

Curtain Wall, Window and Window Wall

Structural Submission of Curtain Wall Plans

Curtain wall should be designed to meet the performance requirements set out in sections 29 to 31 of the Building (Construction) Regulation (B(C)R). Attention should be paid to the requirements for wind loads, horizontal imposed loads specified in section 9 of and Table 3 in the Schedule to the B(C)R on curtain wall when there is no protective barrier provided, protection of openings, protection against corrosion and the quality of materials.

2. The following details are required to be included in the curtain wall plans for submission to the Building Authority (BA) for approval:

- (a) structural framing and key structural details and the installation procedures excluding any unnecessary shop fabrication details;
- (b) structural calculations comprising design check on the parent structure, analysis on the structural adequacy and stability of the proposed curtain wall, element design for aluminium alloy, fixing components, glazing, and deflection check on major load carrying members;
- (c) workmanship specifications for welding, galvanisation measures to overcome bi-metallic effects, and corrosion prevention;
- (d) elevations including pane arrangements;
- (e) typical and non-typical sections showing structural members and supports;
- (f) typical and non-typical connections;
- (g) specifications on allowable tolerance of the positioning of curtain wall supports and any remedial arrangements in cases where such tolerance is exceeded;
- (h) the mode of support from and connection to the load-bearing structure of the building (anchorage in structural concrete members or welded connections to structural steel members) and any justification and application for modification of section 31 of the B(C)R for using other mode of support, e.g. drilled or bolted fixings;

- (i) standards or codes of practice;
- (j) material specifications for structural steel, aluminium alloy, cast-in anchors, fixing screws, structural sealant, and glazing; and
- (k) sections showing compliance with section 35 of the B(C)R and the Code of Practice for Fire Safety in Buildings 2011 on such relevant aspects as the protection against spread of fire and smoke between floors, between different fire compartments on the same floor, and between the accommodation of a storey and the required staircase or its protected lobby.

3. The authorized person (AP) and registered structural engineer (RSE) are reminded to ensure that the curtain wall plans are compatible with the approved general building plans.

Structural Submission of Window or Window Wall Plans

4. In general, window and window wall should satisfy the performance requirements stipulated in the B(C)R, the requirements on lighting and ventilation stipulated in the Building (Planning) Regulations and relevant codes of practice.

5. If a window or window wall forms wholly or partly the external wall of a building, have a structural opening with the least dimension exceeding 1.8m or an area exceeding 6m², and is at 100m or more above adjoining ground level or where the wind reference pressure, $Q_{o,z}$ ¹, is 2.86 kPa or more, structural framing and key structural details, excluding any unnecessary shop fabrication details should be submitted for approval. The submission should contain the following information to demonstrate that the window or window wall is of adequate strength and stability:

- (a) information described in items (b) to (g), (i) to (k) of paragraph 2 above;
- (b) structural adequacy in resisting horizontal imposed loads specified in section 9 of and Table 3 in the Schedule to the B(C)R for the window or window wall that functions as a protective barrier; and
- (c) deflection checks to ensure that the maximum deflection of the structural elements does not exceed the deflection limits stipulated in the Code of Practice for Structural Use of Glass 2018 (Glass Code).

/6. ...

¹ In case the preceding Code of Practice on Wind Effects in Hong Kong 2004 is adopted for the design of window or window wall, design wind pressure, q_z , should be regarded as the wind pressure criterion.

6. Structural details of a window or window wall (including glass shop front) with the design span of its structural elements (i.e. mullion, glass fins, etc.) exceeding 6m should be submitted for approval. The structural information mentioned in items (a) to (c) of paragraph 5 above should be included in the submission.

7. Where the structural details of a window and window wall are not required to be submitted for approval, the AP and RSE should ensure that the design, fabrication and installation of the window and window wall would achieve the required safety standard. Attention should be given to the requirements on horizontal imposed loads, protection of openings, function of protective barriers, corrosion protection, quality control of materials and protection against the spread of fire and smoke between floors.

Minor Works Relating to Curtain Wall, Window or Window Wall

8. Under the Minor Works Control System, certain minor works relating to repair or replacement of curtain wall, and construction, alteration, repair or replacement of window or window wall in an existing building are designated as minor works, which may be carried out under the simplified requirements as an alternative to obtaining prior approval and consent under the Buildings Ordinance (BO). Reference can be made to Schedule 1 of the Building (Minor Works) Regulation and Practice Note for AP, RSE and Registered Geotechnical Engineers (PNAP) APP-147 regarding the list of minor works items and the simplified requirements respectively.

Design and Construction Standards

9. Standards commonly used for the design and construction of curtain wall, window and window wall, which are acceptable to the BA, are given in Appendix A and PNAP APP-53.

Separate RSE

10. In view of the specialty of curtain wall, window and window wall works, a separate RSE may be appointed to prepare the design and supervise the carrying out of such works. Under such circumstances, the specified Forms BA4 and BA5 indicating the appointment of the separate RSE and the scope of works for which he/she is responsible are required to be submitted together with the plans submitted for approval. Upon completion of the works, the separate RSE so appointed is required to certify satisfactory completion of the works in accordance with regulation 25(3) of the Building (Administration) Regulations (B(A)R).

11. Where structural details for proposed curtain wall, window or window wall works are submitted by the separate RSE, the submission should be accompanied by an assessment report prepared by him/her giving an account of the effect of the proposed works to the parent structure. The assessment report should be appended with a statement signed by the project RSE to confirm that he/she is fully aware of the connection details and the effect of the works on the parent structure.

12. The separate RSE appointed for the curtain wall, window or window wall works shall be responsible for the supervision of the construction of such works, including the installation of any cast-in anchorage, e.g. anchor plates, cast-in embeds and through bolts, etc., in the parent structure except in the event where the cast-in anchorage has been pre-installed in the parent structure prior to his/her appointment. For such cases, the structural details and layout of the pre-installed parts should be given in the superstructure plans to be submitted for approval by the project RSE who shall then be responsible for the supervision of the installation of such parts. The separate RSE should refer to the pre-installed connection details when designing the curtain wall, window or window wall works and should co-ordinate with the project RSE for any necessary amendments if different connection details are to be used.

Use of Tempered Glass

13. Where tempered glass is used, the RSE and the registered contractor (RC) should ensure that an acceptable Quality Assurance Scheme (QAS) is adopted by the glass manufacturer to minimise the risk of spontaneous breakage of tempered glass.

14. To ensure that the tempered glass panes are of good quality, proper supervision and adequate quality control are necessary during the production processes of the tempered glass panes. In this connection, the following conditions/requirements will be imposed when giving approval of plans:

Quality assurance

- (a) the tempered glass should be manufactured by a factory with ISO 9001 quality assurance certification as required under item 6 of section 17(1) of the BO;
- (b) a copy of the QAS of the manufacturer should be submitted at least 14 days before the commencement of the production works in the factory as required under regulation 10 of the B(A)R. Such submission should be appended with a statement signed by the RSE to declare that he/she has studied the QAS and confirm that there are adequate measures incorporated in the QAS to ensure the quality of the tempered glass products in compliance with the provisions of the BO and the approved plans. The items to be included in the QAS are listed in clause 9.1.3 of the Glass Code;
- (c) the compliance reports for heat soak process² issued by the glass manufacturer and endorsed by the RSE should be submitted prior to the application for occupation permit or the submission of Form BA14 as appropriate under regulation 10 of the B(A)R. The compliance reports for heat soak process should be in accordance with clause 9.3 of the Glass Code;

/Quality ...

² As one of the quality control measures for tempered glass used in curtain wall, window and window wall works, heat soak process conforming to BS EN 14179-1:2016 and complying with the Glass Code should be carried out to all tempered glass panes.

Quality supervision plan

- (d) a quality supervision plan for the quality supervision of manufacturer's heat soak process of the tempered glass to be used in the works shown in the approved plans prepared by the RSE and the RC should be submitted as required under regulation 10 of the B(A)R at least 14 days before the commencement of the tempered glass production in the factory. A standard form of supervision plan together with a list of typical items for quality supervision and a sample of the inspection record are provided in Appendix B for reference.

Qualified supervision

- (e) the required qualified supervision under item 6 of section 17(1) of the BO should be provided as follows-
 - (i) the RSE should assign a quality control supervisor (QCS) to supervise a certain number of tempered glass panes undergoing the heat soak process. The RSE should determine the necessary frequency of supervision, which should cover at least 30% of the number of tempered glass panes used in the project. The minimum qualifications and experience of the QCS are to be the same as grade T3 technically competent person (TCP) under the RSE's stream, as stipulated in the Code of Practice for Site Supervision 2009 (2021 edition) (Supervision Code). As an alternative, the RSE's QCS may employ videotelephony³ to conduct supervision. In this connection, the QCS should work with his/her assistant in the factory who is not a member of the team of supervisory personnel of the RC stream providing the required continuous supervision;
 - (ii) the RC should assign a quality control co-ordinator (QCC) to provide full time continuous supervision of the heat soak process of all tempered glass panes in the factory. The minimum qualifications and experience of the QCC are to be the same as grade T1 TCP under the RC's stream, as stipulated in the Supervision Code. To ensure the heat soak process is properly conducted by the glass manufacturer, the QCC should measure the glass surface temperature independently by using his/her own data logger. The information recorded by the data logger should be set at one-minute intervals and kept in the factory; and

/(iii) ...

³ Videotelephony means two-way simultaneous communication with both audio and video in real time through telephone or computer network connections. The video should be recorded in colour with resolution of not less than 480p in a non-rewritable DVD-ROM.

- (iii) the names and qualifications of the QCS and QCC of the RSE and the RC respectively should be recorded in their inspection log books. The details of heat soak process for tempered glass panes should also be recorded in their log books and kept in the factory. If the alternative arrangement of employing videotelephony as described in paragraph 14(e)(i) above is adopted, all supervision items covered in the videos taken should be recorded contemporaneously in QCS inspection log book and should be submitted together with the DVD-ROM discs of the videos taken to BD within 14 days after completion of the heat soak process for each batch of tempered glass panes. The RSE should certify on each disc with a permanent marker signifying that his/her QCS personally use videotelephony for compliance with the approval conditions; and

Quality supervision report

- (f) a quality supervision report should be submitted by the RSE as required under regulation 10 of the B(A)R, prior to the application for occupation permit. The report should include a statement signed by the RSE to confirm that adequate supervision has been provided in accordance with the quality supervision plan, a copy of the inspection log book of the QCS and QCC of the RSE stream and RC stream respectively for the heat soak process required in paragraph 14(e)(iii) above, and a soft copy of the record of the data logger required in paragraph 14(e)(ii) above.

Structural Sealant

15. For better aesthetic appearance, structural sealant may be used in the curtain wall, window or window wall works. The proposed structural sealant should be compatible with the glazing system and the structural frame with which it is in contact. Compliance certificates comprising sealant compatibility test report, sealant adhesion test report and print review report in accordance with the Glass Code together with deglazing test report are required to be submitted prior to the application of an occupation permit or the submission of Form BA14 as appropriate. The compliance certificates and deglazing test report should be made by sealant manufacturer and be also appended with a statement signed by the RSE who has prepared the plans to confirm the acceptance criteria appropriate to the test have been complied with.

/Design ...

Design of Spider Fixing

16. The design of metal spider fixing as the fixing device for supporting glass panes should be verified by means of proof load test. In addition, attention should be given to its detailing at the interface connection with the glass panes, which should be designed to accommodate all anticipated movements. The mechanical properties, dimensions, load capacities and specific proprietary model number/series of metal spider fixing should be shown in the relevant plans submitted for approval.

17. Proof load test on metal spider fixing should be conducted in accordance with the test criteria specified in Appendix C upon completion of the works. The test report should be endorsed and submitted by the RSE prior to the application of an occupation permit or the submission of Form BA14 as appropriate. Proof load tests of metal spider fixing may not be required if the type of the proposed metal spider fixing is already included in the Central Data Bank promulgated in PNAP ADM-20 and uploaded to the Buildings Department (BD) website.

Locking Devices of Openable Sashes/Sub-frames

18. Locking devices are used to restrain openable sashes/sub-frames of windows, window walls and curtain walls in locked positions. All components of locking devices should be made of durable and non-combustible materials.

19. Locking devices should be evenly distributed along the sash/sub-frame to allow even load distribution on the window frame/curtain wall. The locations and the ultimate design strength of the locking points should be shown on structural plans for approval⁴. The ultimate design strength should be the characteristic strength divided by a factor of safety (FOS) of 1.8. The characteristic strength should be verified by means of a proof load test in accordance with the test criteria set out in Appendix D and the test report should be endorsed by RSE and submitted to BD prior to the application for an occupation permit or the submission of Form BA14 as appropriate. Proof load tests of locking devices may not be required if the type of the proposed locking devices is already included in the BD's Central Data Bank.

20. In order to ensure all locking points can be triggered effectively, a single handle bar should not be connected to more than 8 locking points.

21. Hinges for openable sashes/sub-frames should be adequate in holding its own weight. In general, the size of a top-hung sash should not exceed 2.5m². Similarly, the width of a side-hung sash should not exceed 700mm.

22. AP/RSE should ensure the openable sash/sub-frame and the locking devices are properly designed and assembled to meet the performance requirements and construction tolerance. In normal circumstance, the FOS of 1.8 is considered adequate for covering construction tolerance. Improper assembly may cause additional moment on the components of the locking devices. Adequate site supervision should also be provided to ensure that the works are properly assembled.

/Safety ...

⁴ The requirements on locking devices are applicable to all new or major revision of structural plans for development proposals or alteration and addition works submitted to the BA for approval on or after 1 August 2020.

Safety Test for Curtain Wall

23. Safety test for a curtain wall should be conducted as required under item 6 of section 17(1) of the BO. The test should be carried out by an independent laboratory accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) or by other laboratory accreditation bodies which have reached mutual recognition agreements/arrangements with HOKLAS. The test carried out by an accredited laboratory should be within its scope of accreditation. The test reports should be made on a HOKLAS endorsed certificate or equivalent certificate/report and be also appended with a statement signed by the RSE who has prepared the plans to confirm the acceptance criteria appropriate to the test have been complied with. They should be submitted prior to the application of an occupation permit or the submission of Form BA14 as appropriate. However, such safety test is not required for the curtain wall repair or replacement works carried out under the fast track processing procedures as stipulated in the relevant paragraphs of PNAP ADM-19 or minor works item 1.61 of the Minor Works Control System.

24. As a curtain wall may comprise various pane sizes subject to a wide range of design wind pressure, the test panes should be selected based on engineering judgement and with justification of mathematical computation models where appropriate. It is desirable to specify the representative test panes in the curtain wall plans. Detailed requirements of the safety test are given in clause 8.3.1 of the Glass Code.

Inspection, Maintenance and Repair

25. In view of the special requirements for the design and construction of curtain wall, window and window wall, the inspection, maintenance and repair of such works shall follow Annex D of the Glass Code. The BA recommends all AP and RSE to adopt the guidelines and requirements given in the Glass Code. They are also requested to offer help and advice as appropriate to their clients who have curtain walls, windows or window walls in their buildings.

26. At completion of new building projects or alteration and addition works, spare glass panes may be reserved for future repair or replacement works of curtain wall, window or window wall. The guidelines on record keeping and use of spare glass panes set out in Appendix E should be followed.

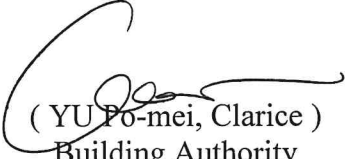
Aluminium Windows

27. Reference may be made to PNAP APP-116 in respect of the design and installation guidelines on aluminium windows.

Concurrent Processing of Approval and Consent Applications

28. For curtain wall works, the application for approval of plans and consent to the commencement of works may be made concurrently under PNAP ADM-19.

29. A similar practice note has been issued to RC.



(YU Po-mei, Clarice)
Building Authority

Ref. : BD GP/BREG/C/6(VII)

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**Standards Commonly Used for the
Design & Construction of
Curtain Wall, Window and Window Wall
Acceptable to the Building Authority**

Reference Standards

The standards listed in this appendix and PNAP APP-53 are intended to provide reference information only for the purpose of design and construction of curtain wall, window and window wall systems. It should be noted that:

- (a) the standards listed are not meant to be exhaustive;
- (b) national standards and codes of practice of various countries, though similar in major aspects, do not have exact equivalence to one another;
- (c) should a certain design standard be adopted, it should be applied to the design consistently; and
- (d) Building Regulations shall always take precedence over other design standards should there be a conflict between them.

A. Material & Workmanship

	Standard	Title/Description
Glass	Hong Kong Code of Practice	Code of Practice for Structural Use of Glass 2018
Stainless Steel	BS EN 10029:2010	Hot rolled steel plates 3 mm thick or above - Tolerances on dimensions, shape
	BS EN ISO 9445:2006	Continuously cold-rolled stainless steel. Tolerances on dimensions and form.
	BSEN ISO 9445-1:2010	Part 1. Narrow strip and cut lengths
	BSEN ISO 9445-2:2010	Part 2. Wire strip and plate/sheet
	BS EN 10048:1997	Hot rolled narrow steel strip. Tolerances on dimensions and shape
	BS EN 10051:1991+A1:1997	Continuously hot-rolled uncoated plate, sheet and strip of non-alloy and alloy steels. Tolerances on dimensions and shape
	BS EN 10095:1999	Heat resisting steels and nickel alloys

/B. ...

B. Design

	Standard	Title/Description
Glass	Hong Kong Code of Practice	Code of Practice for Structural Use of Glass 2018

C. Testing

	Standard	Title/Description
Glass	Hong Kong Code of Practice	Code of Practice for Structural Use of Glass 2018
Curtain Wall, Window, Window wall	Hong Kong Code of Practice	Code of Practice for Structural Use of Glass 2018

(Rev. 5/2020)

Heat Soak Process of Tempered Glass Supervision Plan

To the Building Authority,

In accordance with the conditions of approval imposed in your letter of _____ for _____ works,
we submit this supervision plan for the heat soak process of the tempered glass to be used at
(address of site) _____ on
(Lot No.) _____ (BD ref. _____).

2. We undertake that the supervision of the above heat soak process will be carried out in accordance with this supervision plan, PNAP APP-37/PNRC 84 and the Code of Practice for Structural Use of Glass 2018 (Code). We also undertake that the management and execution of quality supervision of the works covered by this supervision plan will be carried out in the manner prescribed by the provisions of the Buildings Ordinance and Regulations.

3. The quality control supervisor (QCS) and quality control co-ordinator (QCC) assigned by the registered structural engineer (RSE) and the registered contractor (RC) respectively to supervise the above heat soak process are:

	Name in English [^]	Name in Chinese [^]	I.D. No.^/ TCP No.**	Frequency of Quality Supervision
RSE's QCS [#]				at least 30% of the number of tempered glass panes
	Signature of QCS for confirmation of appointment*: _____			
RC's QCC [#]				Full time
	Signature of QCC for confirmation of appointment*: _____			

The contact information and CVs showing their relevant experience and academic qualifications are attached at the Annexes. If more than one supervisor/co-ordinator is proposed for a QCS/QCC post, the demarcation of their responsibility should be provided.

[^] In accordance with the Hong Kong Identity Card

^{**} CV is not required if TCP No. is provided.

[#] The minimum qualification and experience of QCS and QCC should fulfill the requirements specified in PNAP APP-37.

^{*} Signature of QCS/QCC for the confirmation of appointment under RSE/RC stream indicates that the QCS/QCC has read, understood and agreed with the notes on "Personal Data" of this supervision plan.

4. The quality supervision will cover all items of works to be inspected as devised in Annex 1. The record of quality supervision in Annex 2 will be completed contemporaneously by the QCS/QCC with a copy of these documents to be kept in the factory.

Prepared by:

Signature	_____	Signature	_____
Name of RSE	_____	Name of AS	_____
Date	_____	RGBC	_____
		Date	_____

Enclosure : Annexes 1 to 3

Personal Data

Purposes of Collection

1. The personal data provided by means of this supervision plan will be used by the Buildings Department for the following purposes:

- (a) activities relating to the processing of your submission in this supervision plan;
- (b) activities relating to the above proposed building works; and
- (c) facilitating communication between the Buildings Department and yourself.

2. It is obligatory for you to provide the information as required in the supervision plan. If you fail to provide the required data, delay may be caused in processing of your submission or even result in rejection of the application.

Classes of Transferees

3. The personal data you provided by means of this supervision plan may be disclosed to other government departments, bureaux, organisations or any persons for the purposes mentioned in paragraph 1 above.

Access to Personal Data

4. You have the right of access and correction with respect to the personal data as provided under the Personal Data (Privacy) Ordinance. The Buildings Department has the right to charge a reasonable fee for the processing of any data access request. Request for personal data access and correction should be addressed to the New Buildings Division 2 of the Buildings Department.

Annex 1 to Appendix B
(PNAP APP-37)

Typical Items for Quality Supervision of Heat Soak Process of Tempered Glass

Item	Description
(a) General	
H1	Ensure that the names of quality control supervisor (QCS) under RSE and quality control co-ordinator (QCC) under RC recorded in an inspection logbook and kept in the factory agree with the supervision plan.
H2	Ensure the respective QCC/QCS's inspection frequency and items are in accordance with the requirements of PNAP APP-37 and Code of Practice for Structural Use of Glass 2018 (Glass Code).
H3	Check that the calibration reports (as detailed in clause 9.3.2 of the Glass Code) of the ovens are in accordance with BS EN 14179-1:2016 and kept in the factory.
H4	Check that all thermocouples are calibrated at 6-month interval as recommended in the HOKLAS Supplementary Criteria No. 2.
H5	Check that all essential details (e.g. quantity and size of glasses, reading of data logger, etc.) of heat soak process for tempered glass panes are recorded in the logbook and kept in the factory.
(b) Heat Soak Process	
H6	Check that a minimum of 8 thermocouples are installed and monitored by the factory in accordance with clause 9.3.3 of the Glass Code.
H7	Check that an additional thermocouple is installed and measured independently by using the QCC's own data logger.
H8	Check that a minimum clearance of 20mm is provided to separate the glass panels and ensure heated air circulation between the glass panels.
H9	Check that heating phase is commenced with all the glass panels at ambient temperature.
H10	Check that heating phase is concluded when surface temperature of the last glass reaches 250°C; the glass surface temperature should not be allowed to exceed 290°C; the period of glass surface temperature in excess of 270°C shall be minimised. The maximum heating rate is 3°C per minute.
H11	Check that holding phase is commenced when surface temperature of all glass panes has reached 250°C; the duration of the holding phase is at least 120 minutes; the oven should be controlled so that the glass surface maintains in range of 260°C $\pm$ 10°C during the holding phase.
H12	Check that doors of oven are not opened until the reading of the control element dropped to 70°C.
H13	Check that number of broken glass after heat soak process is recorded.
H14	Check that fragmentation test is carried out after heat soak process.
Hn	Any other items considered essential for quality supervision of the heat soak process.

**Record of Quality Supervision Carried Out by
QCS / QCC* under RSE / RC* Stream**

BD Ref.: BD 3/1234/22
 Project Location: ABC Street
 Type of Works: Heat Soak Process of Tempered Glass for Curtain Wall Works
 Name of QCS / QCC*(1): Mr. Lee Tai-man
 Frequency of Inspection: Full time / at least 30% of the number of tempered glass panes*

Date Item No. ⁽²⁾	4/1/2022 (Tue)			
	Batch No. and Quantity Inspected	Inspection Findings		Photos (if any)
		Result (S ⁽³⁾ /NS ⁽⁴⁾ /NA ⁽⁵⁾)	Remedial / Remark	
H1	Batch 2, 8 nos. of glass panes	S		
H2	Ditto	S		
H3	Ditto	S		
H4	Ditto	S		
H5	Ditto	NS	Record of some glass panes' size incomplete. It has been rectified and recorded in logbook	
H6	Ditto	S		
H7	Ditto	S		
H8	Ditto	NS	Clearance less than 20mm. It has been rectified and recorded in logbook.	
H9	Ditto	S		
H10	Ditto	S		
H11	Ditto	S		
H12	Ditto	S		
H13	Ditto	NS	Broken glass not recorded. It has been rectified and recorded in logbook.	
H14	Ditto	S		
Signature				

* Delete if inappropriate

- Note ⁽¹⁾ : Full name of the QCS/QCC as provided in the supervision plan.
 Note ⁽²⁾ : According to the checklists devised by the RSE and AS of the RC.
 Note ⁽³⁾ : "S" denotes "Satisfactory".
 Note ⁽⁴⁾ : "NS" denotes "Not satisfactory".
 Note ⁽⁵⁾ : "NA" denotes "Not Applicable".

(4/2022)

Proof Load Test for Spider Component

Reference Standards

The design of metal spider fixing can be verified by means of proof load test, which are required to be carried out in accordance with the test criteria specified in the Code of Practice for the Structural Use of Steel 2011.

2. The requirements and procedures for the test are:
- (a) Sampling rate should be at least 1% or 3 numbers, whichever is more, of each representative type of the spider components concerned, and the test specimens should be set up in such a manner that is compatible with the proposed fixing details given in the approved plans;
 - (b) Test loads should be determined in accordance with clause 16.2.1.2 of the Code of Practice for the Structural Use of Steel 2011. 'Actual dead load present during the test' may be taken as the weight of the spider component. 'Remainder of dead load' may be taken as the weight of the attachment (e.g. glass panes) to the spider component;
 - (c) A test load should be applied and released in at least 5 increments and decrements respectively;
 - (d) A reading on deformation should only be taken when it has become completely stable, and readings on deformation should be taken at three 5-minute intervals at least on attainment of the test load until there is no significant increase in the deformation;
 - (e) There should be no creep for a period of at least 15 minutes under the test load;
 - (f) A running plot in respect of loading increment/decrement against deformation should indicate substantial linear behaviour under the test load; and
 - (g) On removal of the test load, the recorded residual deformation should not exceed 5% of the maximum deformation recorded.

Proof Load Test for Single Locking Devices of Openable Sashes / Sub-frames

The characteristic strength of each type of single locking devices should be verified by means of proof load test. The testing specimens should fully represent the actual arrangement of the single locking devices to be installed on site.

2. The requirements and procedures for the test are:
- (a) Sampling rate should be at least 0.1% or 5 numbers, whichever is more, of each type of the locking devices concerned. The test specimens should be set up in such a manner that they are compatible with the proposed fixing details given in the approved plans;
 - (b) Test load should be applied at a constant rate; and
 - (c) The characteristic strength should be evaluated as follows:

$$\text{Characteristic strength} = \text{Average test load at failure} - K \times \sigma$$

where

K is the K-factor for at least 5 test specimens and may be taken as 3.41 (K-factor corresponding to larger numbers of test specimens may be used if appropriate); and

σ is the standard deviation.

**Guidelines on Record Keeping and Use of Spare Glass Panes in
Repair/Replacement of Curtain Wall, Window or Window Wall**

At completion of new building projects or alteration and addition (A&A) works involving curtain walls, windows or window walls (collectively referred to as “original project”), spare glass panes may be reserved and kept by the owners/ Management Office (MO) of the buildings for use in future repair/replacement works. The registered general building contractor (RGBC) appointed for the original project (the original RGBC) should confirm that the spare glass panes were manufactured for the original project and ensure that relevant documents, including approval letters, consent letters, certificates, test reports, compliance report and quality assurance scheme, of the spare glass panes (spare glass documents) are included in the maintenance manual. The original RGBC should label each spare glass pane with a unique identification number and record relevant information in Schedule A in the Annex for inclusion in the maintenance manual.

2. The owners or MO of the buildings should properly keep the maintenance manual and the spare glass panes for future repair/replacement works. A traceable storage record of the spare glass panes should also be kept by the owners or MO including quantities for each type of the spare glass panes.

3. Where prior approval and consent for repair/replacement of curtain wall, window or window wall with the use of the spare glass panes are sought from the Building Authority (BA), the appointed registered structural engineer (RSE) should check the corresponding set of spare glass documents in the maintenance manual. The RSE should clearly state in the plans submitted for the BA’s approval that: (i) spare glass panes of the original project will be used in the proposed A&A works; and (ii) inspection of such spare glass panes will be conducted prior to installation.

4. Before installation, the RSE or his/her representative should inspect the spare glass panes to ensure that they are suitable for use in the proposed A&A works. Annex D of the Code of Practice for Structural Use of Glass 2018 gives some reference guidelines for inspection of glass panes. Information of the glass panes used in the A&A works should be recorded in Schedule B in the Annex and submitted together with the Form BA14 certifying completion of the A&A works to BD. A copy of the Schedule B should also be provided to the owners or MO after completion of the works for inclusion in the maintenance manual. In case a copy of Schedule A which was duly completed and endorsed by the original RGBC is submitted together with the Form BA14 certifying completion of the A&A works to BD, copies of quality supervision plan and quality supervision report for heat soak process of the spare tempered glass panes are not required to be submitted to BD for the proposed A&A works.

5. For the use of spare glass panes in the repair/replacement of curtain walls, windows or window walls carried out under the Minor Works Control System (MWCS), similar guidelines are provided in the Technical Guidelines on MWCS.

**Schedule A (for Spare Glass Panes Reserved for
Future Repair/Replacement of *Curtain Wall/Window/Window Wall Works)**
(to be completed by RGBC at completion of new building project or alteration and addition works)

(A) Details of Spare Glass Panes

Type of Glass Pane (e.g. heat strengthened/ tempered/ laminated/ IGU, etc.)	Thickness (mm)	Dimensions (width x length) (mm x mm)	Quantities	Identification no. of Glass Pane

- (B) The above glass panes were manufactured for the *new building development/alteration and addition works at (address) _____ under BD reference no. _____.
- (C) The required documents (including approval letters, consent letters, certificates, test reports, #compliance report and #quality assurance scheme) for the above glass panes specified in the approval and consent letters are attached herewith and included in the maintenance manual.

Signature:			
Full name^ of Authorized Signatory (AS) of RGBC:		Date:	
Registration No.^:		Date of Expiry of Registration^:	

* Delete as appropriate

Delete for non-tempered glass

^ In accordance with registration record

**Schedule B (for Spare Glass Panes to be Used in
Repair/Replacement of *Curtain Wall/Window/Window Wall Works)**
(to be completed by *RSE or Prescribed Building Professional (PBP)/Authorized Signatory (AS) of
Prescribed Building Contractor (PRC)# at completion of repair/replacement works)

(A) Details of Spare Glass Panes Used

at (address) _____ under BD reference no. _____

Type of Glass Pane (e.g. heat strengthened/tempered/ laminated/ IGU, etc.)	Thickness (mm)	Dimensions (width x length) (mm x mm)	Quantities used	Identification no. of Glass Pane used

(B) Inspection on Records and Conditions of Glass Panes

1. I have read the relevant documents of the above glass panes kept in the maintenance manual (including approval letters, consent letters, certificates, test reports, @compliance report and @quality assurance scheme).
2. I confirmed the above glass panes, in my opinion, suitable for the proposed repair/replacement works.

Signature:			
Full name^ of *RSE or PBP/AS of PRC#:		Date:	
Registration No.^:		Date of Expiry of Registration^:	

* Delete as appropriate

@ Delete for non-tempered glass

^ In accordance with registration record

To be endorsed by PBP for Class I Minor Works or the AS of PRC for Classes II/III Minor Works

(2/2024)