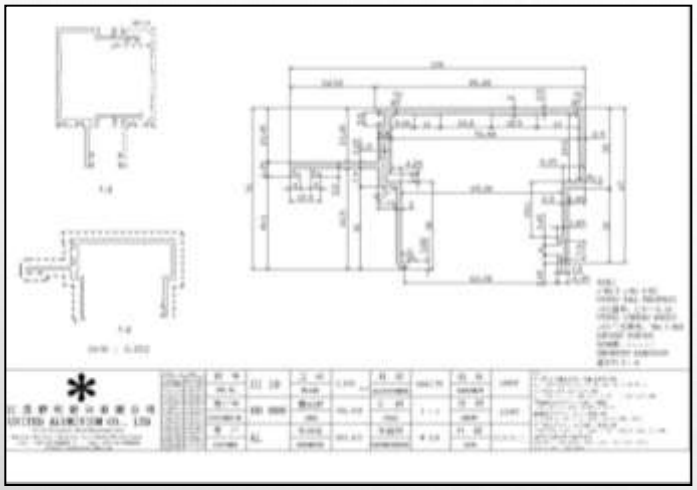
4.0 Manufacturing & Fabrication Processes.

Manufacture & fabrication process.

In coming materials – QA/QC check



Die drawing of profile.

Actual extrusion profile

Visual check in coming profile against die drawings for:

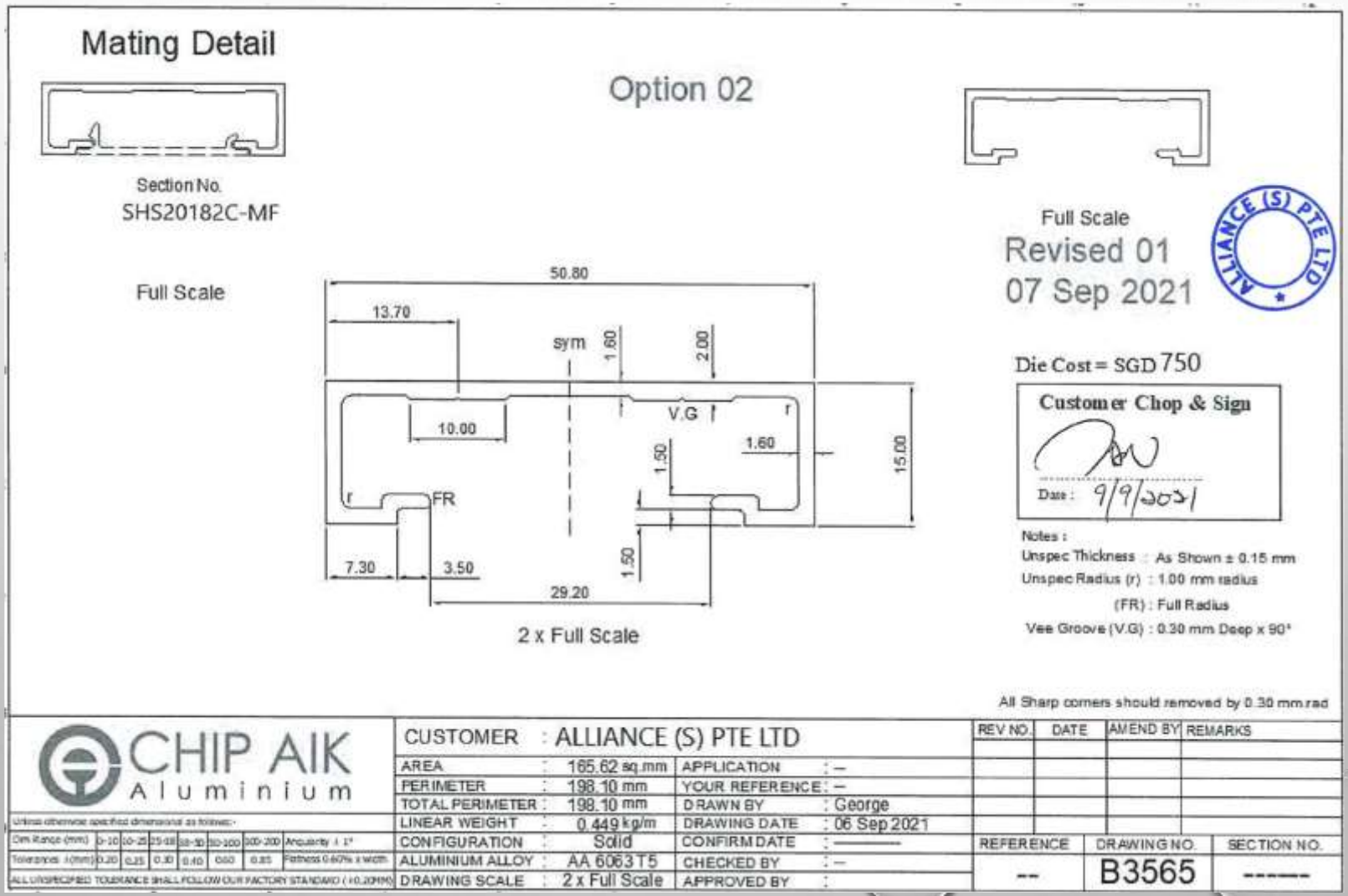
a) Shape, alignment, warp, finishes.
b) Wall thickness – digital caliber.
c) Powder / Fluorocarbon coating – digital micrometer.
d) Hardness – Gauge meter.

1. Tensile Test
2. Chemical Composition Test
3. Brinell Hardness Test – Value

4.0 Manufacturing And Fabrication Processes.

Manufacture & fabrication process.

In coming materials – QA/QC check



4.0 Manufacturing And Fabrication Processes.

Manufacture & fabrication process.

In coming material QA/QC check for hardness, gauge and microns.

Gauge meter – hardness test

Digital caliber – test wall thickness

Coating Thickness Instrument – Testing of coating thickness .

4.0 Manufacturing & Fabrication Processes.

Manufacture & fabrication process.

a. The surface coating is found to be easily peeled off. These batch of materials will be severely tested, 100% for compliance.

1. Degreasing – solvent or alkaline to remove any oils, machining fluids or finger prints.
2. Chemical Pretreatment – Chromate solution is applied to boosts both corrosion resistance and coating adhesion.
3. Rinse and Dry – The part must be rinsed to neutralize and residual chemicals, then dried completely.
4. Life span of the powder – 3 months.

4.0 Manufacturing & Fabrication Processes.

Manufacture & fabrication process.

b. Inner frames will be protected with adhesive PVC tape (70 microns) prior fabrication and storage.

c. This is to prevent scratches during handling and fabrication.

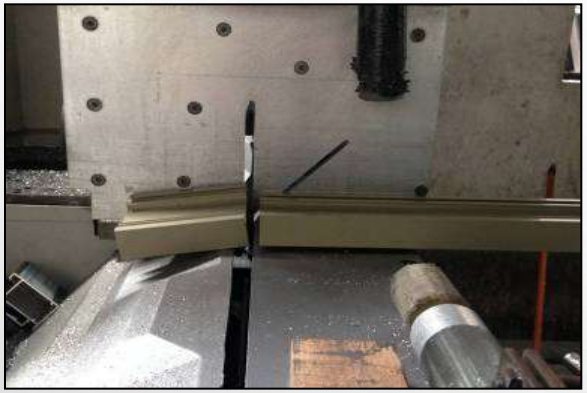
Powder coat is peeled off.

Provide protection to surfaces of profiles before cutting / fabrication.

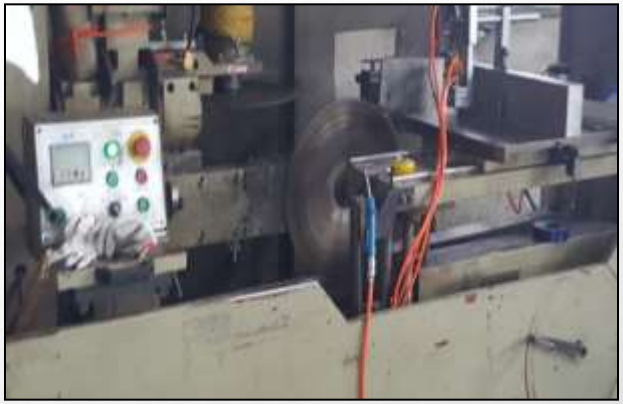
4.0 Manufacturing & Fabrication Processes.

Manufacture & fabrication process.

Cutting, milling & punching processes.



Double cutting machine



Milling of profile

Multiple milling / drilling

Punching of profile

4.0 Manufacturing & Fabrication Processes.

Manufacture & fabrication process - Machineries.

CNC cutting machine

End milling machine

Crimping machine

4.0 Manufacturing & Fabrication Processes.

Manufacture & fabrication process.

Cutting, milling & punching process

Punching of profile – weep hole

Punching – joining of transom for connection of members

Weep holes on sliding bottom track to discharge water.

4.0 Manufacturing & Fabrication Processes.

Manufacture & fabrication process.

Photos on Sample of Typical and Non Typical assembly joints – for ease of understanding and guidance.

Physical samplings.

Designated personnel – Task for respective job.

4.0 Manufacturing & Fabrication Processes.

Manufacture & fabrication process.

Insert gaskets, sealing interfacing members.

Insert weather seal gaskets before assembly

End of transom is fully sealed with weather seal / silicone sealant.

Sealant pad may also be used to seal between joint members

4.0 Manufacturing & Fabrication Processes.

Manufacture & fabrication process.

Assembly of members with seals to prevent water seepage.

Transom is seal before joining

Joining of vertical / horizontal

Joint is seal with weather silicone sealant – 100% check.

4.0 Manufacturing & Fabrication Processes.

Manufacture & fabrication process.

Assembly of members with seals to prevent water seepage.

Joining of vertical / transom member

Screw head is treated with silicone sealant

4.0 Manufacturing & Fabrication Processes.

Manufacture & fabrication process.

Assembly of outer frame and transom.

Partial assembled frame

Complete assembly of framing

4.0 Manufacturing & Fabrication Processes.

Manufacture & fabrication process.

Assembly of outer frame.

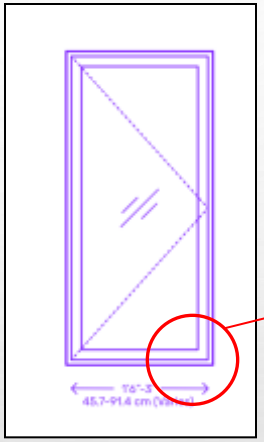
Fully assembled frame outer frame

4.0 Manufacturing & Fabrication Processes.

Manufacture & fabrication process.

Assembly of inner frames – crimping process.

Cut surface to be dipped with silicone sealant before crimping.



Ensure joint is flat

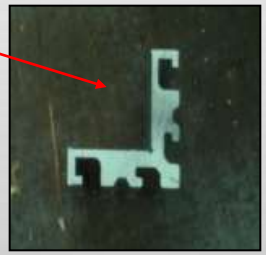
Inner frame is being assembled by crimping machine.

4.0 Manufacturing & Fabrication Processes.

Assembly of inner frame – cramping process

Cramping of inner frame with spigot.

Fully assembled inner frame.

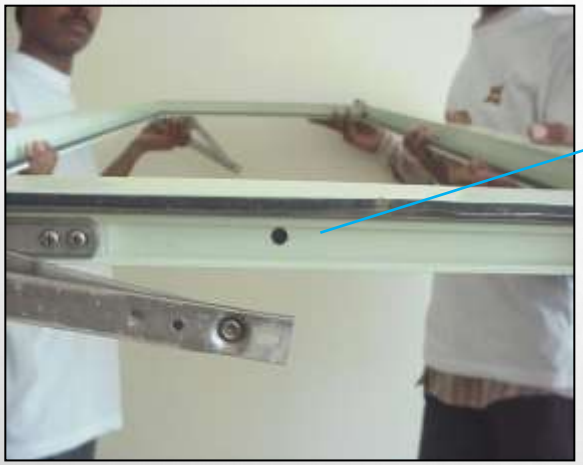


Extruded spigot.

This is the one of the conventional & common method of assembly of inner frame.

4.0 Manufacturing & Fabrication Processes.

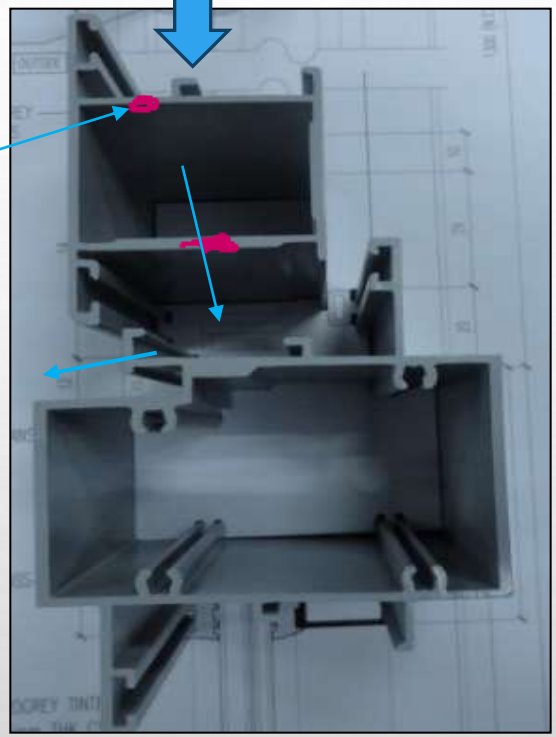
Assembly of inner frame.



Provide 6mm diameter hole
at the base of the bottom sash.

This is to allow water to drain off –
water seep through gaskets
and joints.

Water seep down from here.



Section through transom and
casement window inner.

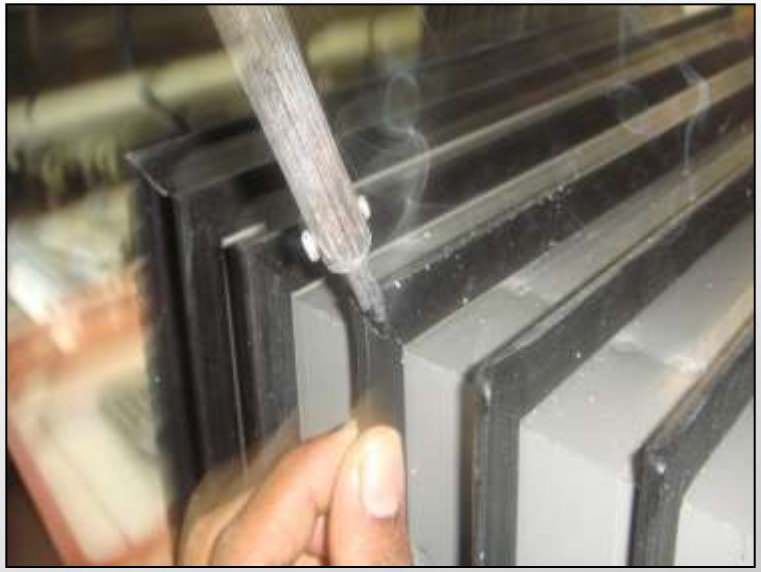
Punching of weep holes for water
discharge to prevent overflow.

4.0 Manufacturing & Fabrication Processes.

Sealing of joints / soldering of gaskets.

1. Gaskets play an important role in the performance of the window system.
2. Ensure the correct type of materials is to be used – EDPM. (Ethylene Propylene Diene Monomer)

Seal joints between members with silicone sealant



Soldering of gaskets to ensure no gaps

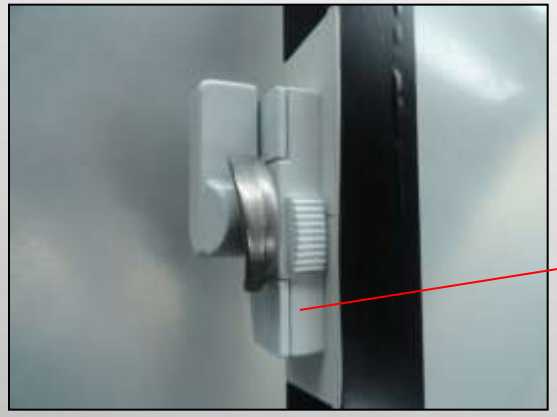
4.0 Manufacturing & Fabrication Processes.

Insert of accessories / hardware to frame.

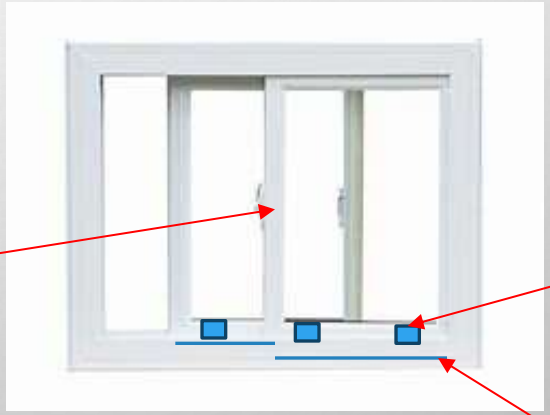
Insert of roller – sliding window

Nylon roller

Insert of mohair –sliding window



Crescent lever lock



2 panel sliding window

4.0 Manufacturing & Fabrication Processes.

Accessories & hardware for casement window.

Fixing of friction stay to inner frame.

Assemble of inner to outer frame.

Secure friction stay to
inner sash and outer frame.

4.0 Manufacturing & Fabrication Processes.

Assembly of inner frames for casement window.

For HDB projects, only friction stay with safety feature can be used. This is to prevent falling window.

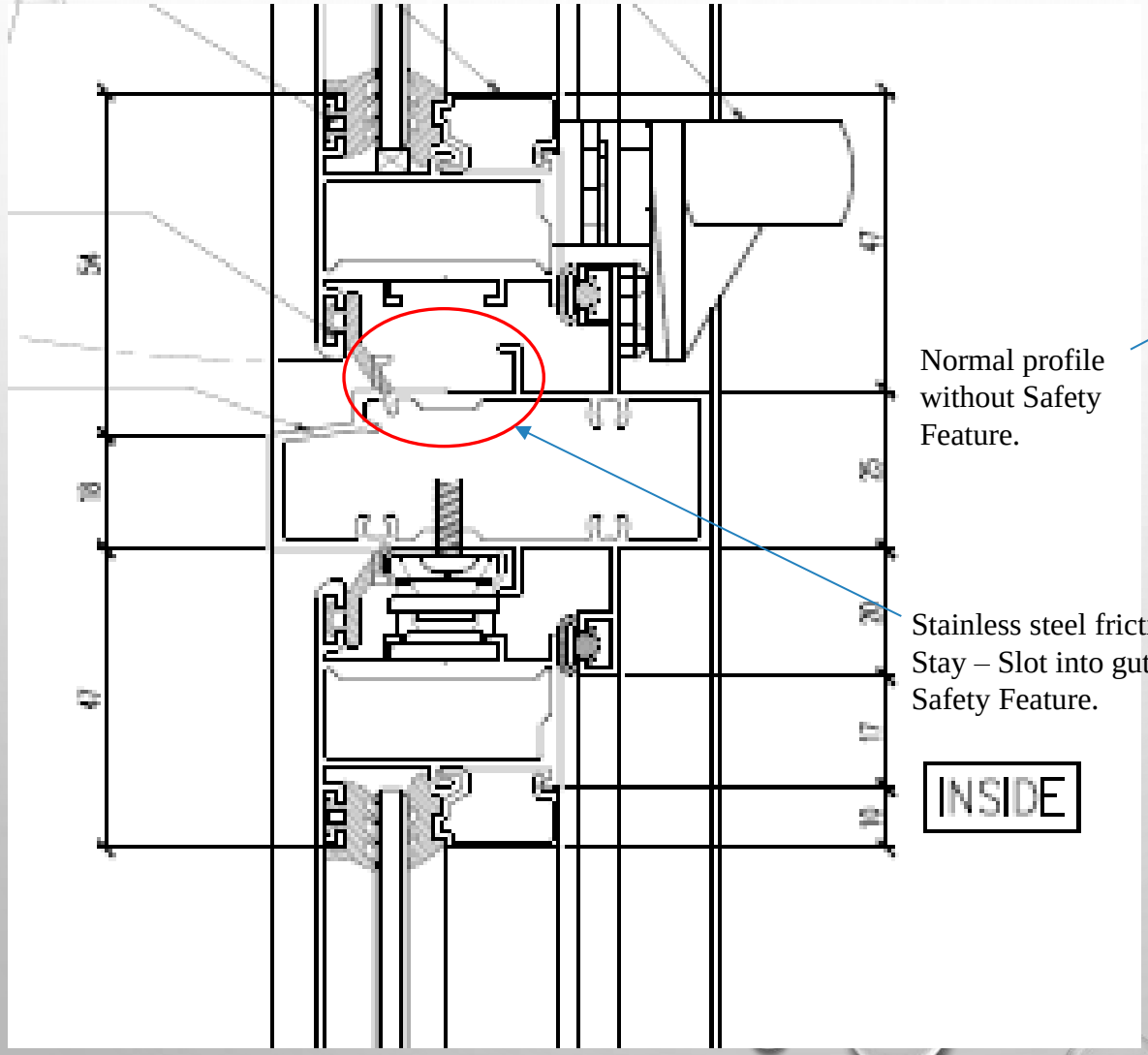
Safety feature – design of channel to engage the housing of the stainless steel friction stay to prevent failing off.

Profile to prevent falling
Friction stay – safety feature

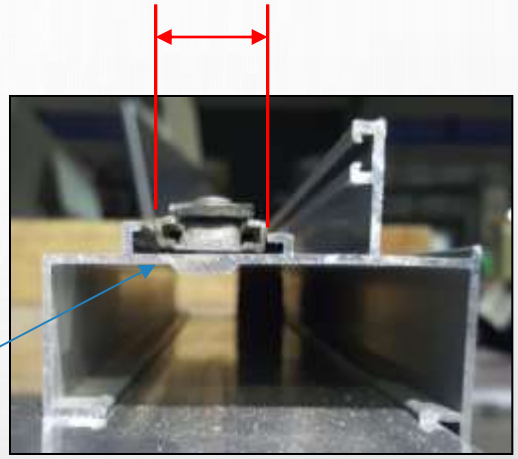
Fixing of cam handle to inner sash

4.0 Manufacturing & Fabrication Processes.

Safety Window – HDB.



Direct place on gutter, no slot in.



Standard window system.

Safety Window System.

4.0 Manufacturing & Fabrication Processes.

Quality Assurance / Quality Check on finished product.

Frame ready for QA/QC Inspection prior tapping.

QA/QC check of fabricated frame prior protection.

4.0 Manufacturing & Fabrication Processes.

Quality Assurance / Quality Check – Guide.

The following tolerances should be achieved during fabrication:

Window Frame		
1.	Length	±1.5mm
2.	Straightness	±1.5mm
3.	Accuracy on angles	±2°
4.	Accurancy on sides	±1mm
5.	Accuracy on diagonals	±2mm

Source: National Productivity and Quality Specification (NPQS)

Glass Panels		
1.	Height	±2mm
2.	Width	±2mm
3.	Straightness of edges	±1mm
4.	Tolerances on insulating glazed units	As allowed by BS 5713

Source: National Productivity and Quality Specification (NPQS)

5.0 PROTECTION.

5.0 Protection of Frames.

Protection of frames.

After materials were fabricated in factory, 2 layers of P.V.C. protection tape will be applied to the aluminium outer / inner frame.

First layer of protection tape will be applied directly to the outer frame surface as shown in Figure 5.3.

Second layer of protection tape will be applied on top of the first layer of protection tape including the fin of the frame (see Figure 5.3a).

PVC tape of 70 microns

5.0 Protection of Frames.

Protection of frames.

Cleaning and protection of frame.

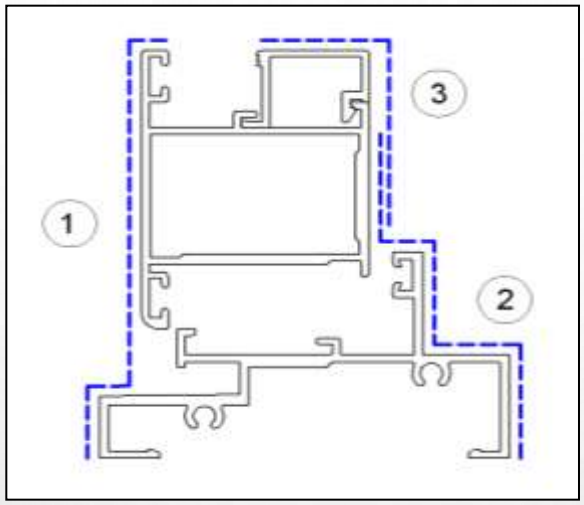
Cleaning of frame prior tap over with adhesive protection sheet.

Applying protection tape on frame prior delivery. Frame corners are further wrap with cardboard protection.

5.0 Protection of Frames.

Protection of frames.

Protection layer **1** to be remained upon wet works completed



Protection layer **3** to remove when glazing

Protection layer **2** to remained upon internal wet works completed

Outside

Inside

(5.3 a)

The second layer of protection tape will be removed for inner frame and glass installation after the external painting/plastering/sealant work is completed.

A layer of protection tape will also be applied to the external and internal surfaces of the inner frame after fabricated in factory.

This is to facilitate the glazing works without removing the entire protection to frames.

5.0 Protection of Frames.

Protection of frames.

The white protection tape on frames are permanent remain intact just before final cleaning.

The “yellow protection tape” is distinguished as to remove when glazing work is carried out.

Yellow tape is for removal during glazing works.

5.0 Protection of Frames.

Protection of frames.

The remaining protection tape on outer and inner frame will only be removed during the cleaning and touch up works and after internal plastering and painting works is completed.

Glass shall be protected by one layer of adhesive P.V.C. plastic protection to both external & internal surfaces, which will be removed during the cleaning.

Protection tape is only used to prevent cement mortar/paint stains to the aluminium frame and glass.

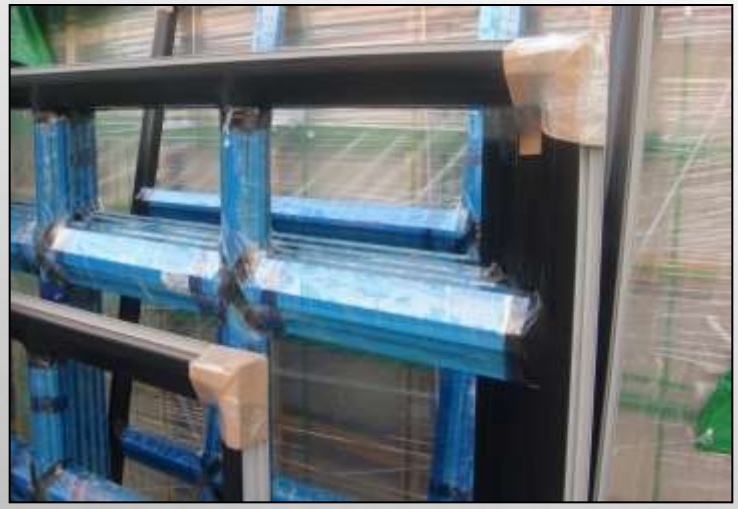
It does not provide protection to mechanical impact or heavy abrasion.

5.0 Protection of Frames.

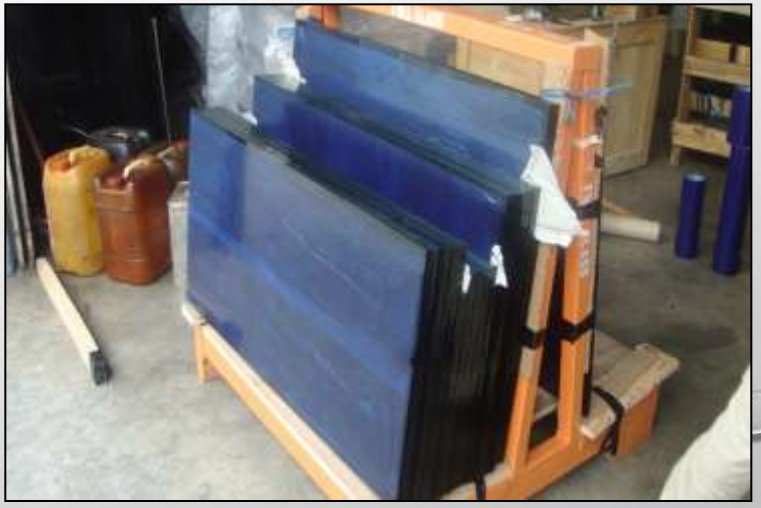
Protection of glass.

All fabricated windows shall be protected with pvc adhesive film with cross wrap in between members.

Corners are also provided with additional cardboard to protect from knocking.
All glass edges should be grinded to prevent cut during handling, delivery and installation.



Corners are further protected
to prevent damages during handling .



Glass panels are provided with adhesive
protection film prior delivery to site.

5.0 Protection of Frames.

Protection of frames / glass.

Standard PVC adhesive protection tape to glass

3mm thick corrugated polypropylene sheet to glazing

5.0 Protection of Frames.

Protection of frames / glass.

polypropylene sheet to glazing

Corrugated Polypropylene Sheet

Water-based acrylic co-polymer emulsion coating

5.0 Protection of Frames.

Protection of frames / glass..

Protection to glass surface using water-based acrylic co-polymer emulsion coating.

Advantage – exposure is 12 months from the applications versus 5 months for adhesive protection tape.

Heavy duty type of Water Based Acrylic Co-Polymer Emulsion Coating is able to expose up to maximum 18 – 20 months. Exposure life time is depending on individual product.

Protection tape falling off after 3 – 5 months.

Glass being protected with 2 coats of water-based acrylic co-polymer emulsion coating.

5.0 Protection of Frames.

Protection.

Ensure glass surface is clean and free from dust, before applying the coat to the glass surface.

1st coat – the approximate curing time is 20 to 90 minutes.

2nd coat – the curing time 30 to 120 minutes. (150 microns)

Maximum exposure is approximately 12 months – 24th months.

Dip roller over the liquid and roll over the glass surface

Single coat application.

5.0 Protection of Frames.

Protection.

Window glass panel was fully applied with 2 layers of protective coatings and cured – in house application prior delivery.

Application did not comply to manufacturer's recommendation or cleaning is not carried out accordingly.

5.0 Protection of Frames.

Protection

Protective on glass surface can be easily removed with the following simple steps:

a. Apply clean water on the surface of the glass edge.

b. Wait for approximately 5 to 10 minutes, before commencing to peel the protective layer from the edge as per the below left bottom photo.

c. For large panel, it may take a few attempts to complete the removal of protection.

d. It makes the cleaning task much easier and conducive, less time and man power.

5.0 Protection of Frames.

Protection.

Due to improper protection or after prolong duration, rainbow effect on the glass surface will appear.

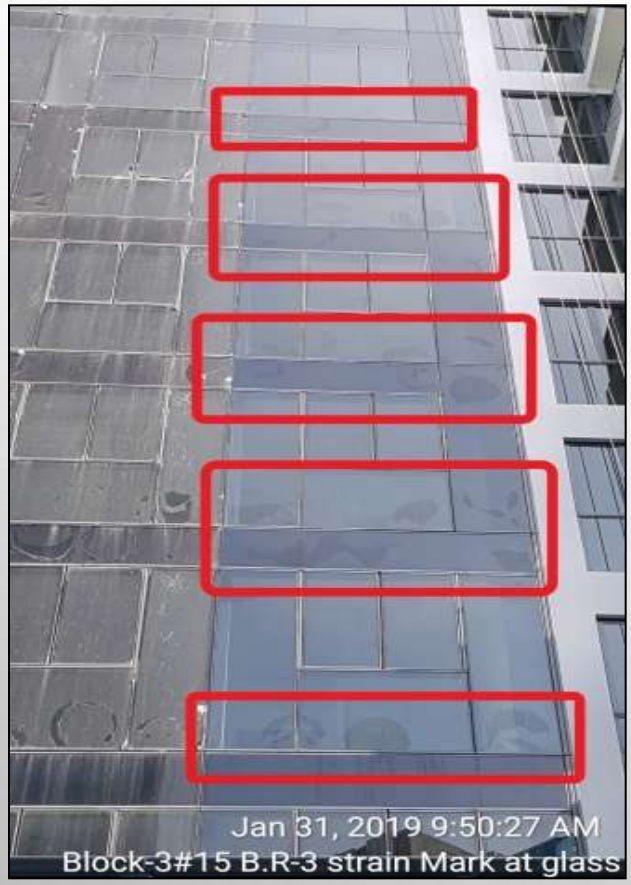
May treat the surface by polishing with water, polish cream and water, depending on the seriousness of the scratch.

Distortion is visible at a distance.

Glass surface damaged - rainbow effect

5.0 Protection of Frames.

Protection.



Glass surface were observed to have rainbow effect after removal of protection tapes.

a. The recommended duration for the protection tape on the glass surface is not more than 6 months.
b. Manufacturer's defects.
c. Replacement.
d. Polishing.

5.0 Protection of Frames.

Protection.

Extra care must be taken while carrying out dismantling of scaffolding, stagging and working platform to minimized damage (chip off, scratches and shatter) to glass.

To ensure debris left over on platform are removed prior dismantling.

Avoid external hacking work without providing adequate protection during and after glass installation work.

To avoid unnecessary abortive works, all site workers are to be educated, with proper supervision and of all, the sequencing of activities.

Outer frame being damaged.

External hacking / damage frame.

5.0 Protection of Frames.

Protection.

Frames being damaged on site by others.

These are common abortive works being found on most of the job sites. The right bottom photo indicate that the installation works were left uncompleted without grouting.

The below left bottom photo show the installed window frame being damaged – due to inconsiderate working attitude of the workers.

Transom member damaged.

Cement bags stacked on to bottom frame, sagging and out of alignment.

5.0 Protection of Frames.

Protection.

Frames being damaged on site.

The photo on the bottom right hand corner shows the hacking of the plastered wall to comply with the passage width clearance after TOP inspection. Without proper protection, damaged window frame and glass were also scratched.

Aluminium bottom outer frame being being damaged by hard object during hoisting process.

Plastered wall were hacked off, due to clearance – Alum frame damaged.

5.0 Protection of Frames.

Protection.

This window were damaged during the hoisting of materials. As it is a pre-casted window system, repair or replacement is very difficult and costly.

The concrete grade make it very difficult to hack and cut.

Window frame being damaged during hoisting of materials.

6.0 DELIVERY, STORAGE AND HANDLING.

6.0 Delivery, Storage and Handling

Delivery of materials to site.

All goods must be inspected via labeled with QA/QC sticker prior delivery to site.

Proper stacking of goods on steel rack is recommended to avoid damages during transportation and during unloading.

Upon delivery on site, goods shall be verified against D.O. via also check physical damages to frame.

Delivery time should be timely planned against schedule to avoid standby time.

Site storage should be:

. Sheltered from weather and fallen objects,
. Ease of material handling and distributions,
. Avoid access / heavy traffic route,
. Safe, clean, stable ground and
. Adequate storage space.

6.0 Delivery, Storage and Handling

Proper storage on site.

Site storage needs to be tidy and in order to ease handling, time and man power.

Improper storage of materials on site.

Frames are stacked in a mannerly order on site prior installation.

Materials storage with crates.

Proper wrapping and stack.

6.0 Delivery, Storage and Handling

Proper packing with labelling.

Ensure that all window frames are located in an accessible route for ease of identifying the type to be used.

Frames stacked on steel crates on site prior installation.

Frames are stacked vertically and proper labeling is provided。

Frames packed in timber crates for delivery to site.

Frames – clear labelled.

6.0 Delivery, Storage and Handling

Delivery.

Delivery of frames has to be in accordance to the request by the site team.

Ensure that the packing are in sequence of unloading, 1st to go up the lorry will be the last to be used on site usage.

Materials packed on timber crates for ease of unloading.

Materials packed on timber crates for ease of unloading on site via hoist to respective floors before installation.

6.0 Delivery, Storage and Handling

Delivery.

Material should avoid direct contact with the floor. Glass panels should be well ventilated by separated from one to another to avoid “rainbow effect”.

Materials to be placed on steel rack and secure prior hoisting to upper level for installation.

Use glazing glove during handling and glazing works.

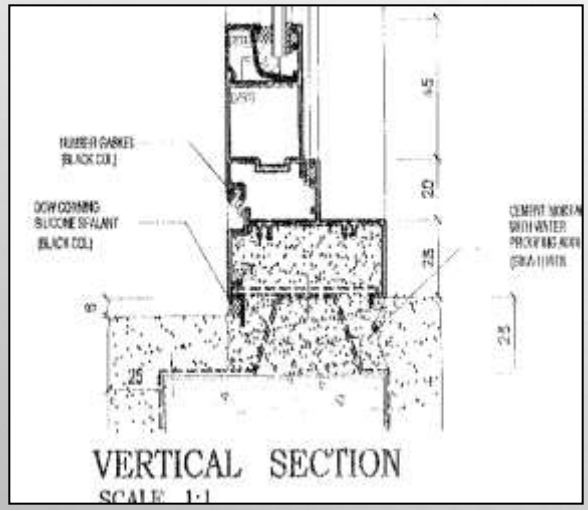
Use sucker to carry glass for heavy and large glass.

7.0 INSTALLATION METHOD.

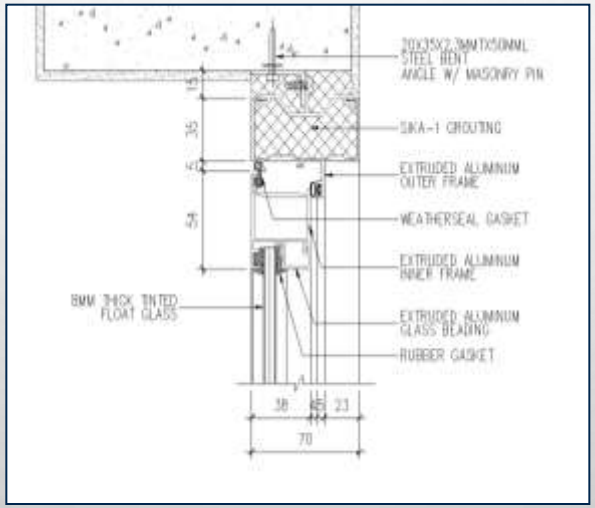
7.0 Installation Method.

There are three types of installation methods as below:

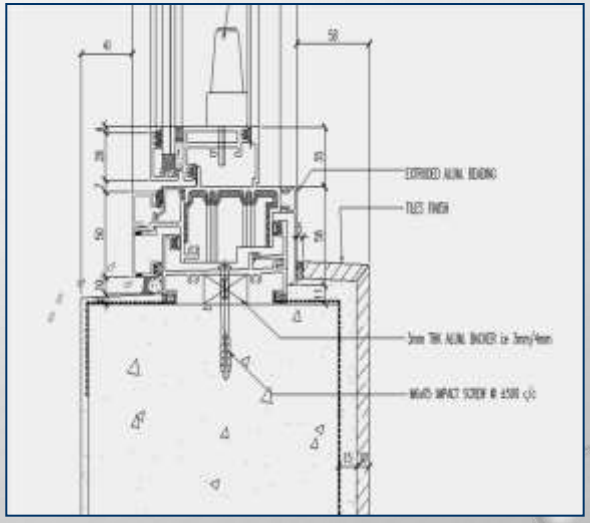
a. Lug System
b. Sub-Frame Bracket System
c. Full Sub-Frame System



a. Lug system



b. Sub frame bracket system



c. Full sub frame system

7.0 Installation Method.

Basic Requirements

a. Proper dimensional control and setting out of the structure opening is critical in ensuring quality window installation.

b. Close dimensional control of opening to ensure gap between wall and frame is within 10-25mm wide (subjected to type of fixing system).

c. Large gap would lead to cracks in the cement grout and eventually cause water seepage.

d. Rectification of opening
   . Large gap – topping up
   . Undersized gap – hacking

e. Proper base for sitting of window frame.

7.0 Installation Method.

Installation requirements.

Datum level must be provided

Provision of rebates for fixing lugs

Verify window sizes

RC base for support

7.0 Installation Method.

Preparation Works Prior Installation

a. Review the setting layout plan versus the approved Aluminium window shop drawings

b. Ensure that the provisions of datum level and reference grids are established on site to facilitate the setting via installation of windows

c. Verify structure openings basing on datum level and reference lines to ensure that the provision of openings are adequate to receive the windows, particularly tiles areas

d. Use red paint to spray on the wall to identify any discrepancies via report to Main Contractor to follow prior installation

Spray red paint on r.c. structures that required hacking / trimming

7.0 Installation Method.

Preparation Works Prior Installation

Ensure height of reinforce concrete kerb is provided adequately to facilitate the fixing of full height window.

Similarly for reinforced concrete beam is at the correct height.

Co-ordination – verify site measurement before fabrication.

Under provision of r.c. kerb to facilitate the installation of window
frame.

7.0 Installation Method.

f. Improper supervision and record of damaged work.

Installed outer frame without the completion of block wall and M&E services.

Record of damaged works on site.

7.0 Installation Method.

Verification / setting before installation.

Verify datum level.

Setting out of alignment.

Transferred of level.

Reference grid setting.

7.0 Installation Method.

Installation requirements – sealing of joints before install.

a. Window sizes that large in sizes, ex. 2.8m width will be divided into module fabrication – for ease of handling and delivery.

b. In that arrangement, ensure site assembled frames / joints are seal with silicone sealant.

Ensure fixing lugs are spaced not more than 600 mm c/c.

Ensure joining of frames on site are seal with weather seal.

Pre-drilled holes for site assembly.

7.0 Installation Method.

Installation requirements – sealing of joints before install.

Caulk joining frames with weather seal.

Seal also the top of adjoining mullions

Secure with F clamp upon applying with seal

7.0 Installation Method.

Installation Of Outer Frame.

Setting out alignment with auto laser

Verify vertical alignment against the frame.

Installation in accordance to setting reference grids and level.

7.0 Installation Method.

Installation Of Outer Frame.

Verifying in / out alignment.

Verify in / out alignment.

Reference lines o guide for during frame installation.

7.0 Installation Method.

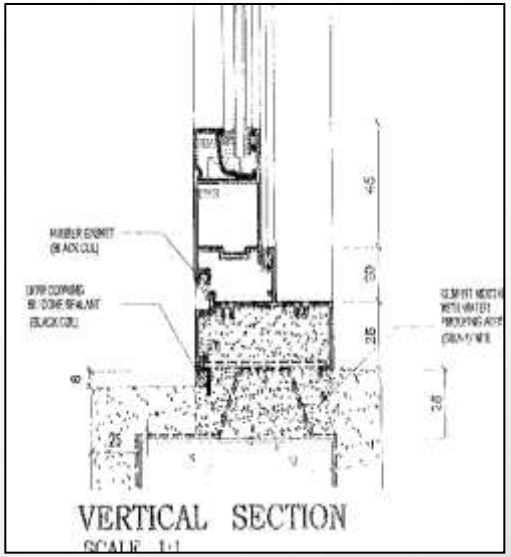
Installation Of Outer Frame

Full window frame positioned without grouting.

Installation of window frames at Pre-Cast yard.

7.0 Installation Method.

Installation Of Outer Frame.



Lug System

1. Install outer frame rigidly with ±450mm(L) x 25mm(W) galvanized steel fastener by using ramset method and positioned plumb and level accordance to approved shop drawings.

a. Window and door outer frame to be temporary secured by using proper wedges or packing materials.

b. Window fastener to be positioned by the following ways.

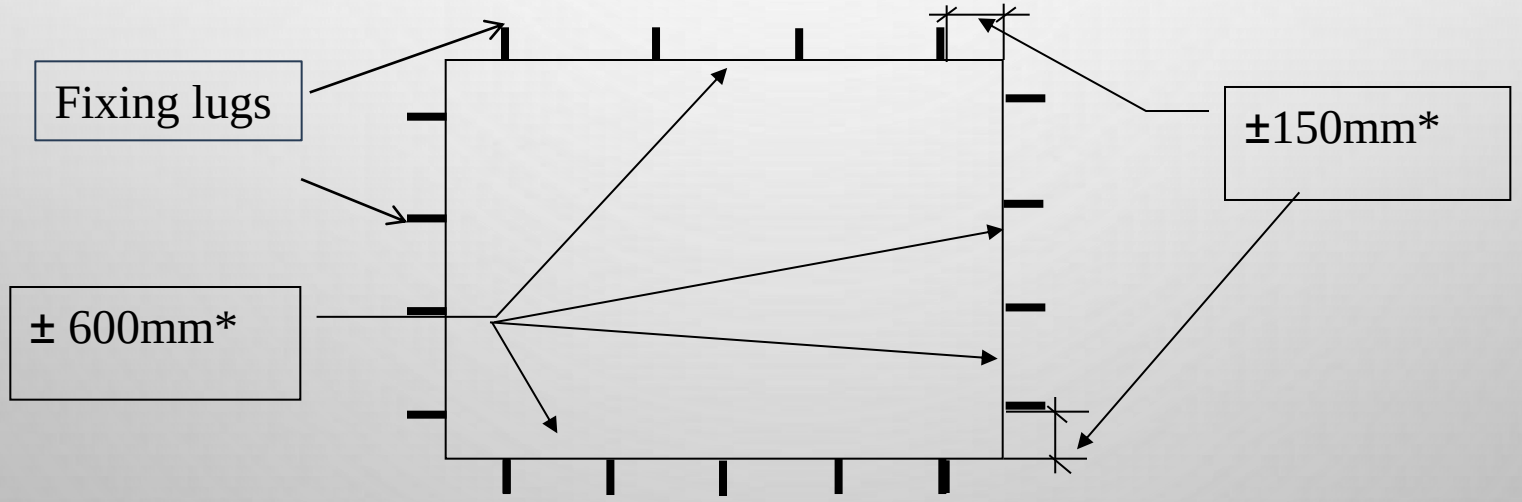
. Distance between fastener and window outer frame edges should be ± 150mm.

. Distance between fasteners – equally divided at ± 600mm.

7.0 Installation Method.

Plumb to check alignment

Using spirit level or auto laser level to check verticality



Position of fixing lugs

7.0 Installation Method.

Installation Of Outer Frame.

c. Each fastener to be fixed to brick/structure wall with single pin at both sides by using ramset method.

d. Adjust window frame's vertical and horizontal alignment accordingly with the aid of laser before fixing all the fasteners.

e. Distance between the pin to the edge of brick wall and R.C. structure should be at least 75mm and 50mm respectively.

f. The pin to brick wall should only be fixed to the cement mortar between the bricks. The excess of fastener should be bent to suitable length and hammer until it is flat with the wall, for ease of plastering.

7.0 Installation Method.

Secure with ramset gun / pin & cartridge

Check vertical alignment

V-shape timber wedge to shim the frame

g. Apply spot grouting to each fastener to secure the outer frame at its position.

h. Request for main-contractor's inspection before carrying out full grouting to the window outer frame.

i. Upon inspection, apply full grout to window frame.

7.0 Installation Method.

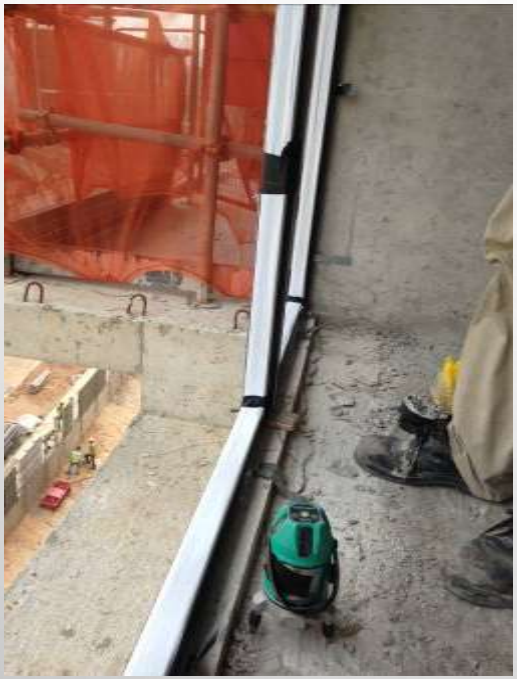
Installation requirements – checking alignment.

Verify level of installed window with pulled string.

Setting and checking of window in / out position & alignment.

7.0 Installation Method.

Installation requirements - Verification.



Check horizontal alignment with auto laser.

Check verticality of frame with auto laser.

7.0 Installation Method.

Installation requirements.

Fixing lug method.

Ramset the power drive pin on the lug to the wall.

During installation, safety is first priority.

7.0 Installation Method.

Grouting works.

1. It is a good practice to clean and wet the structure surface before grouting.

2. This will enable a good bonding between the grouting and structure / wall.

Sweep the ground, clear debris before grouting works.

Wet the floor / slab for approximately 10 mins before grouting works

7.0 Installation Method.

Grouting works.

GIP - Wet the wall prior grouting.

Sweep clean the area of fixing and pour clean water over before grouting.

7.0 Installation Method.

Grouting works.

2. Use waterproof plaster system (water resistant additive) and dilute 1 part of Sika-1 with 10 parts of clean water in a clean container and mixed thoroughly with an electric mixer before apply to gaps with grouting gun.
3. Place a long aluminium rectangular box on the external, between the gap of the outer frame and wall with F clamp to secure before grouting.
4. Apply grouting to gaps around window frame and structure until until excessive grout flows out.
5. Ensure the grouts fill the section by using a trowel to tuck in.
6. Knock the frame with a tool to ensure there is no hollowness with the frame.
7. Check alignment of the frame with a laser, adjust when deemed required.

7.0 Installation Method – Grouting Works.

Grouting works.

8. Types of waterproofing compound and measuring the volume to be mixed with 3 in 1.

Sika waterproofing compound

Measuring waterproofing compound for mixing.

PRODUCT DATA SHEET

DAVCO GROUT 280 ECO

General purpose shrinkage compensated cementitious grout

DESCRIPTION

DAVCO GROUT 280 ECO is a cementitious non-shrink grout with shrinkage compensating properties designed for all general purpose grouting and repairs. It has low embodied carbon footprint and is approved as a sustainable building material by the Eco-labelling Authority in Singapore. It requires only on site addition of water to produce a high strength, non-shrink grout that is non-corrosive, non-swelling and free of chlorides and nitrates.

CHARACTERISTICS / ADVANTAGES

- Environmentally friendly
- Non-bleeding and non-segregation
- Shrinkage compensating
- High early compressive and flexural strength
- Non-corrosive and non-toxic
- Chlorides and iron free
- Pre-mixed to eliminate site variations and errors

APPROVALS / CERTIFICATES

Certified Green Label product under Singapore Green Building Council (SGBC), Certificate No. SGBP 3616, 4 Ticks "Leader"

USES

DAVCO GROUT 280 ECO is primarily used for:

- Grouting of joints between precast and structural components.
- Bonding of new concrete to old.
- Repairs to concrete structures and pre-cast components.
- Patch repairs to vertical, soffit and flooring concrete surfaces.

PRODUCT INFORMATION

Packaging	25 kg bag
Appearance / Colour	Grey powder
Shelf life	6 months from date of production
Storage conditions	Store in dry condition in original, unopened and undamaged packaging. Keep away from water, rain and moisture.

TECHNICAL INFORMATION

Compressive strength	> 40 N/mm²	(ASTM C109/C109M)
Tensile adhesion strength	≥ 1.5 N/mm²	(BS EN 1542:1999)

APPLICATION INFORMATION

7.0 Installation Method – Grouting Works.

Grouting works.

9. Mix the sika and the waterproof plaster system for about 3 to 5 minutes until the mixture is in light grey colour.

Adding appropriate volume of waterproof compound into cement mix.

Electric mixer - mix 3 in 1 grout.

7.0 Installation Method – Grouting Works.

Grouting works.

10. Ensure the slab is wet before grouting works progress.

Grouting process – caulking gun sucked grouts in and pump into the gap between mansory and frame.

Improvised metal rod C- clamp

Using a alum box and c clamp to secure as backing to prevent excessive grouts to flow out and stay compact.

7.0 Installation Method – Grouting Works.

Grouting works.

11. Curing time for grouting is 1 day prior application of K11 water proof applications.

Grouting to frame in progress. Sequence is always bottom up.

When is fully filled, check alignment and level With auto laser. Any excessive grouts will be removed.

Ensure excessive grouts are flow out before using a trowel to make good.

Return the next day to check for cracks, pin holes, de bounding and also alignment.

7.0 Installation Method – Grouting Works.

Grouting works.

12. Improper provisions for proper grouting to frames..

Gap is more than 190mm, unable to grout , hence, required cast back to prevent potential water seepage.

Infill gap with bricks between vertical frame and concrete wall was improper and resulted in water seepage via staining the internal wall.

7.0 Installation Method – Waterproofing.

Grouting works.

13. Materials to be used for grouting works.

Davco BUILDING TRUST

PRODUCT DATA SHEET

Davco K11 Slurry 613

Two component flexible cementitious waterproofing system

DESCRIPTION

Davco K11 Slurry 613 is a flexible two component cementitious waterproofing system. The two components designed with combination of polymeric micro compound, will react chemically after mixing to form a hard and elastic film which bonds tenaciously to most concrete or masonry substrate to protect against possible ingress of water.

USES

- Interior and exterior waterproofing and damp-proofing of concrete wall (to be plastered over).
- Repairing and waterproofing underground masonry subjected to waterhead and moisture seepage.
- Levelling or smoothing waterproofing compound of the underground walls before laying of bituminous sheets/liquid membrane and concrete repair works.
- Sealing fine hairline cracks in concrete structure that is not subjected to movement.
- Concrete water tanks, fountains, wet kitchen, bathroom, toilet, balcony, planter boxes, lift pit and RC gutters.

CHARACTERISTICS / ADVANTAGES

- Economical
- Non-toxic
- Protection against concrete carbonation and penetration
- Non corrosive to steel or iron
- Easy to mix and apply

PRODUCT INFORMATION

Packaging	Part A	20 kg powder
	Part B	9 L liquid
Appearance and colour	Part A	Grey powder
	Part B	Milky white liquid
Shelf life	6 months from date of production	
Storage conditions	Stored properly in original, unopened and undamaged sealed packaging in dry conditions. Protect from direct sunlight, rain, water and moisture.	
Density	1.8 kg/l (mixed)	

TECHNICAL INFORMATION

Tensile strength	~ 0.9 N/mm²	(ASTM D412:06a, Dumbell A test piece)
Tensile strain at break	> 40 %	(ASTM D412:06a, Dumbell A test piece)
Water absorption	< 7.5% compare to control	EN 1504-2

Cement based compound + additives

Mechanical mix for 3 to 5 minutes thoroughly

7.0 Installation Method – Waterproofing.

Grouting works.

14. Application of K11 waterproofing.

Application of waterproof system in between frame and masonry.

Complete application of waterproof system around perimeter of frame.

2 layers of applications is required, curing time is 2 – 3 hours per application.

7.0 Installation Method – Waterproofing.

Grouting works.

15. Application of K11 waterproofing.

75mm width application is Recommended for concrete finished by the manufacturer.

100 mm width application is recommended by the manufacturer.

Application of K11 waterproofing on perimeter of window frame.

7.0 Installation Method – Waterproofing.

Grouting works.

16. These unacceptable grouting works will lead to potential water seepages.

Shoddy grouting works.
Repair from outside.

Timber wedging not removed.
return the next day to pull out
and back fill fully.

Grouting not filled.

7.0 Installation Method – Waterproofing.

Grouting works.

17. Poor application of waterproofing – K11.

No proper supervision. Plasterer to proceed plastering on the same day, back fill of grout is not done, potential seepage.

Improper application of K11 waterproofing.

Shrinkage of grout – gaps / holes.

7.0 Installation Method – Waterproofing.

Grouting works.

18. Unacceptable grouting works.

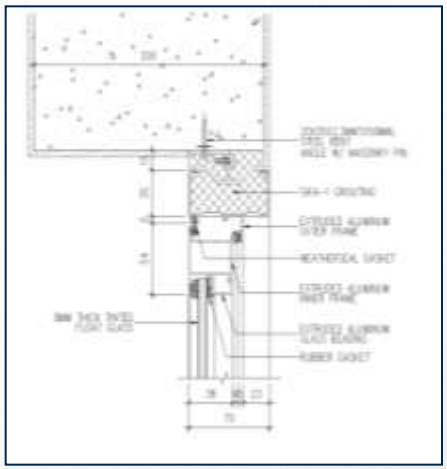
Non provision of r,c, kerb, instead stuff in bricks as replacement.

Will result in potential water seepage.

Unacceptable water proof application.

7.0 Installation Method.

Sub Frame Bracket System



1. Accuracy in structure opening size is important.

   Maximum tolerance - ± 5mm in overall height and width (opening exceeding tolerances shall be rectified).

2. Sub-frame brackets (50-75mm length) are arranged and position in factory as follow:

   a. The first sub-frame bracket should be 150mm from the edge of the frame (top and both sides of frame).

   b. The remaining sub-frame bracket should be placed 600mm to 750mm from center to center.

   c. The bottom sub-frame bracket should be in full length of the frame width.