

# **Management of Indoor Moulds**

## **Part III Compliance Assessment for Indoor Air Quality Certification Scheme for Offices and Public Places**

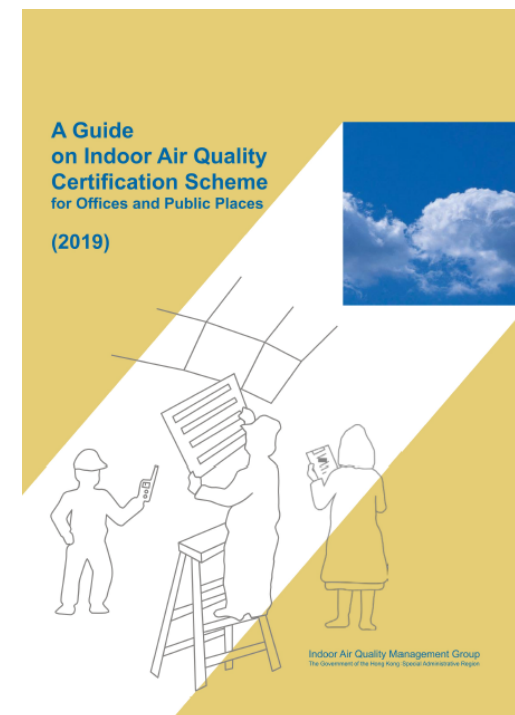
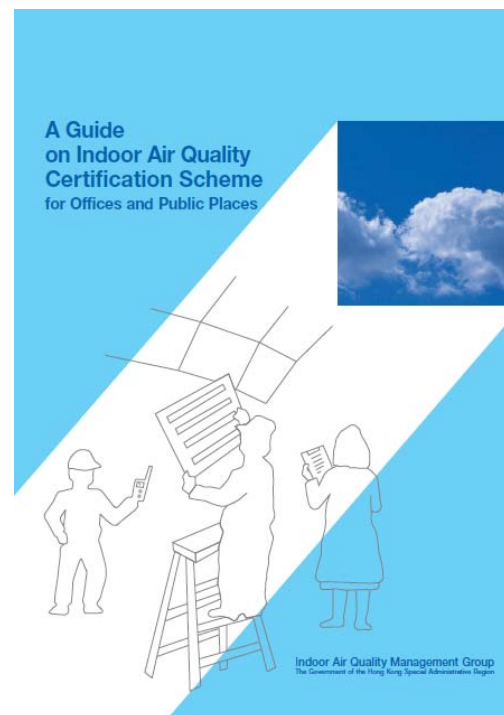
January 2019

# Indoor mould management programme

**‘Mould’ will be added as another criterion** under the Indoor Air Quality (IAQ) Certification Scheme for Offices and Public Places.

Parameter	Unit	Averaging Time	Old Objectives (Effective since 2003)		New Objectives (Effective on 1 July 2019)	
			Excel- lent Class	Good Class	Excel- lent Class	Good Class
Room Temperature	°C	8 hours	20 to <25.5	< 25.5	---	
Relative Humidity	%	8 hours	40 to <70	<70	---	
Air Movement	m/s	8 hours	<0.2	<0.3	---	
Carbon Dioxide (CO <sub>2</sub> )*	ppmv	8 hours	<800	<1,000	800	1,000
Carbon Monoxide (CO)	ppmv	8 hours	<1.7	<8.7	1.7	6.1
Respirable Suspended Particulates (PM <sub>10</sub> )*	µg/m <sup>3</sup>	8 hours	<20	<180	20	100
Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	8 hours	<40	<150	40	150
		1 hour	---	---	100	200
Ozone (O <sub>3</sub> )	µg/m <sup>3</sup>	8 hours	<50	<120	50	120
Formaldehyde (HCHO)	µg/m <sup>3</sup>	8 hours	<30	<100	30	100
		30 mins	---	---	70	100
Total Volatile Organic Compounds (TVOC)	µg/m <sup>3</sup>	8 hours	<200	<600	200	600
Radon (Rn)	Bq/m <sup>3</sup>	8 hours	<150	<200	150	167
Airborne Bacteria	cfu/m <sup>3</sup>	8 hours	<500	<1,000	500	1,000
Mould*	---	---	---	---	Assessment in the form of walkthrough inspection	

\* Measurement for CO<sub>2</sub> and PM<sub>10</sub> is required for 1<sup>st</sup> to 4<sup>th</sup> annual re-certification for certificate renewal in a 5-year cycle. Assessment of mould is also required when the new IAQ objectives are adopted.



# Compliance assessment of mould

This involves:

- A prescriptive **Compliance Checklist**,
- **Technical Guidelines** to enhance the understanding and implementation of the Checklist, and
- **A Guide on Prevention and Control of Indoor Mould** to provide background information and practical guidelines to identify, control and prevent indoor mould problems.

# The prescriptive Compliance Checklist (1)

- **Title**

- *Checklist for Assessing the Compliance with the IAQ Objectives on Moulds under the IAQ Certification Scheme for offices and Public Places*

- **Developed by**

- an Expert Panel on Fungi Control in Offices and Public Places appointed by EPD, The Government of the Hong Kong Special Administrative Region.

- **Purpose**

- To provide **guidelines**
  - for **inspection and detection** of moulds in the indoor environment, and
  - a **checklist** for recording presence of mould, environmental factors supporting mould growth, and proper building housekeeping and maintenance tasks to avoid mould growth.

# The prescriptive Compliance Checklist (2)

- **Applicability**

- indoor environment of all types of buildings/premises with mechanical ventilation and air conditioning (MVAC) systems eligible for applying to the IAQ Certification Scheme.

- **Who** will use the Compliance Checklist?

- **IAQ Certificate Issuing Bodies (CIBs)** responsible to determine whether the inspected building/premises complies with the “mould” parameter under the IAQ Certification Scheme.

# **The prescriptive Compliance Checklist (3)**

- **Content**

- 1) General Information of the Premises**

- 2) Compulsory Items**

- Evidence of growth of moulds
- Prevention of dampness and control of excess moisture – record temperature, relative humidity and water condensation
- Indicators of dampness and mould growth/remediation
- Housekeeping

- 3) Supplementary Inspection Items (Optional)**

- Design, operation and maintenance of indoor ventilation system
- Housekeeping

# The Technical Guidelines

- **Content**

- Arranged in the same sequence as the Checklist
- **Part 1 : General information of the premises**
- **Part 2 : Compulsory items**
  - Looking for evidence of visible mould growth and detection of mould odour.
  - Measuring relative humidity levels,
  - Looking for signs of water condensation,
  - Looking for evidence of water damage as indicators of dampness and excess moisture,
  - Looking for evidence of past possible mould growth, and
  - Looking for evidence of proper housekeeping practices.
- **Part 3 : Supplementary inspection items (Optional)**
  - Checking on design, operation and maintenance of indoor ventilation systems; and
  - Checking on additional good housekeeping practices.

# A Guide on indoor mould control and prevention

- **Title**

- *A Guide on Prevention and Control of Indoor Mould*

- **Purpose**

- To provide **background information and practical guidelines** for building/premises owners or managers **to identify, control and prevent indoor mould problems.**

- **Applicability**

- All types of building/premises, especially those equipped with MVAC systems.



# **How to use the prescriptive Compliance Checklist**

## **Compliance Assessment**

# Compliance assessment for the IAQ Certification Scheme (1)

- The inspector **should**:
  - conduct a walkthrough inspection according to the **Checklist** to inspect accessible areas for
    - possible mould growth, and
    - identify the factors present to facilitate mould growth.
  - complete the templates provided in the **Technical Guidelines** to assist completing the Checklist,
  - assist the building/premises owners/management to rectify any mould or water problems if identified in the inspection, and
  - conduct further inspections to ensure mould growth are cleaned and can be prevented.
- **The Technical Guidelines help enhance understanding and implementation of the Checklist.**

# Compliance assessment for the IAQ Certification Scheme (2)

Compliance of the **Compulsory Items** in the Checklist could provide evidence that the building or premises is unlikely to have mould problems, hence compliance with the Mould objective.

# **How to use the prescriptive Compliance Checklist**

## **Part 1 of Checklist: General Information of the Premises**

# General information of the premises

- The **inspector must provide** the following information in the Checklist, including the weather conditions on the date of inspection:

## 1. General Information of the Premises

Building Name:			
Building Address:			
Date of Inspection:	Time:	Weather:	
Temperature (Outdoor/Indoor):	_____ °C / _____ °C	Relative Humidity (Outdoor/Indoor):	_____%/ _____%
Inspected by:	Contact No.: _____		

The term “**inspector**” is only used in its general sense but **NOT** specifically referring to the “**approved inspector**” in the Hong Kong Inspection Body Accreditation Scheme operated by Hong Kong Accreditation Service.

# **How to use the prescriptive Compliance Checklist**

## **Part 2 of Checklist: Compulsory Items** *Evidence of Growth of Moulds*

# Evidence of growth of moulds (1)

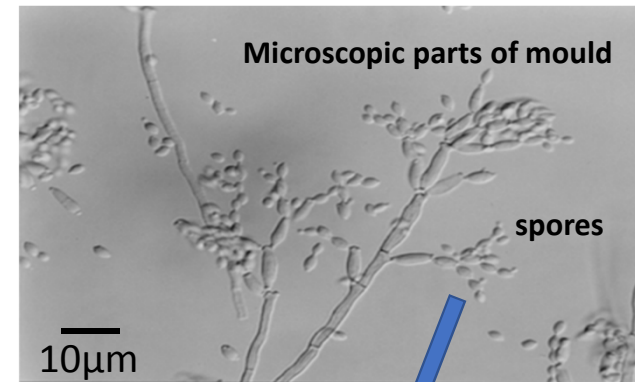
The **inspector must complete** the following information in the Checklist:

Criteria	Complied with	Not complied with	Remarks (e.g. Location/Observation/Measure/Reference)
<b>2.1 Evidence of growth of <u>moulds</u></b>			
2.1.1 No observable possible <u>mould</u> growth present.			
2.1.2 No detectable damp/musty <u>odour</u> .			
<b>2.2 Prevention of dampness and control of excess moisture</b>			
2.2.1 Indoor relative humidity is maintained at a level below 70%.			Relative humidity: _____ %  (record the range of relative humidity measured if more than 1 sampling point)
2.2.2 No water condensation observed on any indoor surfaces or materials.			

Information in slides **16 – 21**  
provide additional references to help completion of the Checklist

# Evidence of mould growth (2): observable mould growth

- Mould is made up of **microscopic structures** (e.g. spores), but **mould patches (colonies)** are easily seen as they **enlarge**.
- Mould colonies typically appear as patches, varying from about a **few mm to 1 cm in diameter**, usually dark in colour.
- When many colonies join together, bigger **irregular patches** will appear.



Fungal spores develop into colonies



Observable mould patches (**arrows**) on a painted cement wall are in irregular arrangement but each colony is circular with a regular margin



# Evidence of mould growth (3): observable mould growth

- Unlike other IAQ parameters, measurement of visible mould growth **cannot** be carried out at specific sampling points.
- For **visual inspection**, the inspector **should inspect all accessible locations with sources of potential water leakage and/or ingress.**
- The inspector **should note that mould growth usually appears as circular patches with regular margin** whereas **stain patches are usually irregular in appearance.**

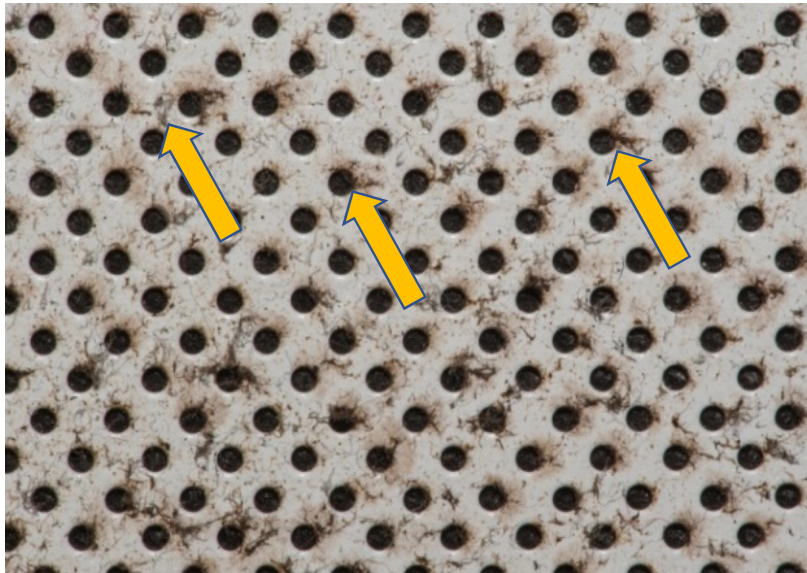


Irregular patches of observable **mould colonies** which are usually circular patches with regular margin (**arrows**) on a painted cement wall.

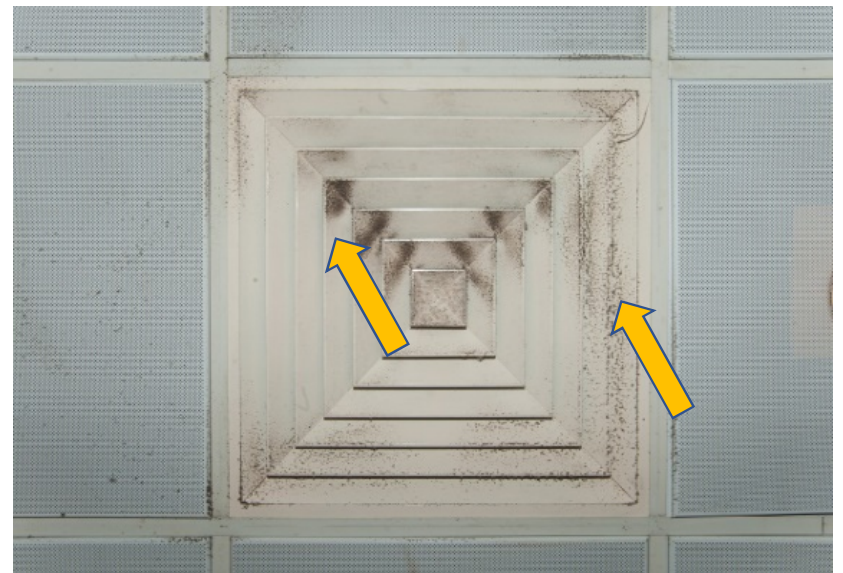


Irregular patches of **stains (arrows)** which do not have a regular shape and margin.

# Evidence of mould growth (4): examples of indoor observable mould growth



On dust on metal ceiling tile



On dust on and around diffuser

# Evidence of mould growth (5): examples of indoor observable mould growth



On dust on and around diffuser



On dust on aluminium window frame

# Evidence of mould growth (6): template for recording observable possible mould growth



Table 2.1.1: Locations of observable possible mould growth	Location/ Floor	Estimated possible mould growth area (m <sup>2</sup> )	Not observed	Acceptable or not? (Y/N) (Note 1)
On ceilings / or ceiling tiles, especially for locations close to water sources				
On/around diffusers				
On window frames				
On carpets near water sources, e.g. water fountains				
On walls, especially for locations close to water sources				
Area near indoor plants				
Others (please describe)				

## Note 1:

- Small areas of observable mould damage (< 0.3 m<sup>2</sup>) confined to few locations are unlikely to pose much risk and hence considered to be acceptable.
- However, the inspector should advise the premises/building owner or management to identify the reason for the observable possible light mould growth and rectify the problem.

# Evidence of mould growth (7): detectable damp/musty odour

- **Growth activities of microorganisms emit damp/musty odour**, especially when mould growth occurred in damp conditions.
- Damp/musty odour is **an unpleasant odour** which smells like decaying organic materials.
- To detect any damp or musty odour, the inspector **should walk through all accessible areas of the building/premises**, including
  - those areas with restricted/insufficient ventilation, and
  - areas near water sources.

# **How to use the Prescriptive Compliance Checklist**

**Part 2 of Checklist: Compulsory Items**  
*Prevention of dampness and  
control of excess moisture*

# Prevention of dampness and control of excess moisture (1)

The **inspector must complete** the following information in the Checklist:

Criteria	Complied with	Not complied with	Remarks (e.g. Location/Observation/Measure/Reference)
<b>2.2 Prevention of dampness and control of excess moisture</b>			
2.2.1 Indoor relative humidity is maintained at a level below 70%.			Relative humidity: _____ %  (record the range of relative humidity measured if more than 1 sampling point)
2.2.2 No water condensation observed on any indoor surfaces or materials.			

Information in slides **24 – 31**  
provide additional references to help completion of the Checklist



# Prevention of dampness and control of excess moisture (2)

Formation of water of condensation in the **indoor** environment is due to:

- high air relative humidity (RH) and cold surface temperature of building materials, and
- the moisture-holding capacity of the indoor air drops to enable the water vapour to condense.

The condensed water will **provide the water necessary for mould growth.**



**Mould growth** around the diffuser is probably supported by **accumulated dust and water of condensation** gathered on the wall surface



# **Prevention of dampness and control of excess moisture (3): indoor relative humidity**

**Compliance represents more than 80% of the sampling points with the 8-hour average RH maintained at < 70%.**

# Prevention of dampness and control of excess moisture (4): indoor relative humidity

Table 2.2.1b: The guidelines for the minimum number of sampling points required (Note 1)	
Total floor area to be certified (served by MVAC system) (m <sup>2</sup> )	Minimum number of sampling points
< 3,000	1 per 500 m <sup>2</sup>
3,000 - < 5,000	8
5,000 - < 10,000	12
10,000 - < 15,000	15
15,000 - < 20,000	18
20,000 - < 30,000	21
≥ 30,000	1 per 1,200 m <sup>2</sup>

**Note 1:** Additional samples **should be taken** if necessary

# Prevention of dampness and control of excess moisture (5): indoor relative humidity

- Indoor RH data should be **measured** during field data collection **by a psychrometer with readouts for the data logging**.
- Measurement conducted during the measurement of other IAQ parameters are accepted.
- Surrogate measurement is also accepted where it is not practicable to take 8-hour continuous measurement.
- **Sampling points should be chosen** according to the following criteria:
  - distributed among **individual MVAC zones**,
  - include **areas under complaints**, and
  - areas with both **high and low occupant density**.

# Prevention of dampness and control of excess moisture (6): indoor relative humidity

**Sampling locations** (which should be **documented**) can be selected using the following guidelines:

- a) representing the primary workstation layout and work activities;
- b) of minimal disturbance of work activities within the study area;
- c) at least 0.5 m from corners or window;
- d) at least 0.5 m from walls, partitions, and other vertical surfaces (e.g. file cabinets);
- e) not directly in front of air supply diffusers, induction units, floor fans, or heaters, or the exhaled breath of the operator, etc.;
- f) not under direct sunlight that will impact instrumentation;
- g) preferably not in hallways or passageways;
- h) at least 1 m from localised sources such as photocopiers, printers, cigarette smokers, etc.;
- i) not within 3 m of an elevator if sampled at a corridor/lobby;
- j) not within 2 m of doors;
- k) not obstructive to, or interfering with, occupant egresses from the study area under normal or emergency situations;
- l) not at the junction connected to stations of public transport facilities; and
- m) placing inlets of samplers at a height of about 1.1 m above the floor.

# Prevention of dampness and control of excess Moisture (7): template for recording indoor relative humidity

Table 2.2.1a: Indoor relative humidity	
Location of sampling point:	8 hr average RH measurement:
Point 1	%
Point 2 and so on	%
>80% of sampling points with RH less than 70%?	Y/N

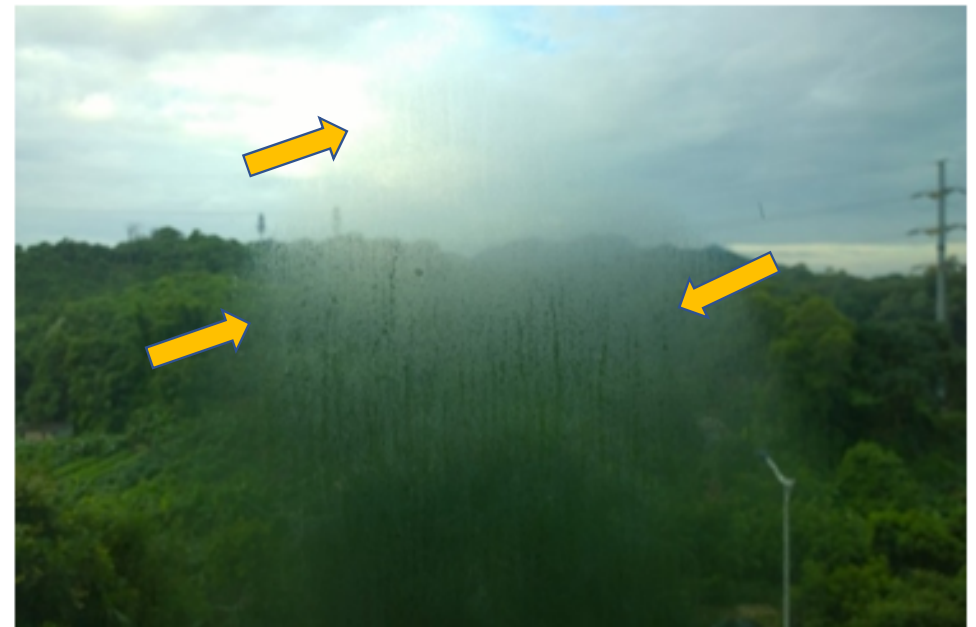
# Prevention of dampness and control of excess moisture (8): water condensation

The **inspector** should look for any **observable signs of water condensation** on any surfaces with **surface temperatures which are lower than the ambient air temperature**.

Figure 2.2a: Condensate on air diffuser surface



Figure 2.2b: Condensate on window pane



# Prevention of dampness and control of excess moisture (9): template for recording water condensation events

Table 2.2.2: Evidence of condensation events			
Possible locations for water condensation:	No	Yes (i.e. Non-compliance)	Requires maintenance/replacement
<u>Air diffuser surfaces</u> (e.g. Fig.2.2a Condensate on air diffuser surface)			
<u>Window panes / frames</u> (e.g. Fig.2.2b Condensate on window pane)			
Walls, particularly those directly opposite to air diffusers			
Ceiling or ceiling tiles			
Others (please specify)			

# **How to use the Prescriptive Compliance Checklist**

**Part 2 of Checklist: Compulsory Items**  
*Indicators of dampness and  
mould growth/remediation*



# Indicators of dampness and mould growth/ remediation (1)

The inspector must complete the following information in the Checklist:

Criteria	Complied with	Not complied with	Remarks (e.g. Location / Observation / Measure / Reference)
<b>2.3 Indicators of dampness and mould growth / remediation</b>			
<p><b>2.3.1</b> No leaks, flooding, wet floors, window leakage (that causes mould growth) present.</p> <p>If there is/are sign(s) of leaks, flooding, etc. occurred in the past 12 months, remedial measures have been taken to stop the leaks, flooding, etc. and to prevent recurrence of similar incidents. <i>(Please describe briefly the incident(s) and remedial measures<sup>1</sup> taken in the 'Remarks' column.)</i></p>			
<p><b>2.3.2</b> If there is/are sign(s) of possible mould growth in the past 12 months, remedial measures have been taken to clean up the possible mould and prevent its recurrence. <i>(Please describe briefly the observations and remedial measures<sup>1</sup> taken in the 'Remarks' column.)</i></p>			

Information in slides **34 – 39**  
provide additional references to help completion of the Checklist

# Indicators of dampness and mould growth/ remediation (2): water damage incidents and past remediation records

The inspector should:

- look for any **signs of existing and past water damages** in the building/premises.
- If there are **signs of past water release incidents**, check if there is any **remediation** taken (such as records of cleaning, maintenance and/or replacement of failure parts, etc.) to **stop the incident and prevent its recurrence**.

**Water damage** caused by leaks, wet floors, window leakage  
**will promote mould growth.**

# Indicators of dampness and mould growth/ remediation (3): examples of water damage incidents and past remediation records

Fig. 2.3a: Active water leakage in Air Handling Unit (AHU) room and the wet ceiling below the AHU room



# Indicators of dampness and mould growth/ remediation (4): examples of water damage incidents and past remediation records

Fig. 2.3b: Poor design of architecture plenum of outdoor air intake leading to accumulation of water behind the louver



# Indicators of dampness and mould growth/ remediation (5): examples of water damage incidents and past remediation records

Fig. 2.3c: Water stained carpet due to past water damage



Fig. 2.3e: Past water damage on ceiling next to an improperly sealed door



Fig. 2.3d: Water damaged ceiling in the ceiling void due to flooding in upper floor in the past



# Indicators of Dampness and Mould Growth/ Remediation (6): template for recording existing and past water damages

Table 2.3.1: Evidence of water damage	Location inspected	Observed? (Y/N) (Note 1)	Details of incident, remediation taken if applicable
<u>Active water intrusion</u> such as leaky plumbing, leaks through the cracks in walls and roofing, sewage backflow, etc.			
<u>Active water leakage in Air Handling Unit (AHU)</u> (e.g. Fig.2.3a)			
<u>Active water accumulation owing to poor design of architecture plenum</u> (e.g. Fig. 2.3b)			
<u>Signs of past water leakage or flood</u> (e.g. water stained carpet in Fig. 2.3c, water damaged ceiling in the ceiling void due to flooding in upper floor in Fig. 2.3d, water damage on ceiling next to an improperly sealed door in Fig. 2.3e)			
<u>Others</u> (please specify)			

- Note 1 : Non-compliance** if
- there is any existing water damage at the time of inspection, or
  - no remedial measures have been taken to stop the past incident of leak or flooding, and prevent its recurrence.

# **Indicators of Dampness and Mould Growth/ Remediation (7): possible past mould growth indications and remediation**

The inspector should:

- **investigate** if there are any **indications of possible mould growth in the past**, e.g.
  - new patches of paint,
  - installation of one or a few new ceiling tiles,
  - stains on air grilles, and
  - streak marks on surfaces indicating cleaning activities.

If these indications are observed, **check**

- whether the cause(s) has/have been identified,
- actions taken to prevent its recurrence, and
- proper documentations are available.

**All details should be entered into the Checklist.**

# **How to use the Prescriptive Compliance Checklist**

## **Part 2 of Checklist: Compulsory Items** *Housekeeping*



# Housekeeping (1)

- The **inspector must complete** the following information in the Checklist:

Criteria	Complied with	Not complied with	Remarks (e.g. Location / Observation / Measure / Reference)
<b>2.4 Housekeeping</b>			
2.4.1 Presence of housekeeping records. (e.g. records of carpet cleaning, MVAC system servicing and incidence of water leak or flood in the past 12 months, etc).			
2.4.2 For areas with carpets, carpet cleaning is conducted at least once per year. <sup>2</sup>			

Information in slides **42 – 44**  
provide additional references to help completion of the Checklist

# Housekeeping (2)

- In addition to remediation works, good management of building /premises is also essential to prevent mould growth.
- The following practices are all essential to avoid water incident in buildings/premises:
  - proper building design,
  - good housekeeping, and
  - effective performance of the MVAC.

# Housekeeping (3): housekeeping records

The inspector **should check** if building/premises owner or management maintains any **proper housekeeping records**, e.g.

- regular and preventive maintenance records of the MVAC system with scheduled cleaning;
- replacement of air filters, diffusers, and return and exhaust air grilles;
- regular carpet cleaning;
- water incidents;
- remedial measures taken in the past 12 months; and
- occupant complaints.

**All details should be entered into the Checklist.**

# Housekeeping (4): carpet cleaning

The inspector **should check** if building/premises owner or management has the record of **carpet cleaning conducted at least once per year**.

- **Dust** is a major source of **nutrients for mould growth**
- Carpet cleaning is essential
  - for **removal of accumulated** dust that indirectly **lowers the probability of mould growth**.

# **How to use the prescriptive Compliance Checklist**

## **Part 3 of Checklist: Supplementary Inspection Items (Optional)**

# Supplementary Inspection Items (Optional)

- Aims to encourage the building/premises owner or management to take further steps to enhance their indoor environment for prevention of mould problem if resources are available.
- The inspector should encourage the property owners/management to provide the information as far as possible as it would reveal the areas that required improvement to prevent mould growth.
- The property owners or management should be encouraged to take proper remediation action on the supplementary items, to prevent mould growth other than the remediation action to be taken on the compulsory non-compliance items in the Checklist.

# Design operation and maintenance of indoor ventilation systems (1):

The inspector should complete the following information in the Checklist:

Supplementary Inspection Items	Remarks (e.g. Location / Observation / Measure / Reference)
<b>3.1 Design, operation and maintenance of indoor ventilation system</b>	
3.1.1 Do the design and construction of the premises and ventilation systems comply with relevant international technical codes and guidelines? If 'Yes', please provide the name of the technical code or guideline (e.g. ASHRAE Standard, CIBSE Code) in the 'Remarks' column.	
3.1.2 Is air ducting regularly inspected and cleaned (as necessary)? If "Yes", please describe briefly the inspection frequency and relevant records in the 'Remarks' column.	
3.1.3 Is air balancing regularly checked (as necessary)? If "Yes", please describe briefly the frequency and relevant records in the 'Remarks' column.	
3.1.4 Are the following MVAC equipment regularly checked and cleaned (as necessary)?	
- Air-cooled chillers	
- Cooling towers	
- Fresh air intakes	
- MVAC equipment room	
- Air filters	
- Cooling/Heating coils	
- Drain pans	
- Fan coils	
- Air grilles/diffusers	

Information in slides 48 - 51 provide additional reference to help completion of the Checklist

# Design operation and maintenance of indoor ventilation systems (2): compliance with international codes and guidelines

- The inspector **should check** if building/premises owner or management has followed the international standards for design of MVAC system.
- Template for recording the compliance with the suggested standards with reference to the relevant ASHARE Standard<sup>1</sup> and CIBSE Code<sup>2</sup> and the situation in Hong Kong:

Table 3.1.1a: Ventilation for acceptable IAQ

Item	Requirements	Complied with?	
		Yes	No
Occupancy Density	For Office: Layout Plan (7 - 10 occupants/100m <sup>2</sup> )		
	For Mall: Occupancy Permit (40 transient occupants/100m <sup>2</sup> )		
Ventilation Rate	For Office: 8.5 L/s/person		
	For Mall: 4.6 L/s/person		

Table 3.1.1b: Criteria for IAQ and ventilation

Item	Requirements	Complied with?	
		Yes	No
Extract (exhaust air) rates	Rooms with high volume printing (30min/h): 20L/s/machine		
	Office washroom 6L/s per WC-urinal		
Fresh Air (floor area)	Minimum ventilation rate >0.3L/s/m <sup>2</sup> internal floor area		

<sup>1</sup>**American Society for Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE):**

ANSI/ASHRAE Standard 62.1-2016, ASHRAE Standard Ventilation for Acceptable Indoor Air Quality. Atlanta, GA. 30329-2305.

<sup>2</sup>**The Chartered Institution of Building Services Engineers (CIBSE):** KS17: Indoor Air Quality and Ventilation (CIBSE Knowledge Series). London, UK. 2011.



# Design operation and maintenance of indoor ventilation systems (3): air duct inspection & cleaning

- The inspector **should check** if the air ducts are inspected and cleaned regularly.
- Template for recording the compliance with the suggested cleanliness inspection frequency with reference to relevant National Air Duct Cleaning Association ACR standards<sup>1</sup> :

Table 3.1.2: Frequency of MVAC System Cleanliness Inspection

MVAC System Cleanliness Inspection – recommended Intervals (Commercial Buildings)					
Air-Handling Unit		Supply Duct		Return/Exhaust Duct	
Annually		Annually		Annually	
Yes	No	Yes	No	Yes	No

<sup>1</sup>. **National Air Duct Cleaning Association:** ACR, The NADCA Standard for Assessment, Cleaning, Restoration of HVAC Systems. Mt. Laurel, NJ. USA. 2013.

# Design operation and maintenance of indoor ventilation systems (4): air balancing checking

- The inspector **should check** if the air balancing are checked regularly (as necessary), including when the systems are renovated or changed to regulate air flow.
- Template for recording the compliance with the suggested checking frequency with reference to ASHRAE Handbook<sup>1</sup>:

Table 3.1.3 Time for air balancing checking

Air balancing checked	Yes	No
At time of commissioning		
After renovation of premises		
At time of changes made to MVAC equipment and/or system		

<sup>1</sup>. **American Society for Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE)**: Proportion flows in the distribution system (sub-mains, branches, and terminals) according to specified design quantities. Chapter 38, 2011 ASHRAE Handbook, HVAC Applications.

# Design operation and maintenance of indoor ventilation systems (5): MVAC equipment checking and cleaning

- The inspector **should check** if the following items of the MVAC systems are checked regularly and cleaned if necessary according to ANSI/ASHRAE standard 180-2012.

- Air-cooled chillers
- Cooling towers
- Fresh air intakes
- MVAC equipment room
- Air filters

- Cooling/Heating coils
- Drain pans
- Fan coils
- Air grilles/diffusers

<sup>1</sup>American Society for Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE): ANSI/ASHRAE Standard 180-2012, Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems. Atlanta, GA. 2012.

# Housekeeping (1): carpet cleaning

The **inspector** should complete the following information in the Checklist:

Supplementary Inspection Items	Remarks (e.g. Location / Observation / Measure / Reference)
<b>3.2 Housekeeping</b>	
3.2.1 For areas with carpets, are the carpets regularly cleaned with a vacuum cleaner equipped with high efficiency particulate air filter (HEPA filter)? If 'Yes', please provide the cleaning method and the model of the vacuum cleaner in the 'Remarks' column.	
3.2.2 Any management system <sup>3</sup> to provide a healthy indoor environment which is free of excess moisture and mould?	
3.2.3 Are water dispensers properly installed? Any instructions and guidelines to the users to avoid water spillage?	
3.2.4 Any measure(s) is/are taken to avoid water spills, leaks and flood? If 'Yes', please describe briefly the measure(s) taken in the 'Remarks' column.	

Information in slides **53 – 59**  
provide additional references to help completion of the Checklist

## Housekeeping (2): carpet cleaning

- Cleaning of carpet is **necessary**
  - **for removal of accumulated dust;**
  - **which indirectly lowers the probability of mould growth.**
- To achieve **high effectiveness for dust removal**
  - **vacuum cleaner equipped with high efficiency particulate air (HEPA) filter** is suggested.

# Housekeeping (3): carpet cleaning

- The inspector **should check** if the carpets are cleaned regularly with a vacuum cleaner equipped with HEPA filter.
- Template for recording whether the recommended method and equipment<sup>1</sup> are used for carpet cleaning:

Table 3.2.1 Carpet cleaning method and equipment

Method of cleaning <sup>(8)</sup> (Note 1)		
	Yes	No
Wet “shampoo” cleaning		
Absorbent pad/compound		
Dry compound		
Steam cleaning		
Equipment used (manufacturer specification)		
	Yes	No
Vacuum cleaner fitted with HEPA filter		
Carpet pile comb		

<sup>1</sup>Institute of Inspection, Cleaning and Restoration  
**Certification:** IICRC S100 Standard for Professional Cleaning of Textile Floor Coverings – 6<sup>th</sup> edition, Sec. 8.6. Vancouver, WA. IICRC, 2015.

# Housekeeping (4): carpet cleaning

## Note 1:

**Wet “shampoo” cleaning** – a low rpm (revolution per minute) rotating brush shower application of detergent foam system. After vacuuming with rotary brush agitation and resulting extraction of dry dust/dirt, rinse the carpet by hot or cold water and remove extra moisture with MVAC system switched on to assist drying.

**Absorbent pad/compound** – a low moisture cleaning system. After vacuuming with rotary brush agitation and extraction of dry dust/dirt, apply pre-conditioning liquid to carpet for lubrication and use absorbent pad to agitate and extract.

**Dry compound** – a low/restricted moisture compound cleaning system. After vacuuming with rotary brush agitation and extraction of dry dust/dirt, apply dry compound as per manufacturer specification and agitate with dual cylindrical brush and then vacuum to extract compound.

**Steam cleaning** – also known as “hot water extraction cleaning”. A common household carpet cleaning method also adopted for commercial application with industrial grade “steam cleaners”.

# Housekeeping (5)

## IAQ management system

- Implementation of an IAQ management programme will help **provide a healthy indoor environment** for the occupants.
- Under the programme, building/premises owner or management should as good practice:
  - **properly document** all prevention, maintenance and remediation records for future reference, and
  - **provide instructions or guidelines** to the occupants about good housekeeping practices to avoid water incidents.



# Housekeeping (6)

## IAQ management system

- The inspector **should check** if the IAQ management system is in place.
- Template for recording whether the suggested documentation for a good IAQ management system is maintained:

Table 3.2.2 Suggested documentation for an IAQ management programme

Activity	Documentation	
	Yes	No
IAQ management system in place – IAQ Management Plan <sup>(1)</sup>		
Maintenance log for past water incident (12 months)		
Remedial actions documented		
Evaluation of effectiveness of actions taken		
Guidelines on good housekeeping practices to occupants		

<sup>1</sup>Indoor Air Quality Management Group, The Government of the Hong Kong Special Administrative Region:  
“Guidance Notes for the Management of Indoor Air Quality in Offices and Public Places, January 2019.  
Available at <http://www.iaq.gov.hk> .

# Housekeeping (7)

## Installation of water dispensers

- The inspector **should check**:
  - if the water dispensers are installed properly; and
  - if the building/premises owner or management has provided clear and documented instructions and guidelines to the users to avoid water spillage.
- **The details should be entered into the Checklist.**

- Areas close to the water dispensers are potential water sources for mould growth (arrows).
- It is **recommended** that the water dispensers should be **installed at proper locations without carpet** for easy cleaning in case of spillage.



# Housekeeping (8)

## preventive measures for water spills, leaks and flood

- The inspector **should check** what preventive measures are taken by the building/premises owner or management to avoid water spills, leaks and flood.
- **All details should be entered into the Checklist.**

Following are good housekeeping practices to avoid any water incidents, which should be documented:

- regular checking of plumbing and sewage system for any leakage or backflow, and
- inspection of building structures such as cracks on roof, walls and windows.

**END**