

**For Information**

**LEGISLATIVE COUNCIL  
PANEL ON DEVELOPMENT**

**Standards for Glass Windows of Buildings**

**PURPOSE**

This information paper briefs Members on the standards and regulations relating to the construction of glass windows (including glass curtain walls) under the Buildings Ordinance (BO) (Cap. 123) and updates made in recent years so as to ensure the construction standards of all glass windows and curtain walls within buildings are in compliance with international standards and, given proper maintenance, could resist inclement weather so that public safety is guaranteed.

**STANDARDS ESTABLISHED FOR THE CONSTRUCTION OF GLASS WINDOWS OF BUILDINGS**

2. The construction of glass windows (including curtain walls, aluminium windows and glass walls, collectively named as “Glass Windows” hereafter) is defined as “building works” under section 2 of the BO, and is subject to the control of the BO and its subsidiary regulations. The materials, design and construction of Glass Windows are subject to the control of the Building (Construction) Regulations (Cap. 123B) and shall comply with the requirements in resisting wind loads<sup>1</sup>. In respect of the standard on design and construction of Glass Windows, the Buildings Department (BD) has issued relevant Practice Notes for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers (PNAPs) and codes of practice (the list and relevant links are at the **Annex**) for the registered building professionals to follow during the design stage.

3. In general, approval and consent from BD<sup>2</sup> is required prior to the

---

<sup>1</sup> Wind loads refer to the pressure exerted on buildings as a result of air flow. Generally speaking, higher wind speed will result in larger wind pressure.

<sup>2</sup> Except for exempted building works and minor works stipulated under section 41 of the BO, approval and consent should be obtained prior to the commencement of all building works.

commencement and carrying out of the construction of Glass Windows. For small-scale building works involving Glass Windows which include erection, alteration or repair works, if the sizes of the subject structural members fulfill those specified dimensional criteria, the works may be carried out under the simplified requirements of the Minor Works Control System (MWCS)<sup>3</sup>.

## **PNAPs**

4. As regards the standard for the design and construction, safety supervision and testing, maintenance and repair of Glass Windows, BD has been providing the registered building professionals with relevant guidelines which have been timely updated so as to assure the safety of the built Glass Windows. In as early as 1984, the then Building Development Department (BDD) (the predecessor of BD) issued PNAP 106 to specify the requirements of design wind pressure and safety testing for glass curtain wall. In 2000, BD issued PNAP 239 on large glass windows and glass walls. In 2001, BD issued PNAP 248 to specify the design and installation requirements on aluminum windows. In 2006, BD incorporated the contents of PNAP 239 into PNAP 106 while making a general revision to the latter. In August 2009, PNAP 106 was renamed as PNAP APP-37. A revision was made to PNAP APP-37 in May 2012, in which the quality assurance and supervision requirements of tempered glass and the design and testing requirements of metal spider fixings for the support of glass panels were added. PNAP 248 was renamed as PNAP APP-116 in August 2009, which was updated in March 2006 to revise the design of four-bar hinges of aluminum windows and provide guidelines for the design of the top members of window frames and the maximum width of window sashes.

## **CODE OF PRACTICE FOR STRUCTURAL USE OF GLASS 2018 (THE GLASS CODE)**

5. In view of the latest development in the design and construction methods of glass structures, BD commissioned a consultancy study to review the requirements and standards for the materials, design and construction for glass structures. By consolidating the guidelines in the relevant PNAPs<sup>4</sup> of BD and

---

<sup>3</sup> The MWCS has come into full operation since 31 December 2010. Building owners may carry out minor works under the simplified requirements under the MWCS without the need to obtain prior approval and consent of BD prior to the commencement of works.

<sup>4</sup> Including PANP APP-37, APP-110 and APP-116.

taking into account local practices, as well as the experience and practices in Europe, the United States, the Mainland, Singapore, Australia and Canada, BD promulgated the Glass Code in February 2018 that would be in line with the latest international standards and meet local requirements. The Glass Code seeks to strengthen the regulation of glass structures based on the foundation laid by the PNAPs mentioned in paragraph 4 above.

6. In comparison with the PNAPs mentioned in paragraph 4 above, the Glass Code was published specifically for glass structures (including glass curtain walls, aluminum windows, glass walls, glass balustrades, glass beams and columns) to provide up-to-date and comprehensive guidelines for the industry on the design, construction, testing and quality assurance of structural glass works. The Glass Code brings in common glass design methods which are adopted internationally to enhance design accuracy and cost effectiveness. It also provides guidelines for the quality control and safety requirements of various types of glass and their structural components, the use of laminated glass at the external walls of buildings, safety test for various types of glass materials and curtain wall system, and on the maintenance and repair of glass windows and glass curtain walls for registered building professionals to follow when designing, constructing and maintaining the glass structures.

7. In addition, a Technical Committee on the Glass Code<sup>5</sup> has been set up to gather and consider feedback from the building industry on the application of the Glass Code, relevant advancement in glass design, technologies and construction methods, associated regulatory control adopted in the Mainland and overseas countries and international standards, with a view to regularly reviewing the use and technical requirements of the Glass Code and making recommendations.

8. When processing building plans, BD will strictly examine the load carrying capacity of the Glass Windows and their structural components to withstand various external factors (including wind force) in accordance with the technical principles listed in the Codes of Practice and relevant PNAPs to safeguard public safety. Prior to the installation of glass curtain walls, a representative module<sup>6</sup> is required to undergo and pass designated safety tests.

---

<sup>5</sup> The committee comprises representatives from the industry, academia, the Architectural Services Department and the Housing Department.

<sup>6</sup> Representative module refers to a specimen of at least one floor height and shall include the different features of the curtain wall system to be used.

When building works are completed, a certificate of completion of building works have to be submitted by an Authorized Person (AP) together with a Registered Structural Engineer and a Registered Contactor in accordance with the BO to certify that the works have been completed in accordance with the approved plans and in compliance with the BO and its subsidiary regulations.

## **CODE OF PRACTICE ON WIND EFFECTS (THE WIND CODE)**

9. The Wind Code was promulgated by the then BDD in 1983 and was updated in 2004. The Wind Code stipulates general standards on building design to withstand wind pressure for the registered building professionals to make reference and comply with when designing the buildings. The design wind velocities adopted in the Wind Code are higher than the gust wind velocities that would trigger the hoist of the Hurricane Signal No.10 by the Hong Kong Observatory. Also, an additional factor of safety of 40% is required to be applied when determining the wind loads on the Glass Windows structure in accordance with the Glass Code. Therefore, Glass Windows designed in accordance with the Wind Code and Glass Code with proper maintenance should be able to withstand wind forces up to that during Hurricane Signal No.10 is hoisted.

10. That said, in view of the development of wind engineering and the meteorological data available in recent years, BD commissioned a consultancy study earlier to review the existing Wind Code. The consultancy study compares the Wind Code with the practices in relevant overseas codes on wind effects and published journals. Recommendations have been made on revising the Wind Code so as to better align it with contemporary international design approaches and keep it in pace with the latest development in wind engineering and technologies, with the effect of climate change on the velocities of hurricanes taken into consideration. In consultation with the industry, BD has promulgated the revised Wind Code in September 2019 (i.e. Code of Practice on Wind Effects in Hong Kong 2019 (“2019 Wind Code”). Although the design wind pressures adopted in the 2019 Wind Code are largely similar to those before the revision, the 2019 Wind Code has introduced new parameters for the calculation of wind loads, including the effect of wind along and across a building and the effect of uneven wind pressure on wind frontal faces, sheltering effect of surrounding buildings, variation of wind velocities at different directions in Hong Kong and wind tunnel testing, so as to comprehensively enhance the capability of buildings

in resisting extreme wind forces.

11. Considering climate change, BD will continue to review from time to time the technical requirements of the codes of practice and relevant PNAPs and update such timely. In this connection, BD will set up a technical committee to gather and consider feedback from the building industry on the use of the 2019 Wind Code, latest advancement in design and technologies, and international standards in order to regularly review the use and technical requirements of the 2019 Wind Code and make timely recommendations.

## **MAINTENANCE AND REPAIR**

12. The Government has long been emphasising that building owners are responsible for the proper maintenance and timely repair of their properties and the common areas of the buildings. Repair or replacement of Glass Windows are common works items. As mentioned in paragraph 3 above, for the repair or replacement works of Glass Windows which are not exempted building works or minor works, the building owners should appoint a registered building professional to submit an application for alteration and addition works to BD and carry out the works after obtaining prior approval and consent.

13. To further improve building safety and facilitate building owners in carrying out maintenance and repair works for their buildings, BD is proposing to make amendments to the extant Building (Minor Works) Regulation (Cap. 123N), by adding and amending certain minor works items involving repair of Glass Windows. The proposed amendments, as set out in Appendix II of the Legislative Council Paper No. CB(1)593/18-19(04) were discussed at the meeting of the Panel on Development on 26 February 2019.

14. Under the Mandatory Building Inspection Scheme (MBIS) implemented since mid-2012, owners of buildings aged 30 years or above (except domestic buildings not exceeding 3 storeys), upon being served with statutory notices, are required to appoint a Registered Inspector (RI) to carry out inspection and supervise the repair works found necessary of the common parts, external walls and projections or signboards of the buildings. If repair works are required, the owners concerned should appoint a registered contractor to carry out the repair works under the supervision of an RI. For clarity, glass curtain walls fall within the scope of external elements requiring inspection and repair under

the MBIS.

15. The Mandatory Window Inspection Scheme (MWIS) implemented since mid-2012 also requires owners of private buildings aged 10 years or above (except domestic buildings not exceeding 3 storeys) to appoint a Qualified Person to carry out inspection of all windows of the building and supervise the necessary repair works carried out by a registered contractor. Glass windows and their structural components fall within the scope of elements requiring inspection and repair (if applicable) under the MWIS.

16. Building owners may also initiate inspections and repairs for their buildings in accordance with the standards and procedures of MBIS and MWIS voluntarily before the receipt of statutory notices from BD. In such cases, the buildings or the relevant parts thereof will be deemed to have fulfilled the requirements within the respective inspection cycles of 10 years (for MBIS) and 5 years (for MWIS).

17. Besides, BD may issue an investigation order to the owner concerned under section 26A of the BO to require the owner to appoint an AP to conduct a detailed investigation on condition of the Glass Windows of the building, and submit a remedial proposal to BD to rectify the defective conditions. Similarly, BD may issue a repair order under section 26 of the BO to require the owner concerned to repair defective or damaged Glass Windows. An owner who, without reasonable excuse, fails to comply with a repair order/investigation order may be prosecuted and, upon conviction, liable to a maximum penalty of a fine of \$50,000 and imprisonment for 1 year, plus a daily fine of \$5,000. BD may also arrange for carrying out of the required investigation or repair works by its contract consultant and contractor, and recover the cost of the investigation or repair works as well as the supervision charge from the owner, together with a surcharge of not exceeding 20% of that cost and supervision charge. In case of emergency, BD may carry out necessary rectification works first under the BO and recover the cost from the owner afterwards.

18. In respect of publicity and public education, BD has uploaded information on “Precautionary Measures For Public and Building Safety during Typhoon Season” in its website, providing guidelines for precautionary measures to building owners, incorporated owners, property management companies, registered building professionals and registered contractors. These guidelines include the provision of proper protection materials or devices for windows, glass

doors and glass panes in positions exposed to strong wind; ensuring gondolas parked at safe location and properly secured; taking suitable precautionary measures against strong winds for tower cranes to avoid causing danger to nearby buildings, etc. The hyperlink is at **Annex** for Members' reference.

**Development Bureau**  
**Buildings Department**  
**October 2019**

**(A) Codes of Practice**

1. Code of Practice for the Mandatory Building Inspection Scheme and the Mandatory Window Inspection Scheme 2012

[https://www.bd.gov.hk/doc/en/resources/codes-and-references/code-and-design-manuals/CoP\\_MBIS\\_MWISe.pdf](https://www.bd.gov.hk/doc/en/resources/codes-and-references/code-and-design-manuals/CoP_MBIS_MWISe.pdf)

2. Code of Practice for Structural Use of Glass 2018

<https://www.bd.gov.hk/doc/en/resources/codes-and-references/code-and-design-manuals/SUG2018e.pdf>

3. Code of Practice on Wind Effects in Hong Kong 2019

<https://www.bd.gov.hk/doc/en/resources/codes-and-references/code-and-design-manuals/WindEffects2019e.pdf>

**(B) Practice Notes for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers**

4. APP-37 Curtain Wall, Window and Window Wall Systems

<https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/APP/APP037.pdf>

5. APP-116 Aluminium Windows

<https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnap/APP/APP116.pdf>

**(C) Practice Notes for Registered Contractors**



6. PNRC 47 Aluminium Windows

<https://www.bd.gov.hk/doc/en/resources/codes-and-references/practice-notes-and-circular-letters/pnrc/Pnrc47.pdf>

**(D) Promotional Material**

7. Precautionary measures for Public and Buildings Safety during Typhoon Season

<https://www.bd.gov.hk/en/resources/codes-and-references/precautionary-measures-typhoon-season/index.html>