Building and Construction Authority

Guidelines on Periodic Facade Inspection

Version 1.2

Jul 2022

BuildSG BCA

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1. BACKGROUND

1.1. The Periodic Façade Inspection (PFI) regime was introduced in 2020 to enhance the safety of building facades by facilitating early detection of façade deterioration and allowing defects to be rectified in a timely manner so as to reduce the likelihood of façade failure as our building stock ages.

1.2. The guidelines serve as a reference for Competent Persons and Façade Inspectors when carrying out façade inspections in Singapore.

2. APPLICATION OF PERIODIC FAÇADE INSPECTION REGIME

2.1. The Periodic Façade Inspection regime applies to all buildings except:

a) Detached houses, semi-detached houses, terraced or linked houses which are used solely as places of residence,

b) Temporary buildings, and

c) Buildings where the highest point (whether or not a roof) is 13 metres or lower when measured from the ground[1].

2.2. Periodic façade inspections are to be carried out for a building that is more than 20 years of age[2] . The subsequent inspection shall be conducted at any time during the 7th or later year after the year during which the last notice requiring a façade inspection was given in respect of the building.

3. QUALIFICATIONS OF COMPETENT PERSON AND FAÇADE INSPECTOR

3.1. The amendments to the Building Control Act that were passed by the Parliament in March 2020 require façade inspections to be conducted by a Competent Person. The

[1] The building height shall be measured from the ground level to the highest point of a building and does not include installations (e.g. equipment such as antenna) on the roof of the building. See also Annex A for other examples of building apex.

[2] The age of a building in respect of which a Temporary Occupation Permit (TOP) or Certificate of Statutory Completion (CSC) is granted in respect of the whole building is determined from the date the last TOP is granted in respect of the whole building or, where no such TOP is so granted, the date the last CSC was issued for the whole building.

Competent Person may appoint Façade Inspector(s) to assist him to carry out the façade inspections.

3.2. The Competent Person may be either a registered Professional Engineer in the civil or structural engineering discipline with the Professional Engineers Board, or a Registered Architect with the Board of Architects.

3.3. The Façade Inspector may be a registered Resident Engineer or registered Resident Technical Officer who is accredited with the Joint Accreditation Committee established by the Institution of Engineers of Singapore (IES), the Association of Consulting Engineers Singapore (ACES) and BCA for the accreditation of Façade Inspectors, or any other person who possesses the relevant qualifications and experience recognised by BCA.

3.4. All Competent Persons and Façade Inspectors are required to attend and pass a course titled the “Certificate in Façade Inspection” prior to carrying out any façade inspection.

4. GENERAL DUTIES OF COMPETENT PERSON AND FAÇADE INSPECTOR

4.1. Competent Person

4.1.1. The Competent Person who is appointed by the building owner shall carry out a comprehensive visual inspection and close-range inspection that enable him to exercise his/her professional assessment and judgement on the condition of the façade being inspected. The Competent Person shall carry out the duties as prescribed in the Building Control Act and Regulations.

4.1.2. The Competent Person may appoint a Façade Inspector to assist him in the façade inspection under his/her direction and supervision. However, the Competent Person shall remain ultimately responsible for the inspection and assessment of the inspection findings and overall condition of the building facade.

4.1.3. The Competent Person must take all necessary steps as prescribed in the Building Control Act and Regulations when carrying out of a façade inspection. He/she shall also plan for the entire inspection exercise to be carried out in a safe manner, and be present at the façade inspection to ensure that the inspection is carried out in accordance with the Building Control Act and Regulations.

4.1.4. As a matter of good practice, the Competent Person should, upon becoming aware of any unsafe conditions in respect of a building façade, immediately report the unsafe conditions to the Commissioner of Building Control and building owner.

4.2. Façade Inspector

4.2.1. The Façade Inspector should familiarise himself with the available information and documents relevant to the building façade prior to the commencement of the façade inspection and assist the Competent Person to carry out the façade inspection in accordance with the Building Control Act and Regulations.

4.2.2. In the course of carrying out his duties, the façade inspector is required to record defects found during inspection and promptly inform the Competent Person and building owner if he/she observes facades that are dangerous or likely to pose immediate danger.

4.2.3. The façade inspector should ensure that defects recorded are done so accurately and with due diligence.

5 SCOPE OF FAÇADE INSPECTION

5.1 The scope of façade inspection covers the exterior of the building, any exterior feature attached to the building, and parts of a building that is located on or near the exterior of a building:

(a) any window, with or without movable parts, such as a roof skylight, glass panel, glass brick, louvre, glazed sash, glazed door, translucent sheeting and any other building material which transmits natural light directly from outside a building into an interior of the building;

(b) any grille or shutter, with or without movable parts;

(c) any tile, cladding, curtain wall, siding, plaster, bracket or cornice;

(d) any gutter, rainwater down-pipe or part of the roof;

(e) any membrane shade structure, or any awning or device to provide shade;

(f) any green wall which is partially or completely covered by vegetation, including any brackets that support it, the growing medium for the vegetation (other than soil) and any integrated water delivery system;

(g) any screen or screen wall;

(h) any louvres or fins;

(i) any masonry veneer;

(j) any window hood;

(k) any cantilevered roof;

(l) any part of a concrete wall, concrete slab, concrete beam or concrete column;

(m) any external balustrade;

(n) any directional sign, signboard, skysign, animated billboard or other advertising structure installed, and includes any frame, panel, hoarding or other supporting structure of or for the directional sign, signboard, skysign, animated billboard or other advertising structure;

(o) any clothes drying rack;

(p) any suspended ceiling system —

(i) fitted under or hung from a porch, porte-cochere, portico, covered concourse or walkway, or similar shelter —

(A) that is located at the entrance or side of building or projects from or near an external edge of a building; and

(B) that spans across a space below which is accessible to members of the public; and

(ii) the underside of which is exposed to rain;

(q) any of the following that is used or may be used to attach to, or that supports or may support for use with, the building any externally mounted equipment:

(i) a metal or concrete bracket, or similar structural supporting system attached to the building and to the externally mounted equipment (if any);

(ii) a cable and other associated components of a structural supporting system mentioned in sub-paragraph (i), where the cable or components are attached to the building and to the externally mounted equipment (if any).

5.2 In paragraph 5.1 (q), externally mounted equipment includes the following:

(a) an air-conditioning unit and its condensing equipment;

(b) a ventilation system;

(c) a photovoltaic array or panel;

(d) a solar water heater;

(e) an apparatus (including a dish antenna) or a combination of apparatus for the transmission or direct reception of broadcast matter or wireless communication.

6 INSPECTION PROCEDURES

6.1 Preparation and Review of Drawings/Documents

6.1.1 Prior to the commencement of the inspection, the Competent Person should obtain and review all relevant approved plans, shop drawings, previous inspection reports, repair works histories and details to have an understanding of the façade design and construction of the building including subsequent additions, alterations and repairs. It is also useful to find out from the building owner/ facility manager about any problems observed or reported in the building façade or its components in the past. This will enable the Competent Person to have a good understanding of the existing façade types and detailing.

6.1.2 If there is no information or document available on the building façade, the Competent Person shall carry out the review based on the appropriate Standards and Codes of Practices (which are applicable to Singapore) at the time of installation of the building façade with reference to the date of issue of the Temporary Occupation Permit, Certificate of Statutory Completion or other relevant documents.

6.2 Inspection Planning for Access and Equipment

6.2.1 The Competent Person must perform façade inspections in accordance with the Building Control Act and Regulations. When formulating the façade inspection methodology, the Competent Person should conduct an assessment of the risks involved in carrying out the façade inspection. The risk assessment should not be limited to the risks potentially faced by the Competent Person, Façade Inspector and the inspection team, and should also consider risks posed to the general public and building occupants during the façade inspection. The safe ingress and egress of the building occupants shall be ensured at all times when a façade inspection is in progress .The Competent Person must take measures to manage all identified risks such as adopting good safety practices, proper use of safety equipment, cordoning-off of at-risk areas and etc.

6.2.2 After reviewing all available information, the Competent Person should formulate appropriate methods for carrying out the façade inspection, including the types of access platform (e.g. gondola, boom lift etc.) to be used for close-up inspection of the

façade elements by the Competent Person and Façade Inspector. The Competent Person should consider the existing maintenance access platform available and the suitability of the access platform having considered the surrounding conditions of the building.

6.2.3 In situations where the use of a gondola is not feasible, the Competent Person may consider to use other access modes or equipment for carrying out the inspection such as mast climber, scissor lift, boom lift, building maintenance unit system, motorised elevated work platform or other observation platform as he/she deems appropriate. Notwithstanding the selected mode of access, the Competent Person is reminded to ensure that all requirements pertaining to working-at-height as imposed by the Ministry of Manpower (MOM) and relevant agencies must be met, and all operators shall have attained the relevant certification in the operation of the relevant machineries. The Competent Person must also ensure that all access platforms required to be erected for facilitating the inspections comply with standards set by the MOM.

6.2.4 The Competent Person must plan for the façade inspection to be done with minimal inconvenience to the building occupants and the general public, and work with the building owner to notify the building occupants of the façade inspection in advance.

6.3 Full Visual Inspection

6.3.1 The full visual inspection is a visual survey carried out to observe and assess the condition of the entire building façade at an appropriate distance from ground level or other suitable vantage points.

6.3.2 The Competent Person and Façade Inspector under the direct supervision of the Competent Person shall, from ground level or other suitable vantage locations, methodically observe and assess the condition of the entire facade areas horizontally and vertically. Amongst others, the Competent Person and Façade Inspector should look out for dilapidation and displacement of façade elements.

6.3.3 Equipment such as photographic cameras and binoculars should be used to assist in the façade inspection, and to record the façade condition. Good resolution photos showing all elevations views, far views, and close-up views of the building facades

inspected, including the façade defects observed during this stage, shall be taken during the visual inspection.

6.3.4 Where the Competent Person intends to adopt technologies (e.g. infra-red scanning thermography, unmanned aerial vehicles/ drones, etc.) to facilitate the performance of façade inspection, approval from Commissioner of Building Control is required. The Competent Person shall engage a suitably qualified party to operate the equipment and provide interpretation and assessment of the results obtained. The Technical Reference TR 78: 2020 – Building facade inspection using Unmanned Aircraft Systems (UAS) shall be referred to when unmanned aerial vehicle or drone is used for the façade inspection.

6.4 Close-range Inspection

6.4.1 **What is "close-range" inspection?**

6.4.1.1 A close-range inspection is a close-up visual façade inspection with tactile assessment (i.e. physical contact with the façade) of the building façade, carried out using probing tools (e.g. tapping rod, rubber mallet), non-destructive testing or technology (i.e. borescope, scanning equipment which does not require special training to operate or use), or a combination of the aforesaid probing tools and non-destructive testing or technology. Where the Competent Person intends to adopt technologies (e.g. robotic automated tapping device, automated scanning equipment, Infrared and ultrasound scanners, etc.) to facilitate the performance of façade inspection, approval from Commissioner of Building Control is required. The Competent Person must perform close-range façade inspection on suitable parts of each elevation of the building, being at least 10% of the surface area of each elevation (i.e. each face of the building). The purpose of a close-range inspection is to conduct a detailed inspection of the façade elements to observe and evaluate conditions of the façade that might be concealed or cannot be observed during the full visual inspection. Close-range inspection requires physical contact with the façade to detect both surface and underlying defects, such as delamination, de-bonding, or hollowness in plaster/ tile and displacement or dislodgement of panels, failure of anchorages/ fasteners/ supports/ brackets, as well as looseness or cracking of the elements on the building façade.

6.4.2 **How to calculate the 10% surface area of each façade elevation?**

6.4.2.1 In general, the entire façade area for each building elevation is calculated by multiplying the height of the building elevation by the length of the building elevation. The “close-range” inspection must be performed on a surface area of at least 10% of the surface area of each building façade elevation. See Annex B for examples of the computation of the 10% façade elevation area.

6.4.2.2 On buildings with recesses within the façade elevations, the recessed areas shall count towards the total surface area of a façade elevation for close-range inspection for that façade elevation. The Competent Person is to assess and decide if the “close-range” inspection should be performed for the recessed area.

6.4.2.3 The close-range inspection shall also apply to the external façade elements at the underside of sky-bridges and overhanging floors of cantilevered buildings (e.g. The Interlace, Marina Bay Sands). The underside area of each sky-bridge or overhanging floor shall count towards the total surface area of a façade elevation.

6.4.3 **Where to carry out close-range inspection?**

6.4.3.1 Based on the findings from the full visual inspection and the review of the available information on the building façade including past inspection reports, the Competent Person shall carry out a close-range inspection covering certain surface area of at least 10% of the surface area of each façade elevation.

6.4.3.2 The selection of areas of the building facade for close-range inspection should take into consideration factors such as volume of human traffic below the facade, areas of building facades with possible façade defects or problems identified during the full visual inspection and degree of deterioration risk of associated façade elements.

6.4.3.3 The Competent Person should also select areas that are different from the areas selected during the previous façade inspection cycles, where possible. The coverage of the close-range inspection should be well spread out around the façade perimeter of the building and representative of the façade condition.

6.4.3.4 The Competent Person shall keep and ensure keeping of all records of the findings, including details such as time and date of façade inspections, areas and locations of façade defects, items or parts of building façades inspected.

6.4.4 **How to carry out close-range inspection?**

6.4.4.1 The Competent Person and Façade Inspector should, whenever possible, adopt the use of suitable equipment and techniques to assist him in performing close-range inspection. A small flexible optical camera i.e. a borescope should be used to inspect the concealed supports behind a cladding panel and cavity brick wall. Probing tools such as a tapping rod or rubber mallet to gently tap on the building façades should be used to detect underlying defects (e.g. delamination or hollowness in plaster/ tile), or other equipment to detect hollowness in façade elements.

6.4.4.2 Where the façade has concealed supports and the Competent Person or Façade Inspector is unable to use equipment to inspect these supports, the façade inspection should include localised removal of selective façade elements or panels in each façade elevation.

6.4.4.3 If required, the façade elements and their attachments and anchorages should be sent for testing to ascertain the deterioration level and integrity of the building façade.

7 FULL FAÇADE INVESTIGATION

7.1 Following the completion of the full visual and–close-range inspections, the Competent Person is required to assess whether a full facade investigation is necessary. The presence of extensive or systemic severe façade defects (e.g. several loose panels/tiles/bricks, bulging plaster at many locations of the façade, missing or failed anchorages, extensive corrosion of metal parts, etc.) shall warrant the need for a full façade investigation.

7.2 Where a full façade investigation is required, the Competent Person shall make an application to the Commissioner of Building Control to carry out the full façade investigation. The application must be accompanied by an interim report containing a detailed description of the visual inspection and close-range inspection, information relating to the design, construction, maintenance and history of the façade of the

building, and a proposal describing in detail the percentage of the total surface area of each building elevation to be subject to the full façade investigation and the manner in which the relevant design checks and tests are to be carried out.

7.3 In the application, the Competent Person should also indicate whether any on-site and/or laboratory tests will be carried out to assess and verify the façade condition, strength of the façade materials and extent of the façade defects, if deemed necessary. Examples of on-site tests on structural sealant glazing building include the de-glazing test and sealant pull-out test of existing sealants to better evaluate the adhesion and performance integrities for non-mechanical restraining of façade elements such as curtain walls.

7.4 For the concealed elements that the Competent Person or Façade Inspector is unable to use equipment to inspect, the Competent Person or Façade Inspector should remove suitably selected façade elements or panels per façade elevation for inspections. Where access from inside the building is required in order to carry out the full façade investigation on the concealed façade elements, the Competent Person shall obtain the necessary permissions (e.g. from the building owner and tenant) for the requisite access.

8 RECORDS OF FAÇADE INSPECTIONS

8.1 The Competent Person and Façade Inspector should adopt appropriate identification systems (e.g. using photos and mark-ups on drawing plans and elevations) to record defects in the facades that require repairs.

8.2 Good resolution photos showing far views, all elevations views, medium long shot (up to four storeys), and close-up views of the building façades inspected, including any façade defects observed, shall be taken during the façade inspection and submitted in the report to BCA. The minimum photo ground sampling distance of 0.15cm/pixel is recommended. All the individual original defect photos are to be submitted as attachment files with the inspection report. For thermography, the minimum resolution of 320x240 is recommended at suitable sampling distance.

8.3 The Competent Person must also prepare and submit reports on the results of the visual inspection, close-range inspection and full façade investigation (where applicable), in accordance with the Building Control Act and regulations, to the Commissioner of Building Control.

9 COMMON DEFECTS ON BUILDING FAÇADE

9.1 General

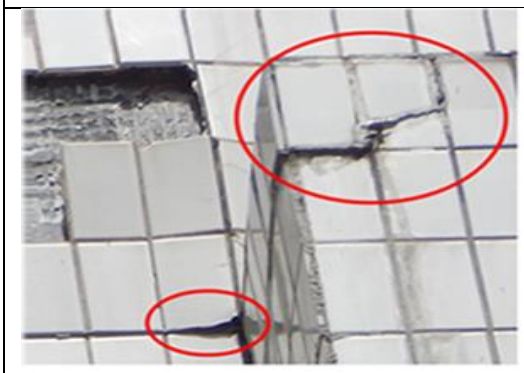
9.1.1 Materials used in building façades will deteriorate over time due to exposure to weather and general wear and tear. The rate of deterioration depends on the type of materials and connection systems used, the quality of workmanship during construction and the exposure conditions. If timely rectification of defects is not carried out, the façade element may fall off from the building façade, posing danger to people and risk of possible property damage. Hence, it is important to tackle and arrest defects in building facades early for repairs to be carried out before failure occurs.

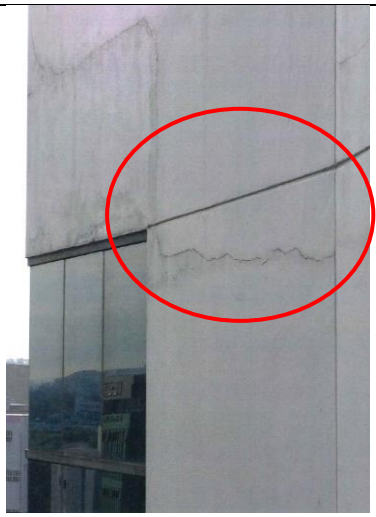
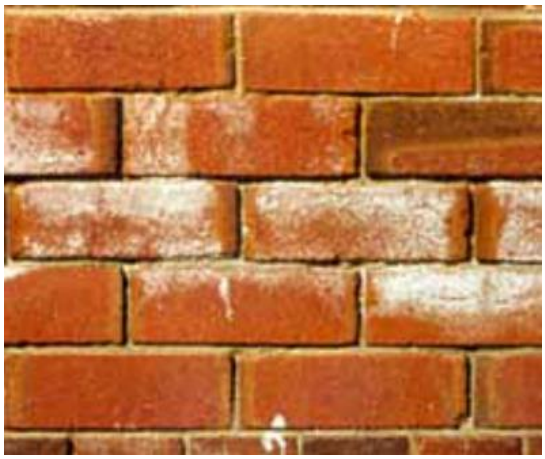
9.1.2 Section 9.2 of these Guidelines highlight some common defects in building façades and attachments affixed to building facades. Competent Persons and Façade Inspectors should exercise due diligence while carrying out the façade inspections, and also keep a lookout for other types of defects that are not listed herein. For metal fixtures which were installed after the TOP/CSC, it is also important to find out the age and details of the metal fixtures to study the risk of fallen of the metal fixtures. All defects in building facades should be set out in the façade inspection reports, in accordance with the Building Control Act and regulations.

9.2 Common Facade Defects

9.2.1 Plaster, concrete elements, tiles, bricks:

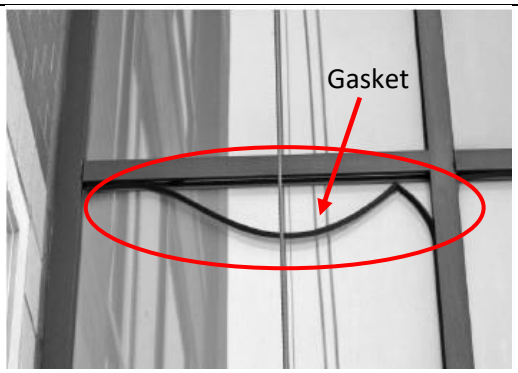
a) Bulging/ cracked plaster
b) Spalling/ delamination/ cracking of concrete
c) Cracked/ loose wall tiles
d) Efflorescence on plaster/ brick walls

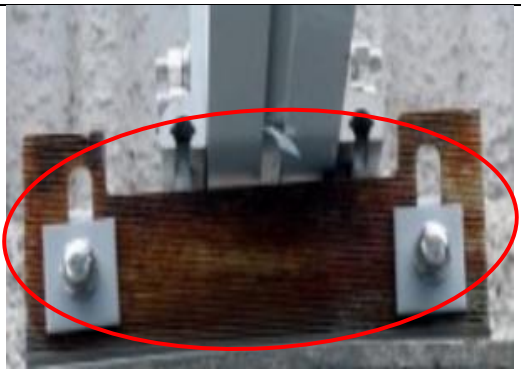
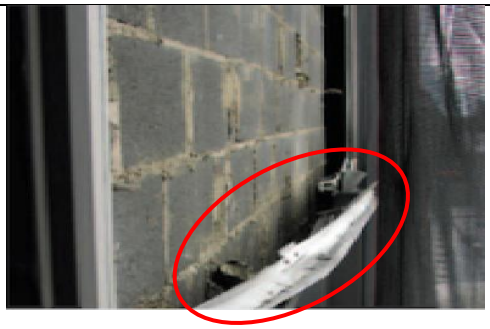
	
Bulging plaster [Source: BCA file]	Spalling concrete [Source: BCA file]
	
Spalling concrete [Source: BCA file]	Loose wall tiles [Source: BCA file]
	
Cracked wall tiles [Source: BCA file]	Loose wall tiles [Source: BCA file]

	
Cracked concrete panel [Source: BCA file]	Efflorescence on brick wall [Source: https://www.diydoctor.org.uk/projects/efflorescence-causes-and-cures.htm

9.2.2 Curtain wall and associated openable windows

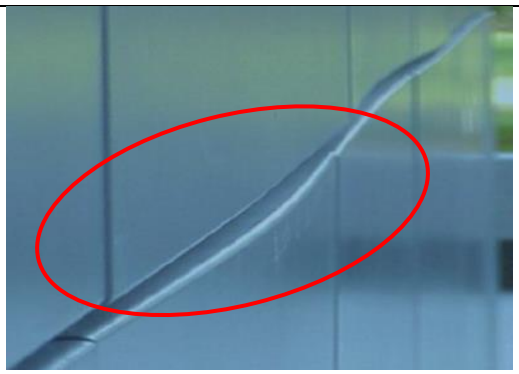
a) Loose gaskets and seals
b) Deformation/ dislodgement of capping
c) Misalignment of transoms
d) Breakage of panels
e) Corrosion of brackets
f) Failure of joints

	
Loose gasket [Source: Hoffmann Architects Journal, Vol. 29]	Dislodged mullion capping [Source: Hoffmann Architects Journal, Vol. 29]

	
Misaligned transom [Source: BCA file]	Broken glass infill panel [Source: BCA file]
	
Detached aluminium capping [Source: local consultant]	Corroded floor bracket of curtain wall [Source: www.building-enclosure.com/bulding-enclosure-commissioning/]
	
Dislodged frame joints [Source: www.bdcnetwork.com/]	Dislodged panel [Source: BCA file]

9.2.3 Cladding

a) Missing screws/ pins in connections
b) Corrosion of brackets/ fasteners
c) Failure of screws/ rivets
d) Failure of adhesive bond e.g. structural sealant
e) Deformation/ warping of panels
f) Cracked panels
g) Defects on boards
h) Loose cladding panels
i) Dislodged panel

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Missing pin in stone cladding connection
[Source: BCAA course notes]</td><td>Corroded bracket in cladding system
[Source: BCAA course notes]</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Corroded bracket in cladding system
[Source: BCAA course notes]</td><td>Deformed or warped of cladding panels
[Source: BCAA course notes]</td></tr>
</table>

	
Dislodged / loose stone cladding [Source: BCAA course notes]	Cracked stone cladding panel [Source: BCAA course notes]
	
Cracked and de-bonded brick cladding [Source: BCA file]	Bulging brick cladding [Source: BCA file]
	
Bulging board cladding [Source: BCA file]	Fallen building board [Source: BCA file]

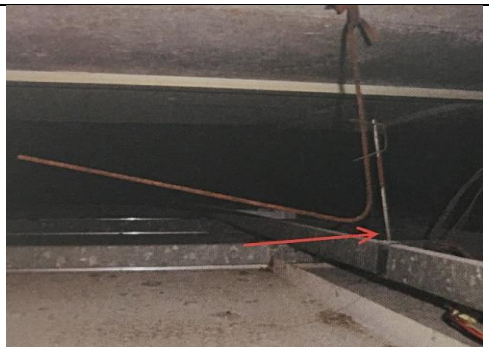
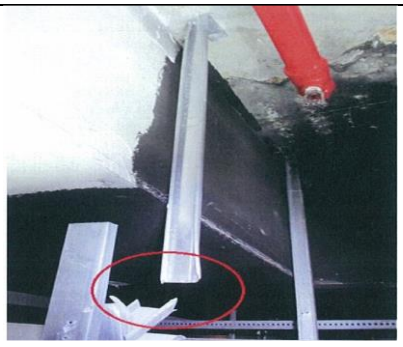
9.2.4 Green wall, screen wall

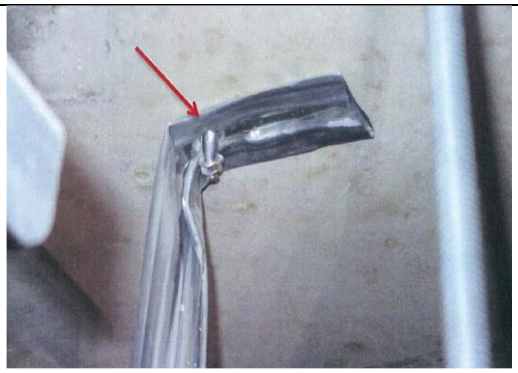
a) Corrosion of green walls
b) Missing/ loose connections

	
Corroded Element [Source: BCA file]	Rusty connection on screen wall [Source: BCA file]
	
Missing connection on screen wall [Source: BCA file]	Loose connection between screen wall and support [Source: BCA file]

9.2.5 Exterior suspended ceiling system

a) Loose ceiling boards
b) Water staining on ceiling boards
c) Dangling ceiling panel
d) Damaged hanging rod for false ceiling
e) Moulding on external ceiling board
f) Corroded fixing
g) Poor embedment of fixing
h) Degradation of ceiling board/ support frame
i) Spalling of concrete substrate

	
Loose ceiling boards [Source: BCA file]	Water stain on ceiling boards [Source: BCA file]
	
Degraded and dangling external ceiling panels [Source: BCA file]	Dangling board [Source: BCA file]
	
Dangling metal false ceiling [Source: BCA file]	Moulding on external ceiling board [Source: BCA file]
	
Corroded hanging rod supporting ceiling sub frame [Source: BCA file]	Broken hanging rod supporting ceiling sub frame [Source: local consultant]

	
Corroded fixing [Source: BCA file]	Poor embedment of fixing [Source: local consultant]
	
Spalling concrete substrate [Source: BCA file]	Fallen ceiling panel [Source: BCA file]

Exterior false ceilings are prone to occasional wetting due to rain. Through the investigation on cases involving dislodgement and fallen exterior false ceiling panels (e.g. calcium silicate boards), it was found that failure of the connecting anchors due to spalling concrete, deterioration of board materials, and corrosion of supporting frames are the common causes for exterior suspended ceiling system. Therefore, the Competent Person shall either remove the false ceiling panel or adopt technology to carry out thorough inspection on the concealed supporting system. The integrity and condition of the ceiling system shall be indicated in the inspection report.

9.2.6 Window

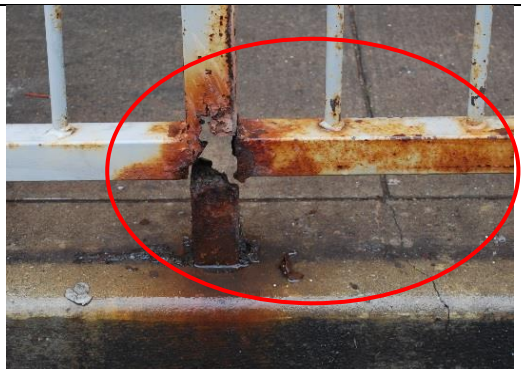
a) Dangling window panel
b) Cracked/ missing window glass panels
c) Rusty or corroded window panel fixings
d) Failure of screws

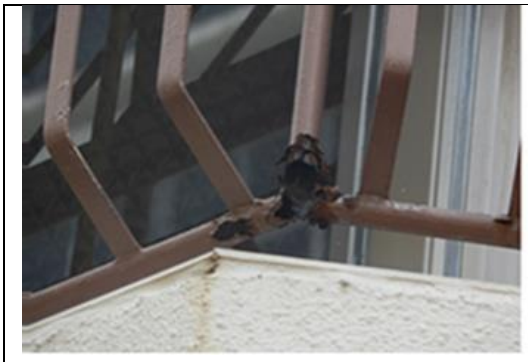
	
Dangling window [Source: BCA file]	Cracked window glass [Source: BCA file]

The Competent Person shall report to BCA any dangling windows spotted during the course of inspection.

9.2.7 Balustrade and railing

a) Corroded railing members/ supports/ connections
b) Cracked glass balustrade
c) Damaged sealant

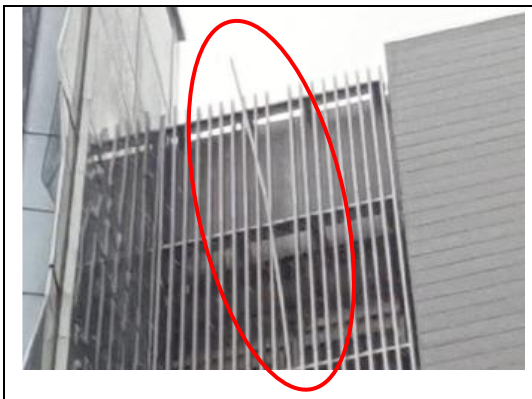
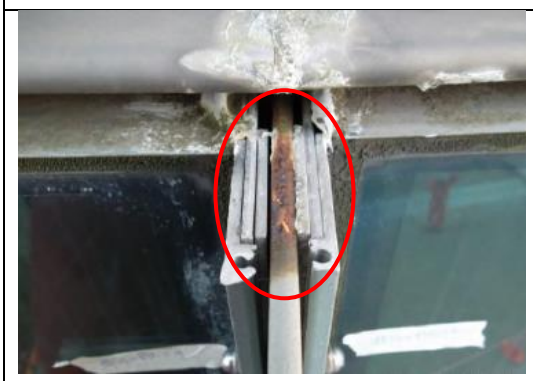
	
Cracked glass panels [Source: BCA file]	Corroded railing supports [Source: www.imageworkspainting.com]

	
Corroded metal railing [Source: BCA file]	Damaged sealant [Source: BCA file]

9.2.8 Fins and louvres

a) Dangling elements

b) Corrosion of elements/ connections

	
Dangling fin [Source: BCA file]	Dangling louvre [Source: BCA file]
	
Corroded steel fin [Source: BCA file]	Corroded screws at louvres [Source: BCA file]

9.2.9 Sunshade, awning, canopy, roofing sheet, rainwater down-pipe and gutter

a) Dislodgement
b) Corroded/ loose connections
c) Corrosion/ dislodgement of rainwater down-pipe and gutter
d) Dislodgement of ceiling boards, fascia boards
e) Corrosion of rainwater down-pipe/ gutter hangers/ clamps

	
Corroded and missing gutter [Source: BCA file]	Dislodged timber board [Source: BCA file]
	
Dislodged gutter [Source: BCA file]	Dislodged facia board and frame [Source: BCA file]
	
Fallen tiles [Source: BCA file]	Corroded and missing rainwater down-pipe [Source: BCA file]

	
Detached awning [Source: BCA file]	Corroded sunshade support [Source: BCA file]

9.2.10 Structural support for air-conditioning unit

a) Corrosion of air-con brackets,

b) Corrosion of air-con brackets fixing/ fasteners

	
Corroded air-con bracket [Source: BCA file]	Corroded fixing [Source: www.daikin.com/anti-corrosion]

10 ASSESSMENT AND CLASSIFICATION OF RESULTS

10.1 The Competent Person shall give his/her assessment on the façade condition based on the façade inspection findings and his/her professional judgement. Each type of façade on the building and its condition must be classified as either "**Safe**", "**Require Repair**" or "**Unsafe**".

a) A "**Safe**" classification means that the façade is in a condition that will not require any repair and is unlikely to become unsafe or require repair.

b) A "**Requires Repair**" classification denotes that the condition of façade is deteriorating but does not pose any imminent danger. However, the façade requires repair to address problems detected and prevent further deterioration.

c) An "**Unsafe**" classification represents a condition of a façade that is dangerous and requires immediate attention and repair.

10.2 If a type of façade is classified as "**Unsafe**" or "**Require Repair**", the Competent Person shall recommend to the building owner to take all necessary immediate measures to ensure that the façade does not pose a danger to any person or damage any property. Any building façade elements found to be loose or dangling shall be removed immediately. The Competent Person is to assess whether immediate measures, such as cordoning off and erecting of protective hoarding to prevent access into the affected area, and removal of the affected façade element, are needed.

10.3 Where the façade defects and rectification involve structural elements, the Competent Person is advised to engage the services of a Professional Engineer in the Civil or Structural discipline (if the Competent Person is not one) and obtain engineering advice to aid him in the assessment of the integrity of the building façade and proposed rectification works.

10.4 The Competent Person shall prepare and submit an inspection report to the Commissioner of Building Control upon completion of the façade inspection, which shall include the recommendation for immediate precautionary measures for "Require Repair" and "Unsafe" classifications of façade condition. See Section 11 of these Guidelines on the preparation of the façade inspection reports.

11 FORMAT OF REPORT SUBMISSION

11.1 The Competent Person must prepare a report on the results of the visual inspection and close-range inspection of the façade and his or her assessment of the condition of the façade in accordance with the Building Control Act and regulations. The report produced by the Competent Person should be professional, clear and conclusive. A stereotype report written in a manner, which can be used for any building with minor

changes to its title block, is non-compliant with the Building Control Act and defeats the purpose of the periodic façade inspection regime. On the other hand, a thick report consisting of mainly photographs with no technical input will also not serve the purpose. Appropriate and sufficient photographs that can represent the general façade condition and defects to match the conclusion made should be set out in the report, and not just be limited to areas of facades where defects are observed.

11.2 The report should reflect how the Competent Person had carried out the façade inspection in a professional manner with reasonable diligence. A well-prepared and professional report is demonstrated by the technical views, assessment, judgement, conclusion and follow-up recommendations put forth with a sound basis. Such a report is also useful for the owner for follow-up on maintenance and repair required.

11.3 The report must contain a detailed description of the visual inspection with photographic images, close-range inspection and any full façade investigation of the facade of the building conducted by the Competent Person, analyses of observations about the condition of the façade and of every test conducted in the course of any visual inspection, close-range inspection and full façade investigation of the façade, and recommendations by the Competent Person as to such building works as are necessary to ensure the integrity of any part of the building façade or to prevent the occurrence of a collapse (wholly or partly) of the façade and death or injury to individuals, or damage to other property, within or outside the building. The Competent Person should use the classification of "**Safe**", "**Require Repair**" or "**Unsafe**" for the building façade system. In addition, checklists in Annex C and Annex E shall accompany the inspection report submission.

11.4 The report shall set out, but not be limited to, the following:

11.4.1 <u>General Information</u>

a) Development/building address and name
b) Number of building blocks in the development
c) Number of storey in each building block within the development
d) Description of main usage of the buildings
e) Details of as-built records/ drawings of façade systems, if available
f) Maintenance history of the façade, if known

g) Names, addresses, contact details of other specialist/consultants involved in the inspection (if any)
h) Particulars of Façade Inspector engaged to assist the Competent Person in the inspection (if any)

11.4.2 Façade Systems of the Building

a) Description of the façade systems in different parts of the building (i.e. materials, connection details, etc.)
a) Sketches, plans and drawings of façade systems with proper titles, explanations and cross-references to the main body of the report
b) Indication of façade systems on building elevation drawings

11.4.3 Diary of the Visual Inspection

a) Time and dates of inspection
b) Duration of inspection
c) Location of inspection
d) Methodology of carrying out the visual inspection
e) Description of any areas not covered by the visual inspection, and the reasons for the non-coverage
f) Observations of any discrepancies and deviations from the approved plans
g) Façade elevations showing relevant findings (drawings or photographs)

11.4.4 Diary of Close-range Inspection

a) Basis of selection of locations/ areas to carry out the Close-range inspection
b) Drawings/plan of selected areas as record (example showing the 10% area)
c) Time and dates of Close-range inspection
d) Duration of inspection
e) Methodology of carrying out the Close-range inspection, including the type of inspection tools & equipment used
f) Façade elevations showing relevant findings (drawings or photographs)

11.4.5 Inspection Photos

a) Colour photographs showing the general condition, including the defects observed, of the entire building façade on each elevation

b) Colour photographs showing medium long shot, including the defects observed, of not more than four storey façade shown in each photo on each elevation

c) Colour photographs showing the "close-up" conditions, including the defects observed, of each façade system from both the visual inspection and Close-range inspection

d) Colour photographs showing the façade segments which require repair or are unsafe

11.4.6 Assessment on Findings

a) Description and classification of conditions (i.e. "**Safe**", "**Require Repair**" or "**Unsafe**") for each façade type on the building

b) Comparison of current façade conditions with conditions observed during the previous façade inspection cycle

c) Presentation of technical views, assessment, judgement and conclusion on the façade conditions based on the findings from the inspection

d) Locations and description of defects observed on the façade classified as "**Require Repair**" or "**Unsafe**"

e) Analysis on the causes of façade defects classified as "**Require Repair**" or "**Unsafe**"

11.4.7 Recommendations, Remedial and Follow-Up Actions

a) If "**Require Repair**" or "**Unsafe**" conditions are found, a repair proposal (to the entire façade, not just for the inspected façade areas) including details of proposed method, materials, precautionary measures, timeframe to complete the repairs, etc. shall be submitted

b) Recommendations for maintenance of façade until the next cycle of inspection, including the replacement of existing façade members to ensure robustness and durability under the existing environmental conditions

11.4.8 Conclusion

a) Summary of assessment on the condition of the façade elements inspected

b) Highlight on façade elements requiring remedial works or further investigation, precautionary measures

11.4.9 Endorsement and Standard Certification

a) Standard certification at the first and last page of the report, duly signed and endorsed by the Competent Person appointed to carry out the façade inspection

12 REPAIR WORKS TO BUILDING FAÇADE DEFECTS

12.1 The Competent Person shall recommend in his inspection report the necessary repairs to be carried out in order to restore the integrity of the building façades.

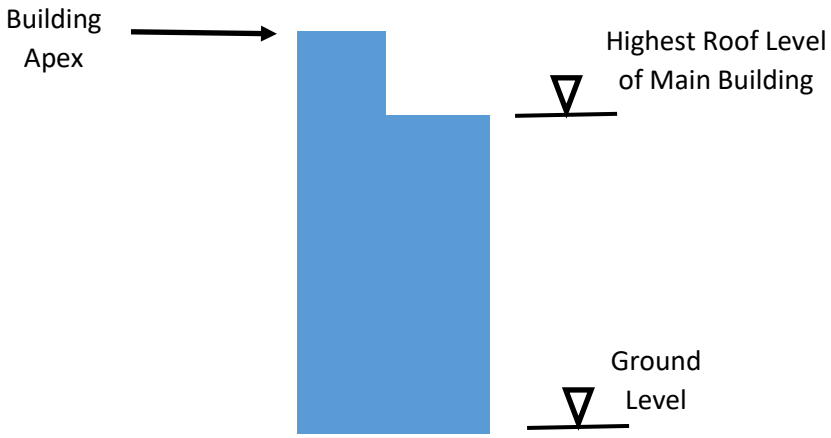
12.2 Where the repair involves any structural elements or works, the structural plan approval and permit to commence structural works are to be obtained prior to commencing the repairs, where applicable. It is recommended that where the Competent Person is also a professional engineer, the Competent Person should also be appointed to supervise the performance of the repair work. If the Competent Person is not a professional engineer, the building owner shall appoint a professional engineer to supervise the performance of the repair works.

12.3 Upon completion of the repairs, the owner shall submit photos of the completed repairs, as well as a certification that the repairs had been carried out in accordance with the recommendations of the Competent Person and supervised by a professional engineer/Competent Person to his/her satisfaction.

ANNEXES

Annex A: Examples of Building Apex

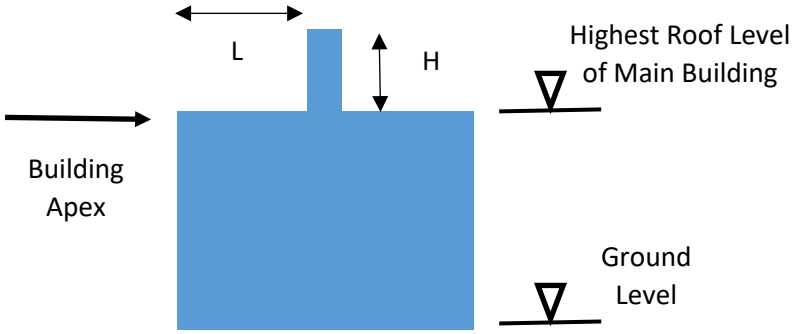
i) Roof Structures Aligned with Building Edge



Elevation View of Building

The building apex shall be taken as the top level of the roof structures.

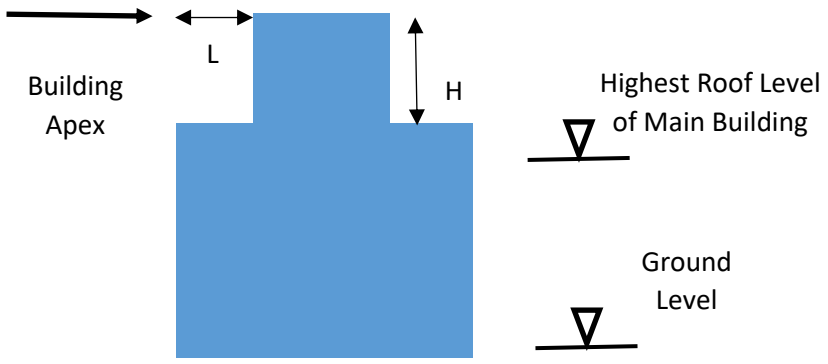
ii) Roof Structures with Setback from Building Edge



Elevation View of Building

L is the setback distance from the roof structures to the building edge.

If L > H, the building apex shall be taken as the highest roof level of the main building.

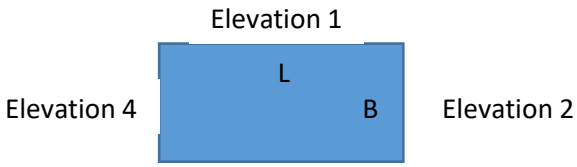


Elevation View of Building

If L < H, the building apex shall be taken as the top level of the roof structures.

Annex B: Examples of 10% Close-Range Inspection Requirement

Example 1



Plan of Building A

Building A, with a total height of H, has a rectangular layout plan and 4 façade elevations. The minimum coverage of the "close-range" inspection shall be as follows:-

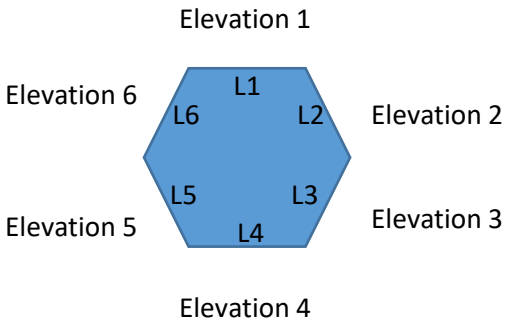
Elevation 1 – 10% of (L*H) m^2

Elevation 2 - 10% of (B*H) m^2

Elevation 3 – 10% of (L*H) m^2

Elevation 4 - 10% of (B*H) m^2

Example 2



Plan of Building B

Building B, with a total height of H, has a hexagonal plan and 6 façade elevations.

The minimum coverage of the "Close-range" inspection shall be as follows:-

Elevation 1 – 10% of (L1*H) m^2

Elevation 2 – 10% of (L2*H) m^2

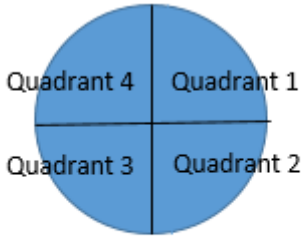
Elevation 3 – 10% of (L3*H) m^2

Elevation 4 – 10% of (L4*H) m^2

Elevation 5 – 10% of (L5*H) m^2

Elevation 6 – 10% of (L6*H) m^2

Example 3



Plan of Building C

Building C, with a total height of H, has a circular plan with diameter D. The minimum coverage of the "Close-range" inspection shall be 10% of (π*0.25*D*H) for each quadrant, and to cover all 4 quadrants of the building.

Annex C: Inspection Checklist of Facade Record for Elevation

Building Address:			
Building Height:		Number of storeys:	
Block Number:		Age of Building:	
BCA Notice Number:		Report Reference:	
Name of Inspector (FI):		ID of Inspector:	

Name of Competent Person (CP): _____

Company of Competent Person: _____

FAÇADE INSPECTION CHECKLIST:

Date of Inspection:	Time of Inspection:
Weather Condition:	Last inspection Date:
Elevation Marking / Reference:	Duration of visual inspection:
	Duration of close- range inspection:
	Location of the close-range Inspection:
Tools used for visual inspection: Eg. photographic camera, taken entire façade photo	
Visual Inspection work by FI:	Declaration of FI on visual inspection works: ☐ I have taken photos of entire façade under CP's instruction for his assessment.

Summary of Close-Range Inspection:

(**CP can edits the checklist in accordance to his inspection plan, such as façade types exist in the building*)

Masonry *e.g. brick, stone, plastering*

Tools used for inspection: eg. rubber mallets, tapping rods,

ID	Height/ Storey	Location: (record the inspected area can be referenced to drawing/report)	Photo No:	Defect Type*	Remarks (For timber cladding, to indicate the MC)

Glass Curtain wall *e.g. infil, frame, connection*					
Tools used for inspection: eg. borescope, etc.					
ID	Height/ Storey	Location: (record the inspected area can be referenced to drawing/report)	Photo No:	Defect Type*	Remarks (For timber cladding, to indicate the MC)
Claddings *e.g. fascia material, (metal/stone/Timber/etc.), frame, connection*					
Tools used for inspection: eg. borescope, metal detector, etc.					
ID	Height/ Storey	Location: (record the inspected area can be referenced to drawing/report)	Photo No:	Defect Type*	Remarks (For timber cladding, to indicate the MC)
Others *e.g. attachment, concrete*					
Types of attachment and tools used for inspection: eg. awning using borescope, etc.					
ID	Height/ Storey	Location: (record the inspected area can be referenced to drawing/report)	Photo No:	Defect Type*	Remarks (For timber cladding, to indicate the MC)

Signed by: _____ Verified by: _____

(FI) Name / Signature (CP) Name / Signature

*Defect Types:

1. Defective of Gasket/Sealant/Paints
2. Cracked/Broken/Deteriorated/Rotten Façade Material
3. Corroded/Loose Fixings/Brackets/Fastener
4. Defective Frame/Components
5. Bulging/Bowing/Delamination/Spalling
6. Stains/Efflorescence/Discoloration/Mold etc.
7. Defective movement joints
8. Termite
9. Others (please specify)

Annex D: Standard Certification by Competent Person for Periodic Façade Inspection of Buildings

Standard Certification by Competent Person for Periodic Façade Inspection of Buildings

In accordance with Section 28(6) of the Building Control Act (the "Act") and Regulations 15,16 and 17 of (Periodic Inspection of Buildings and Building Facades) Regulations 2021 (the "Regulations"), I, _____, the Competent Person appointed by the building owner under Section 28(3) of the Act have conducted an inspection on the condition and integrity of the building façade and hereby submit the report of the results of the inspection. I certify that the inspection was carried out and the report was prepared by me in accordance with the provisions of the Act and the Regulations.

_____ _____

Competent Person Date

ANNEX E - CHECKLIST FOR PERIODIC FAÇADE INSPECTION (PFI) REPORT OF EXISTING BUILDING AT _____

< BUILDING ADDRESS >

I declare that all the items listed below are addressed in my visual inspection report and a "tick" (✓) is placed in the checkbox for each item to indicate the aforementioned.

1. Types of façade systems and details
   a. Floor layout plans and details attached in Annex ☐
   b. Indication of façade types on building elevation plans ☐
   c. Description of all façade systems (including material and connections) ☐

2. Particulars of inspection personnel
   a. For Competent Person (CP): Name of CP, company name, company address, contact number and email address stated on cover page ☐
   b. For Façade Inspectors (FI): Name of FI, company name, company address, FI registration number listed in Annex ☐

3. Visual inspection of the building façade
   a. Inspected 100% of building façade ☐
   b. Description of inspection methods and its process ☐
   c. Close-up photos of façade defects classified as "Require repair" or "Unsafe" attached in Annex, with details of its location and defect type ☐

4. Close-range inspection of the building façade
   a. Inspected a minimum of 10% per building elevation ☐
   b. Location of close-range inspection indicated on elevation plans, with calculation on façade area inspected at each building elevation to justify item 4a. ☐
   c. Description of inspection methods and its process for each façade system ☐
   d. Close-up photos of façade defects classified as "Require repair" or "Unsafe" attached in Annex, with details of its location and defect type ☐

5. Overall elevation photo of each façade elevation, and medium long shot (not more than four stories) covering full building facade. ☐

6. Inspected for signs of façade defects and deterioration: ☐

a. Debonding/bulging ☐
b. Cracks on façade and its supports ☐
c. Corrosion ☐
d. Loose/misaligned members ☐
e. Spalling concrete ☐
f. Dislodged/dangling façade elements ☐
g. Missing supports/fixings ☐
h. Others (Please specify: _____) ☐

7. Summary of façade defects observed, with condition classification ("Require Repair" or "Unsafe") ☐

8. Recommend remedial works for façade systems classified as "Require Repair" and "Unsafe" and façade maintenance measures. ☐

9. Conclusion of inspection. Summary of assessment on the condition of the façade elements and highlight façade elements requiring remedial works. Assessment on the necessity for a full façade investigation. ☐

10. Annex C: Inspection Checklist of Façade Record for Elevation in the "Guidelines on PFI" attached in Annex. ☐

11. If drones are used for inspection, Annex E: UAS Inspection Report in "TR78-1 : 2020: Building façade inspection using unmanned aircraft system (UAS)" attached in Annex. ☐

12. Annex D: Standard Certification by Competent Person on first and last page of report. ☐

_____ _____

Competent Person
For Periodic Façade Inspection of Buildings
(Signature and Stamp)

Date