the satisfaction of the BA.
- S.60: Every brick or masonry chimney or smoke-flue shall be continued up above the roof in brick or cut stone-work, of a thickness all round of not less than 4 inches, to a height of not less than 3 feet above the highest point in the line of junction with such roof, and every such chimney or smoke flue hereafter erected above such point shall be built in cement-mortar.
- S.61: Chimneys of brick, stone, or other incombustible material, may be corbelled out in the upper storeys of buildings, provided that the work so corbelled out does not project from the wall more than the thickness of such wall, but all chimneys built in the ground storeys of buildings shall, unless with the consent of the BA, rest upon solid foundations and upon footings similar in every respect to the foundations of the walls against which such chimneys are built.
- S.62: The back of every chimney-opening, from the hearth up to the height of 4 feet above the level of the fire-grate, shall be at least 9 inches thick if in a party wall, or at least 4-1/2 inches thick if not in a party wall.

APPENDIX 3.9 – S.182-S.190 OF B(C)R 1975: FIRE RESISTING CONSTRUCTION

S.182: In this Part -
 "basement" means any storey of a building or any compartment which is wholly below the level of the street or streets on which such building abuts, or being partially below such level has no access to such streets in the event of fire;

"compartment of a building" means any volume, or floor area in any 1 storey, in any building assessed as a unit for the purposes of Table XLIII;

"elements of construction" means -

- (a) any floor, beam, column or hanger;
- (b) any load bearing wall or load bearing member; and
- (c) any staircase and the landings and supports thereto;

"F.R.P." means the period for which the element of construction is capable of resisting the action of fire when tested in accordance with BS 476:Part 8 or as specified in the Third Schedule;

"staircase" includes landings and lobbies attached thereto without any intervening enclosure.

S.183: Every building shall be separated from any adjoining building by a wall having an F.R.P. Of not less than 4 hours.

S.184(1): Each element of construction in a building or compartment of a building shall have an F.R.P. Not less than that specified in Table XLIII appropriate to the use and the volume, or floor area in any one storey, as the case may be:

Provided that each element of construction in any building which exceeds 3 storeys shall in no case have an F.R.P. of less than 1 hour.

TABLE XLIII (extracts of the "domestic use" portion only)

Use	Volume, or floor area in any 1 storey (as the case may be)	Fire resisting period
3 Office or domestic purposes; schools; hospitals.	(a) (i) More than 1400 m ³ but not more than 3500 m ³ in volume; or	1/2 hour
	(a) (ii) More than 90 m ² but not more than 230 m ² in floor area in any 1 storey.	1/2 hour
	(b) (i) More than 3500 m ³ in volume; or	1 hour
	(b) (ii) More than 230 m ² in floor area in any 1 storey.	1hour

Use	Volume, or floor area in any 1 storey (as the case may be)	Fire resisting period
5 Partly for domestic purposes and partly for manufacture, any part used for trade or manufacture.	(a) (i) More than 900 m ³ in volume.	1/2 hour
	(a) (ii) More than 900 m ³ but not more than 1800 m ³ in volume.	1 hour
	(a) (iii) More than 1800 m ³ in volume	2 hours
	(b) (i) Not more than 90 m ² in any 1 storey.	1/2 hour
	(b) (ii) More than 90 m ² but not more than 230 m ² in floor area in any 1 storey.	1 hour
	(b) (iii) More than 230 m ² in floor area in any 1 storey.	2 hours

S.184(2) Save with the consent of the Building Authority the floor area of any 1 compartment used for bulk storage or warehouse purposes shall not exceed 700 m².

S.184(3) Where a single storey building does not exceed 7000 m³ in volume or 7.5m in height, steel work therein other than columns and beams in external or party walls may, subject to the provisions of PART XI (Structural Use of Steel) be unprotected.

S.184(4) The joints of any elements of construction shall be tight and proof against the passage of smoke or flame.

S.185: Every compartment of a building shall be separated from any adjoining compartment by a wall or floor having an F.R.P. Of not less than 2 hours, and if 1 or both compartments demand a longer period of fire resistance, the separating wall or floor between the compartments shall have an F.R.P. Of 4 hours;

Provided that where adjoining compartments are used solely for domestic purposes the separating wall or floor between the compartments shall have an F.R.P. Of 1 hour.

S.186(1): Each element of construction of a staircase shall have an F.R.P. Not less than the period required for each element of construction of the building or compartment in which the staircase is situated:

Provided that this paragraph shall not apply to staircases enclosed in accordance with paragraph (2).

- S.186(2): Where a staircase serves more than 1 compartment of a building -
- a. such staircase shall be enclosed by walls, and
 - b. such walls shall have an F.R.P. Not less than the longer period required for the elements of construction in any compartment so served:
Provided that this paragraph shall not apply to any external staircases open to the weather on at least 2 sides.
- S.187: where compartments of a building to which the provisions of regulation 185 apply are situated in the topmost storey of a building, the walls required by that regulation shall be carried up to the underside of the roof of the storey:
Provided that where the ceiling is formed beneath a pitched roof, the walls need only be carried up to the underside of the roof so as to form in the roof space vertical firechecks at a distance apart not exceeding 35m.
- S.188: Walls separating compartments of a building or enclosing staircases, in accordance with regulation 185 or 186 may have openings where -
- (a) the door and frame of such opening has an F.R.P. -
 - (i) in the case of walls separating compartments, 1/2 hour, or
 - (ii) in the case of walls enclosing staircases, 1/2 the period required for such walls:
Provided that in no case shall the door have an F.R.P. Less than 1/2 hour; and
 - (b) such door is self-closing, except in the case of such a door in a domestic building which does not lead from a staircase to a corridor used in common.
- S.189(1): Borrowed lights may not be provided in walls separating compartments of buildings in accordance with regulation 185.
- S.189(2): where borrowed lights are provided in any wall enclosing in accordance with regulation 186, a staircase -
- a. the area of such lights shall be not more than 1/5 of the total area of the wall; and
 - b. The lights shall be glazed with a 6mm wired glass or covered with glass bricks or blocks.
- S.190: Each element of construction in a basement shall have an F.R.P. of 4 hours.

