4. Fabrication

Assurance on the quality and performance of windows starts in the factory where the various components of the window system are fabricated and assembled.

4.1. MOCKUP AND SAMPLES

Mock up of the window configurations, colours & finishes, as well as samples of the associated hardwares and accessories should be made available in the factory for reference (Figure 4.1 & 4.2).

Figure 4.1: Mockup of window

Figure 4.2: Samples of associated window hardwares and accessories

<table>
<thead>
<tr>
<th>a) Friction stays</th>
<th>b) Operating devices and bearing devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>c) Handles</td>
<td>d) Fasteners and fixings</td>
</tr>
</tbody>
</table>

### 4.2. FABRICATION TOLERANCES

The following tolerances should be achieved during fabrication:

<table>
<thead>
<tr>
<th>Window Frame</th>
<th>1. Length</th>
<th>±1.5mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Straightness</td>
<td>±1.5mm</td>
</tr>
<tr>
<td></td>
<td>3. Accuracy on angles</td>
<td>±2°</td>
</tr>
<tr>
<td></td>
<td>4. Accuracy on sides</td>
<td>±1mm</td>
</tr>
<tr>
<td></td>
<td>5. Accuracy on diagonals</td>
<td>±2mm</td>
</tr>
</tbody>
</table>

*Source: National Productivity and Quality Specification (NPQ5)*

<table>
<thead>
<tr>
<th>Glass Panels</th>
<th>1. Height</th>
<th>±2mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Width</td>
<td>±2mm</td>
</tr>
<tr>
<td></td>
<td>3. Straightness of edges</td>
<td>±1mm</td>
</tr>
<tr>
<td></td>
<td>4. Tolerances on insulating glazed units</td>
<td>As allowed by BS 5713</td>
</tr>
</tbody>
</table>

*Source: National Productivity and Quality Specification (NPQ5)*
4.3. FABRICATION AND ASSEMBLY OF WINDOW FRAME

High quality windows can be effectively achieved by fabricating and assembling as many components as possible in the factory. This helps to minimise site assembly where quality control is more difficult.

The use of mechanical tools, including jigs and computerised machines are useful in achieving the required fabrication tolerances.

Frame assembly could be carried out on elevated workbench. The workbench surfaces should be padded to prevent scratches and other physical damages to the frames (Figure 4.4).

Figure 4.3: Use of cutting and drilling machines

| a) Computerised drilling machine | b) Precision cutting gives high dimensional accuracy |

Figure 4.4: Workbench
Assembly of the window main frame and sash inner frame using a crimping machine produces strong and quality joints. Sealant should be applied to the joining edges prior to assembly for enhanced watertightness performance (Figure 4.5).

Figure 4.5: Assembling of window frame (Crimping method)

<table>
<thead>
<tr>
<th>a) Crimping machine for mitre joint</th>
<th>b) Application of sealant on mitre edge</th>
</tr>
</thead>
<tbody>
<tr>
<td>c) Joining of frame components</td>
<td>d) Securing of frame</td>
</tr>
</tbody>
</table>
Alternatively, the frame could be secured using screws (Figure 4.6).

**Figure 4.6: Assembling of window frame (Screw joint method)**

- a) Jointing frame
- b) Tightening screw for joint

All screws and screw holes for assembly of components should be sealed with sealant. Sealing pads should be provided at frame intersections to ensure watertightness at these locations.

**Figure 4.7: Waterproofing of frame**

- a) Screw heads sealed with sealant
- b) Screws sealed with sealant
- c) Sealant pads
4.4. GLAZING

For better quality, glazing work should, as far as possible, be carried out by skilled installers in the factory. The gasket used should be of a continuous length, with splices made at appropriate locations for good fitting around the corners of the glass panel (Figure 4.8).

Figure 4.8: Installation of gasket

When assembling the frames, ensure that the gasket fits properly to the glazing and the frames are properly aligned. A suitable tool should be used to knock the frames in place. The tool should come with suitable padding to prevent damage to the frames (Figure 4.9).
For sliding window panel, mole hair and gasket should be inserted to provide additional barrier to water penetration.

The sliding mechanism, consisting of the rolling mechanism should be inserted into the window panel. Capping devices are used to ensure that the sliding mechanism remains in place.
4.5. PROTECTION

All exposed parts of the aluminium frame/sections must be protected with suitable protective tapes (Figure 4.11). The tapes used should not leave stains on the surface of the frames nor damage the frame finishes during removal. Corrugated cardboard may be used beneath the protective tape to give additional protection to the frame.

Figure 4.11: Protection of frame

For slender frame sections, styrofoam strips can be inserted as shown in Figure 4.12 to maintain the rigidity and prevent deformation of the frame during delivery, storage and handling. In addition, corners of frames should be protected to prevent damages during delivery and storage. All glazing should also be protected with suitable materials.
4.6. LABELLING

All fabricated frames, window sashes and glass panels should be properly labelled for ease of identification (Figure 4.13). The frames should be arranged in batches for delivery to site (Figure 4.14). Suppliers should plan the delivery of windows in accordance with the installation schedule to minimize storage and handling on site.

Figure 4.12: Protection of frame for delivery

a) Insertion of styrofoam strips to maintain rigidity of slender frames
b) Protection of the corners of assembled frames

Figure 4.13: Labelling of frames, sashes and glass panels

a) Label on frame
b) Label on sash/glass panel

Figure 4.14: Completed frames arranged in batches for delivery to site