

### **Aluminium Windows**

Section 3 of Building (Construction) Regulation (B(C)R) stipulates that all materials used in building works or street works must be of a nature and quality suitable for their intended use or purposes; adequately mixed or prepared; and applied, used or fixed so as to perform adequately their intended functions. These requirements apply to aluminium windows to be installed in any buildings. This Practice Note for Registered Contractors (PNRC) specifies the requirements on the design and installation of aluminium windows to ensure public safety and to prevent water seepage. Compliance with the design and installation requirements of aluminium windows described in paragraphs 3 to 9 below will be accepted by the Building Authority (BA) as meeting the provisions of section 3 of the B(C)R. Any deviations from these requirements have to be separately substantiated for acceptance.

#### **Minor Works Relating to Window**

2. Under the Minor Works Control System, certain minor building works relating to the repair and replacement of windows have been designated as minor works and may be carried out under the simplified requirements as an alternative to obtaining prior approval and consent under the Buildings Ordinance. Reference can be made to Schedule 1 of the Building (Minor Works) Regulation and Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers (PNAP) APP-147 regarding the list of minor works items and the simplified requirements respectively.

#### **Design and Installation Requirements**

3. Where aluminium windows are proposed, Registered Contractors (RC) should ensure that aluminium windows used in their projects are properly designed and installed to meet the performance requirements and the safety standards in the B(C)R. They should have experienced and skilled supervisors and workers as well as suitable quality assurance procedures in place to ensure the proper installation of the windows. Standards commonly used for the design and construction of window, which are acceptable to the BA, are given in Appendix A to both PNAP APP-37 and PNAP APP-53.

4. When designing windows, attention should be paid to the requirements on horizontal imposed loads, protection of openings, function of protective barriers, locking devices of openable sashes/sub-frames, corrosion protection, quality control of materials and protection against the spread of fire and smoke between floors.

5. Window members, transoms and mullions together with the glass panes should be of adequate size and strength taking into consideration the location, height and orientation of the windows. Window frames should be securely and rigidly fixed in place to window openings in walls. Where fixing lugs are adopted, they should be of stainless steel or hot dip galvanised steel having a minimum material thickness of 1.5 mm and be placed at 300 mm centres maximum. Adequate site supervision should be provided to check that all the fixing lugs are properly fixed. Where a spacing greater than 300 mm is proposed, the authorized persons (AP)/registered structural engineers (RSE) should satisfy that the performance of the windows including structural stability and waterproofing would not be compromised.

6. All structural members of a window should have a minimum aluminium thickness of 2 mm and the depth of the mullion should not be less than 38 mm. Particular attention should be paid to the fixing details of the hinges. All hinges and fastening mechanisms adopted in the installation should be able to withstand the positive and negative pressures due to the design wind conditions when the window is closed and should be of adequate size and strength commensurate with the size of the window.

7. To ensure the strength and rigidity of windows in general, the width of a side-hung sash should not exceed 700 mm and the size of a top-hung sash should not exceed 2.5 m<sup>2</sup>. Hinges for openable sashes/sub-frames should be adequate in holding the weight of the sashes/sub-frames.

8. Where 4-bar hinges are adopted, reference should be made to the Guidelines on Fixing of 4-bar Hinges at Appendix A.

9. Locking devices are used to restrain openable sashes/sub-frames of windows, window walls and curtain walls in locked positions. Improper assembly may cause additional moment on the components of the locking devices. Adequate site supervision should be provided to ensure that the works are properly assembled.

### **Window Stay**

10. Suitably designed window stay can minimise the effect of strong wind on the durability of hinges and casements.

### **Cleaning**

11. Corrosive agent should not be used for the cleaning of external walls and windows of buildings upon the completion of building works unless it is thoroughly washed with clean water immediately after application.

### **Water Seepage**

12. Besides safety consideration, water leakage from windows poses undue nuisance to the occupants. RC are reminded that poor workmanship is a major cause of the problem. Reference may be made to the *Guidelines on Prevention of Water Seepage in New Buildings* enclosed in the circular letter dated 7 March 2005 issued by the Buildings Department.

13. In order to ensure the durability of windows, it is recommended that the top member of a window frame should have a built-in projecting fin with a drip nose to prevent water ingress into the window frame/casement so as to minimise the possibility of corrosion due to accumulation of water. A typical section of the projecting fin is at Appendix B.

### **Water Penetration Test**

14. It is advisable to perform field water penetration test on the installed aluminium windows to ensure water tightness and quality of the completed window units. Some international standard testing methods are given in Annex A of the Code of Practice for Structural Use of Glass 2018.

15. A similar practice note has been issued to AP, RSE and registered geotechnical engineers.

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BD GP/BREG/P/38 (II)

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### **Guidelines on Fixing of 4-bar Hinges**

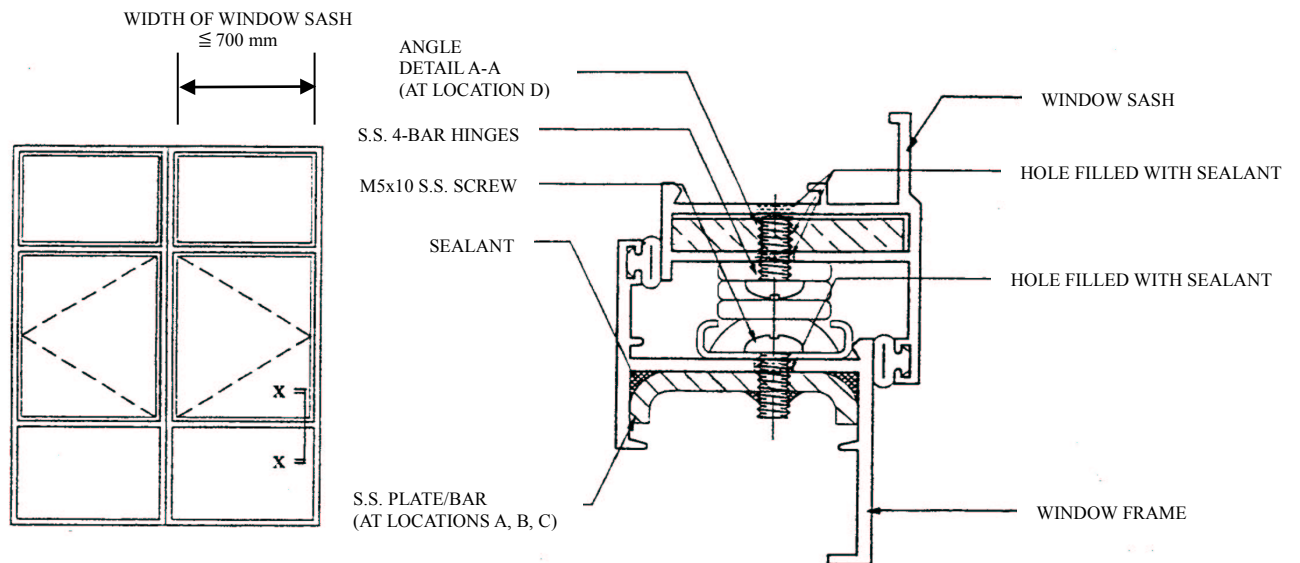
4-bar hinges shall be manufactured from stainless steel with adjustable friction shoe, and all stainless steel bars of the hinge shall have a minimum thickness of 2.5 mm. For better corrosion resistance, stainless steel rivets/screws shall be used for the fixing of hinges and aluminium rivets shall not be used as they tend to corrode. At least 3 numbers of stainless steel rivets of diameter not less than 4.8 mm or stainless steel screws of diameter not less than 5 mm shall be used to fix each bottom and top bars of the hinge to the window frame and the openable sash.

2. As stainless steel hinges and rivets/screws are used in aluminium window installation, due consideration and measures should be taken to prevent contact between dissimilar metals.

3. To provide sufficient anchorage for the stainless steel rivet or screw to fasten the hinge to the window frame and the openable sash, a positive mechanical fixing, for example by inserting a stainless steel or hot dip galvanised steel plate or bar/angle of not less than 3 mm thick inside the section to provide sufficient threads for the screw(s) shall be adopted. A typical example of this arrangement is at Annex I. As an alternative, the window sections for fixing the hinge may be thickened locally to not less than 5 mm. A typical example is at Annex II. When insertion of an extra piece of stainless steel or hot dip galvanised steel bar/angle inside the section or local thickening to 5 mm is not adopted, the thickness of aluminium sections for fixing the 4-bar hinge shall be substantiated by calculations that it could provide sufficient anchorage for the stainless steel rivet or screw.

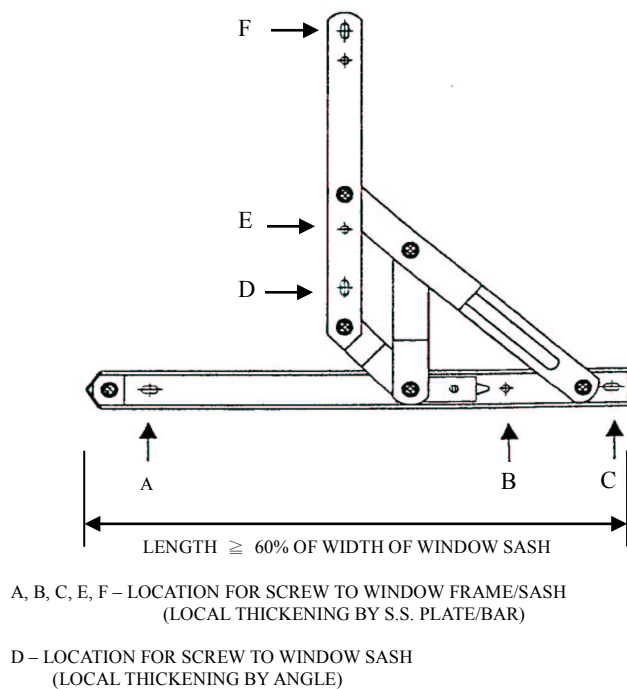
4. The length of the 4-bar hinge should be at least 60% of the width of the side hung casement window sash.

**Annex I to Appendix A**  
(PNRC 47)

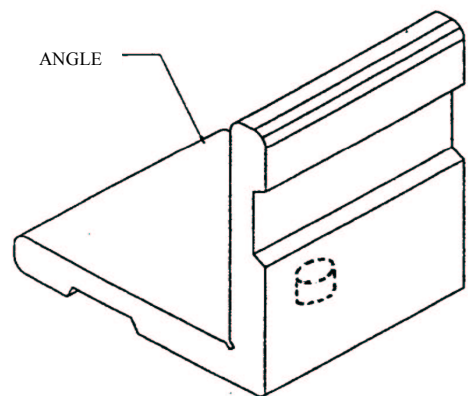


**ELEVATION**

**SECTION X - X**  
**SIDE HUNG WINDOW WITH S.S. PLATE/BAR AND**  
**ALUMINIUM ANGLE INSERTED FOR FIXING SCREWS**



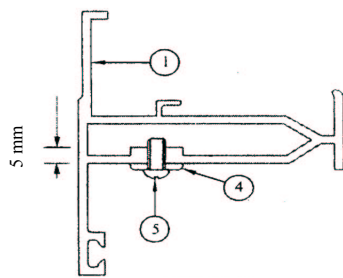
**S.S. 4-BAR HINGE**



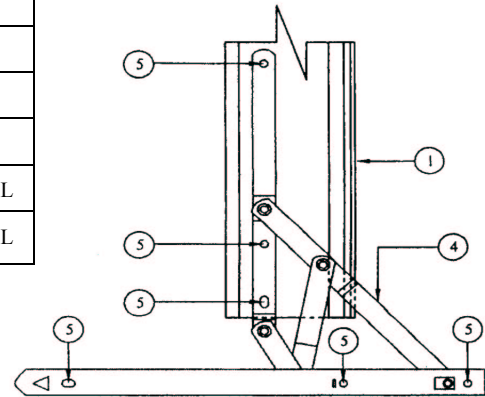
**DETAIL A - A**

**Annex II to Appendix A**  
(PNRC 47)

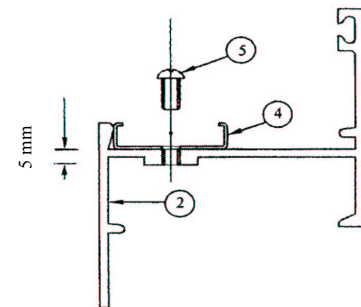
ITEM	DESCRIPTION	MATERIAL
1	WINDOW SASH	ALUMINIUM
2	WINDOW FRAME	ALUMINIUM
3	BRASS PLATE	BRASS </td
4	4-BAR HINGE	STAINLESS STEEL
5	M5 x 16 mm PAN HEAD MACHINE SCREW, PITCH 0.8 mm	STAINLESS STEEL



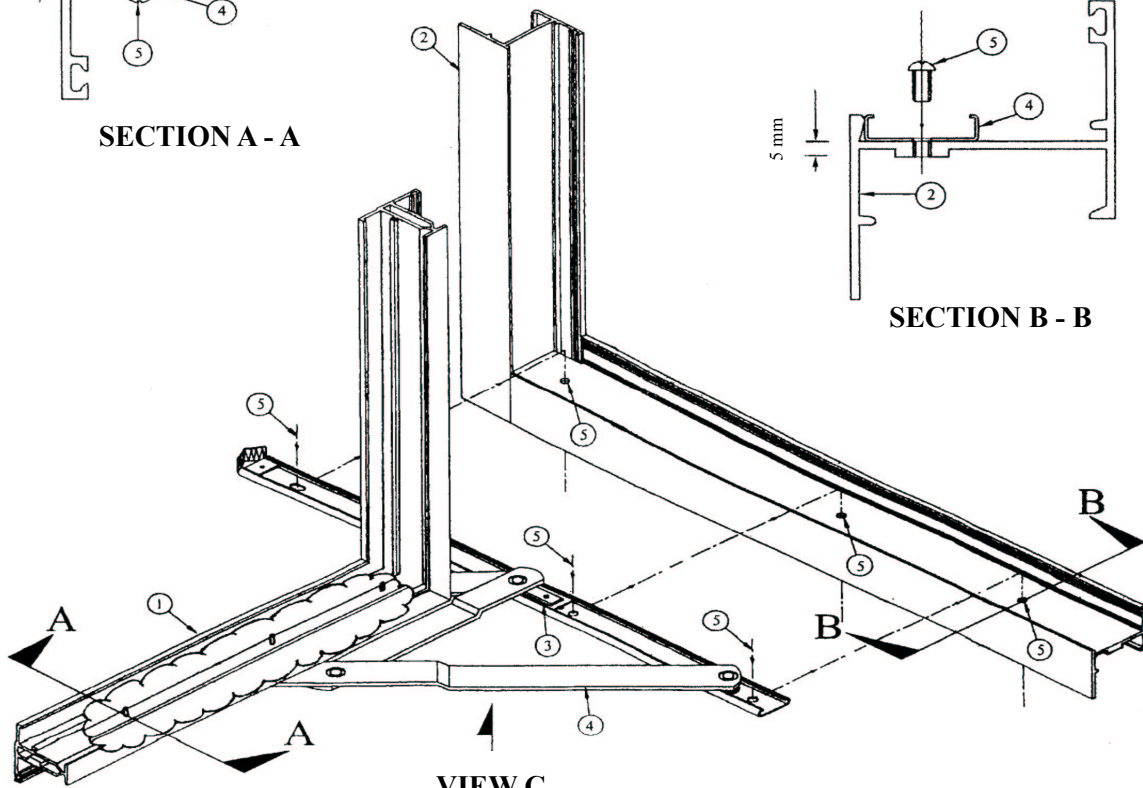
**SECTION A - A**



**VIEW C**



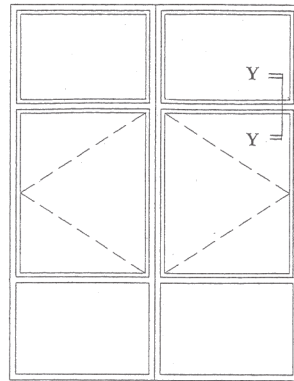
**SECTION B - B**



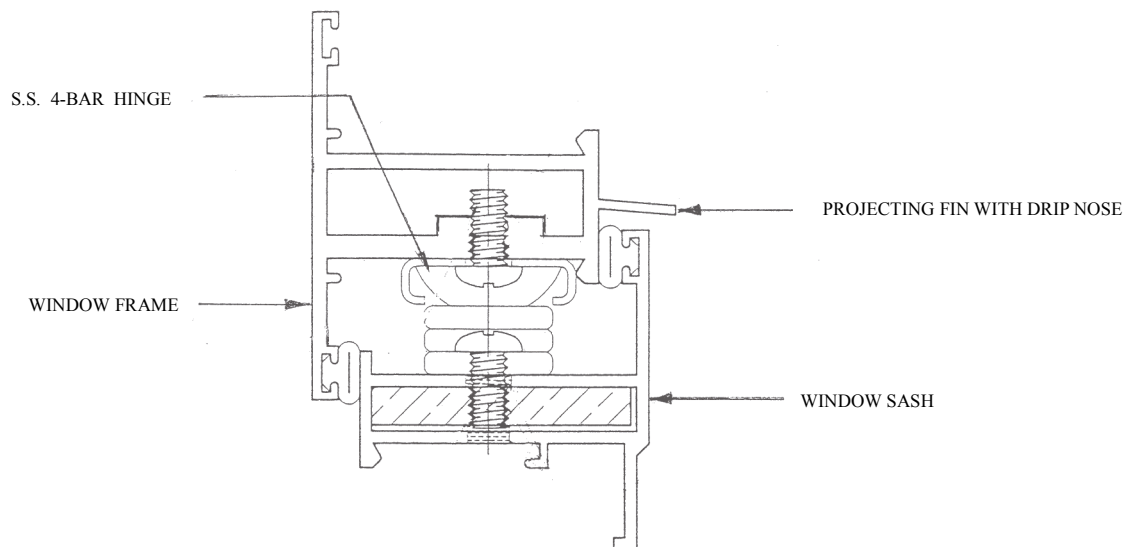
**VIEW C**

**WINDOW FIXING**

**Top Member of Window Frame  
with Built-in Projecting Fin**



**ELEVATION**



**SECTION Y - Y**