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Installation Guidelines for Limited Opening Dual Action (Turn-Tilt) Windows

Approved 7/17/2024

Limited Opening Dual Action Windows

Installation Guideline Disclaimer

This document contains general installation guidelines for Graham Architectural products and does not address each particular condition or installation. Shop drawing installation details may vary from these Guidelines as these Guidelines do not address each particular condition so any variances should be addressed by the design professional. These Guidelines do not address the structural adequacy on any installation, and such should be addressed by a design professional. Anchorage to existing or proposed wall conditions are not addressed in this document. Sealant compatibilities and application details should be reviewed by the sealant manufacturers. This document does not address the interface between the window system and the buildings weather barrier system and should be reviewed by the waterproofing consultant. It is generally recommended that insulation be installed in all voids created in the installation of a thermally improved system, but the application of insulation in wet areas needs to be addressed by the design professional and the particular type of insulation may need to be specified.

Graham adjusts the hardware in the factory, however due to installation tolerances, final adjustments to the hardware is the responsibility of the installer.

Limited Opening Dual Action Windows

These instructions include the installation and initial adjustment instructions of the Limited Opening Dual Action (Turn-Tilt) windows. Read these instructions before starting any installation.

Receiving, Handling, and Storage

The proper receiving, handling and storage of windows is critical to the performance of the products throughout their service life. Abuse of the products during these processes will affect their operation and appearance. Even if the effects are not immediately noticed, they could surface later in the life of the product. The following are precautions that need to be followed.

Receiving: Prior to receiving the shipment of the windows, ensure that there is an adequate location to receive the windows and enough manpower and equipment to off load the products.

- Depending on the glass configuration and the size of the windows, the windows may be extremely heavy. A loading dock or glass manipulator may be needed to offload the windows or doors without damaging them. Contact Graham Architectural to determine the weight of any windows that are over 40 square feet.
- Most trucking companies allow a 3-hour off-loading time and will charge a detention fee if the truck is not off-loaded within that time period. That should be considered when determining the location where the truck will be off-loaded and how much manpower will be needed to complete the process.
- Ensure that the storage location is close to the off-loading area. The product storage area must meet the requirements listed in the “Storage” section below.

Handling: HANDLE CAREFULLY – DO NOT DROP.

- It is recommended to use a glass manipulator for large or heavy units. Ensure that there is enough manpower to lift and maneuver the windows. Use glass cups when possible. Only use material handling equipment that will not damage the finish of the products.
- Be careful handling windows with pre-loaded vents. Make sure pre-loaded vents are fully locked prior to moving windows. Never have fingers or hands inside the operating area of a vent.
- Do not use any of the hardware or grids for lifting or manipulating the windows. Glazed products must always be transported vertically.

Storage:

- The storage location for any finished products must be cordoned off to prevent damage from other trades, such as moving equipment.
- Stack vertically and on their sills with adequate separation so window parts (including hardware) will not rub together, including any protruding hardware such as handles. All products should be stored on top of wood blocking to protect the finish and weather-strip. Blocking will also be needed between the frame and any object that can damage the window frame.

Limited Opening Dual Action Windows

Storage: (Continued)

- Ensure that the products cannot be blown over by the wind and limit the stacking to five (5) units before alternate support is given. If the windows are going to be stored for a short period of time (less than 1 month), they can be leaned at a 15° – 20° angle from vertical, with blocking to prevent them from rubbing/deforming. If they are going to be stored for an extended period of time, they will need stacked vertically (<3° from vertical) with strapping to prevent them from being blown over by the wind.
- Protect windows completely from moisture and dirt prior to installation. It is important that all windows that are not installed, are protected from direct contact with rain, snow, or ice so as to protect the finish and glazing of the product. If water gets into and is retained in the glazing pocket, it will cause the edge seal of the insulating glass to fail.
- Storing the windows in the building is preferred, as long as they are not in a high traffic area. If stored in a trailer, or under clear plastic, there must be adequate ventilation to prevent the temperature of the products from exceeding 110° F (43.3° C). Temperatures exceeding this threshold can damage the sealants in the insulating glass. Heat build can also cause stress fractures in the glass. If storing outside, the products must be covered in a manner that will prevent water from getting into the products, while allowing ventilation to prevent excessive temperature or humidity build-up.
- Construction debris and dirt within the frame will affect the operation of the window. Protect all products from paint, weld spatter, construction debris, cement, plaster, terrazzo, and other construction materials, which include, but are not limited to, alkali-based materials or caustic cleaners. This must be removed immediately to prevent damage to the finish of the aluminum or to the clarity of the glass.
- If the windows have been wrapped in a transparent plastic protective wrap, this wrap cannot be on the product for more than 90 days from the date of manufacturing, otherwise, it will be very difficult to remove protective wrap from the window finish.
- Prior to applying sealants, the surfaces must be cleaned and prepared as directed by the sealant manufacturer.

CAUTION – Windows are not to be used as ladders, scaffolds, or supports. Installed window openings are not to be used as construction entrances, unless adequate protection to the window sill and jambs is provided. Damage to any products from any construction activity will void the product warranty for the products in question.

***Note:** Copies of these instructions can be downloaded from www.grahamwindows.com/architectural-resources/technical-information/*

Limited Opening Dual Action Windows

General Installation Instructions

A. Upon delivery carefully check that all windows have been received undamaged. If any of the windows have been damaged, immediately notify your Graham Representative.

B. The sill will need adequate support. The sill must be level in accordance with Table #1.

Table #1	Installation Tolerances (+/- Target)		
	Inches/ foot	**Inches Maximum**	**Method of Measurement**
Level (Horizontal Measurement)	1/32”	1/8”	Measure sill using level
Plumb (Vertical Measurement)	1/32”	1/8”	Measure jambs using level or plumb bob
True (In Plane Measurement	1/32”	1/8”	Attach strings across corners. Measure where they cross
Extrusion Straightness	1/64”	1/16”	Measure with straight edge.
Square (Diagonal Measurement)	N/A	1/16”* 1/8”**	Measure diagonal corners (Difference/2)
* Openings up to 20 sq. ft. **Openings 20 sq. ft. and over			

C. All work should start from established benchmarks and column center lines established by the architectural drawings and the general contractor.

D. The sequence of installation should be coordinated with the job superintendent, so delays are prevented.

E. It is not recommended to drill through the sill. If fasteners are required to penetrate the sill; sealant must be applied in the pre-drilled hole first. Drill the hole, clean out the drill shavings/debris, clean around the hole area, apply sealant in the hole, install the fastener, and then seal over the fastener head.

F. Be aware of allowable edge distance requirements for the fasteners into the substrate, especially when the substrate is masonry. Refer to the fastener manufacturer's instruction for proper usage.

G. Seal the exterior in accordance with the shop drawings.

H. Insulate between the window frame and the rough opening (or receptor, if used).

Limited Opening Dual Action Windows

Through Frame Installation

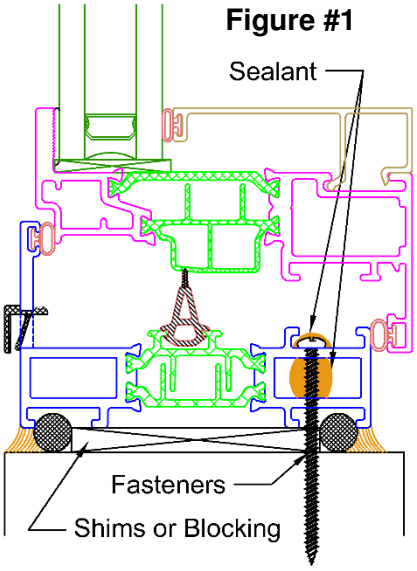
A. Position the frame in the opening. Be careful not to twist or rotate the frame during handling or installation.

B. The fastening schedule will generally be determined by a structural engineer. If a fastening schedule has not been specified, Graham Architectural recommends applying fasteners a maximum of 9 inches from each corner, and then a maximum of 18 inches apart. (Note: Recommended fastening does not apply to projects that have blast mitigation or hurricane requirements)

C. Apply shims and/or blocking at each hinge and fastener location (See Figure 1). The window must be level, plumb and square in accordance with Table 1.

D. When fastening through the window frame, seal the heads of the fasteners before and after installation.

Figure #1



Receptor Installation

A. If the windows are to be installed in a receptor system, refer to the Graham Installation Guidelines for Receptor Systems for more detailed instructions. www.grahamwindows.com/architectural-resources/technical-information/

B. When installed in a receptor, cross-blocking will be needed to prevent the window from going out of square when opened (See Figure 2). Apply shims and/or blocking at each hinge and lock location (See Figure #3). Apply fasteners at, or within 2", of the hinge and lock locations.

C. The window must be level, plumb and square in accordance with Table 1 shown on the previous page.

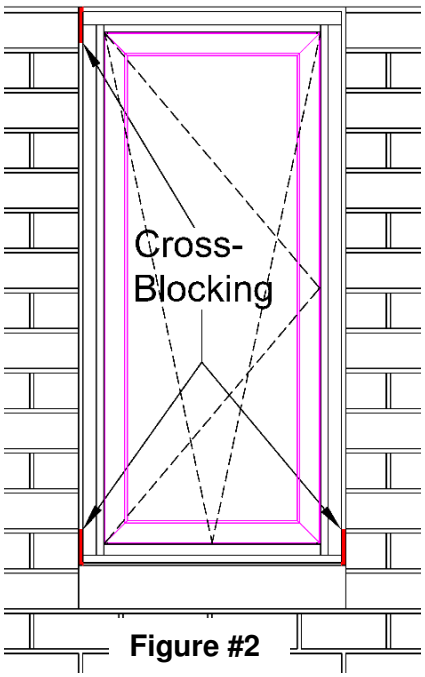


Figure #2

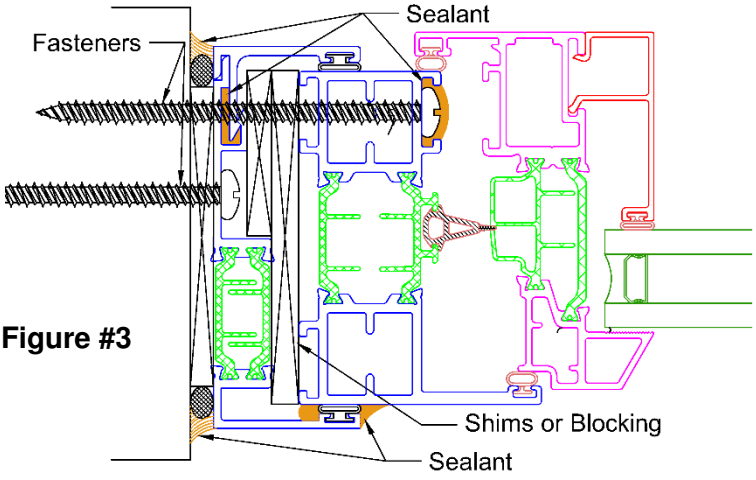


Figure #3

Limited Opening Dual Action Windows

Panning Installation

A. If the windows are to be installed using panning, refer to the Graham Installation Guidelines for the type of panning being used. www.grahamwindows.com/architectural-resources/technical-information/

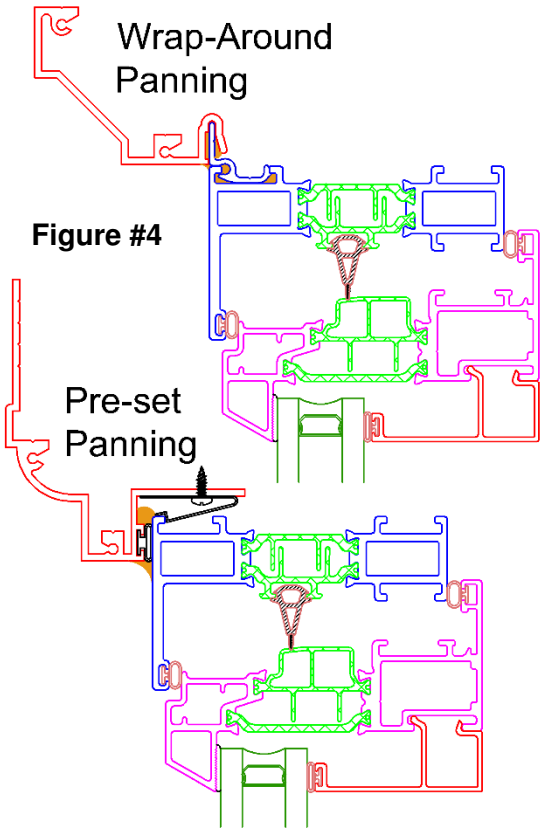


Figure #4

Trim and Clip Installation

A. If trim and clip are used, trim clips can be full length or 3" long sections. If sections are used, they will need to be lined up in order for the trim cover to snap in place.

B. The trim clip to window fastener must be a minimum of #8 x 1/2" screw, or heavier as required to meet project design loads. The trim clip must be attached to the rough opening before attaching it to the window. The trim clip to rough opening fastener is dictated by the substrate. Graham Architectural recommends that the fastener is greater than, or equal to, that of the fastener used at the clip to window (as required to meet project design loads).

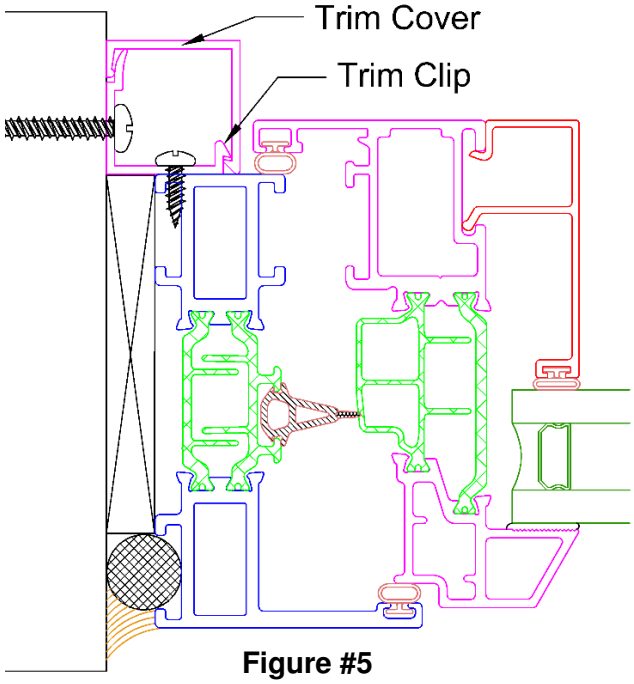


Figure #5

C. Apply shims and/or blocking at each hinge and lock location. If the window is large or heavy (larger than 2' x 4' and/or aspect ratio of greater than 0.5 A/R = W/H), additional blocking and fasteners will be needed along the jambs to support the window.

D. The fastening schedule will generally be determined by a structural engineer. If a fastening schedule has not been specified, Graham Architectural recommends applying fasteners a maximum of 9 inches from each corner, and then a maximum of 18 inches apart. (Note: Recommended fastening does not apply to projects that have blast mitigation or hurricane requirements)

Limited Opening Dual Action Windows

Trim and Clip Installation (Continued)

E. The head and (if used) the sill trim covers are field cut to size and are typically installed first. Snap trim covers on using a rubber mallet, or a block of wood with a hammer. Be careful not to dent or scratch the finish on the trim cover when installing it.

F. The jamb trim covers are field cut to size. Snap trim covers on using a rubber mallet, or a block of wood with a hammer.

G. The window must be level, plumb and square in accordance with Table 1 shown on the previous page.

Strap Anchors

A. Attach the strap anchors to the window frames at the required spacing with the screws provided. If necessary, bend the strap anchors so they point to the interior of the opening.

B. Apply shims at the sill to support the window frame. Make sure the sill will be level within the tolerances in Table #1.

C. Position the window into the opening, making sure that the window is plumb and at the proper set-back from the exterior.

D. Apply fasteners through the pre-drilled holes in the strap anchor. Apply shims, if needed to position the window properly (See Figure #6).

E. Apply backer rod and seal the perimeter of the window frame (See Figure #6).

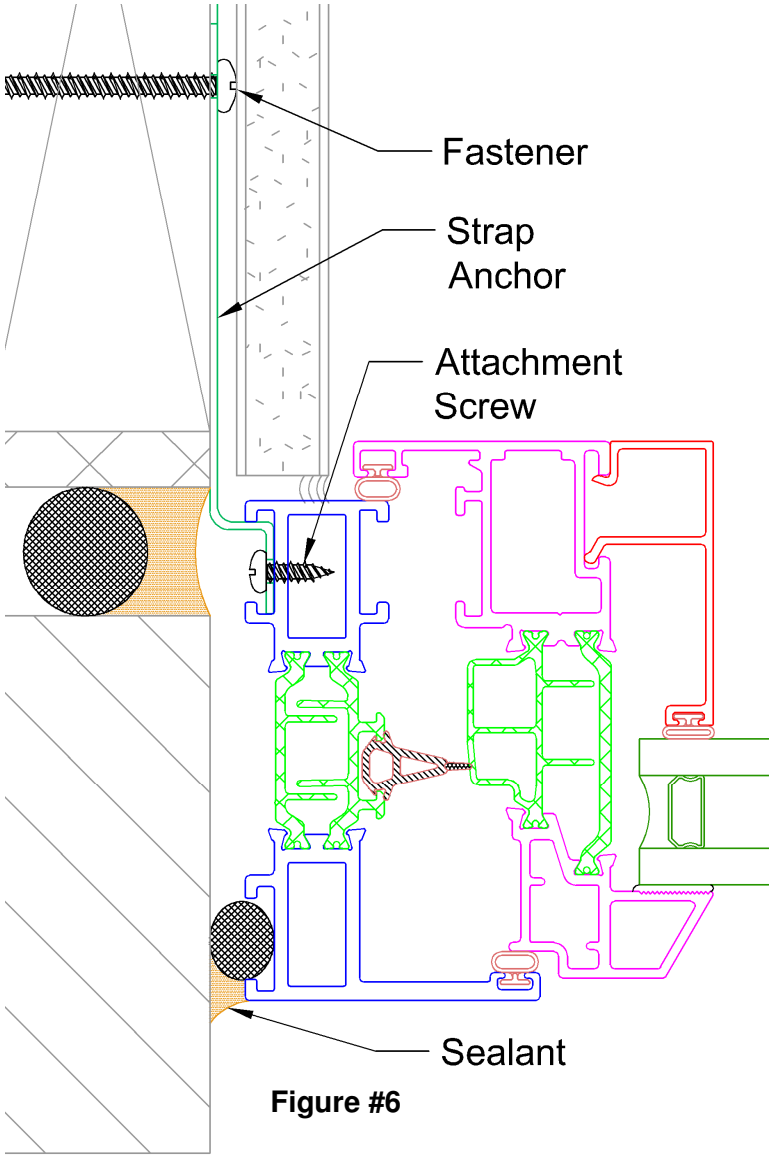


Figure #6

Vertical Mullions

A. Vertical 3-piece mullions will need attached to the head and sill of the rough opening with mullion clips/angles or horseshoe connectors. If a sill starter is used, a horseshoe connector will attach the mullion to the sill starter. Hook the back edge of the horseshoe connector into the back edge of the euro-groove of the sill starter. Push the front leg of the connector toward the interior and rotate the connector into the euro-groove. Slide the mullion over the connector and install the fastener (See Figure #7).

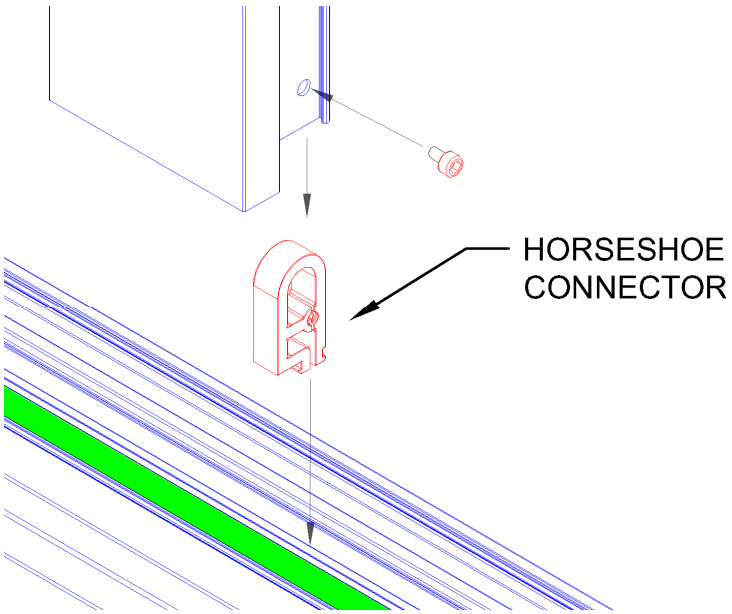


Figure #7

B. The mullion will need back-sealed to the window frames, and cap-sealing is recommended. Mullion pressure plates should be back-sealed starting at the sill and continuing up at least 6" (See Figure #8)

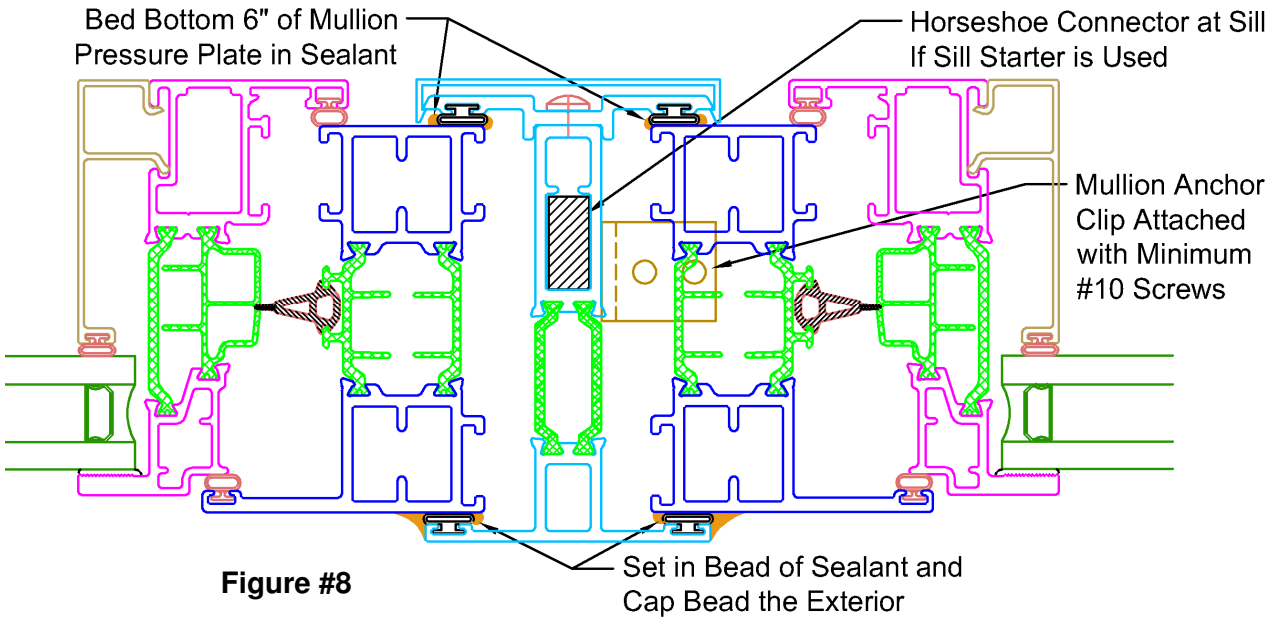


Figure #8

Limited Opening Dual Action Windows

C. Self-mullions and Vertical Stack mullions need sealant applied to the interior and exterior legs of the jamb prior to final assembly (See Figure #9).

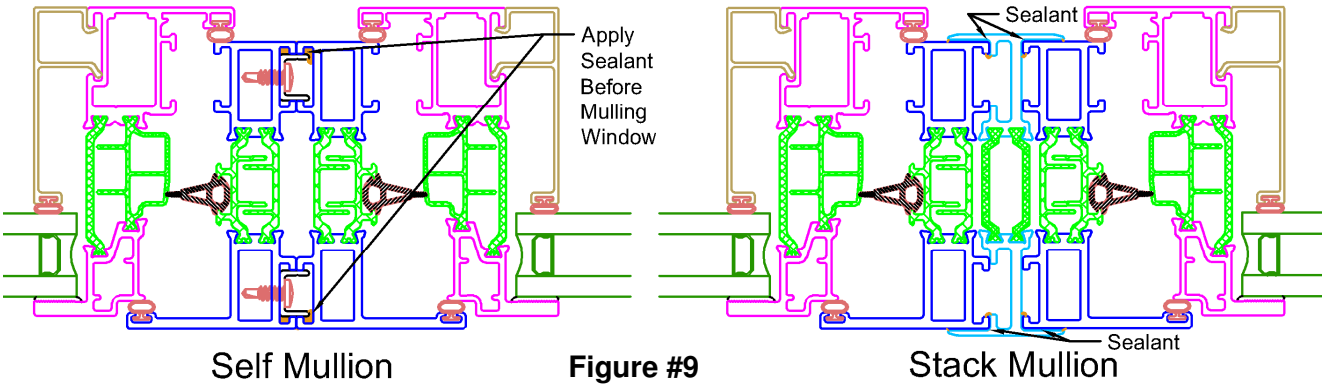


Figure #9

Horizontal (Stack) Mullions

A. Horizontal (stack) mullions need sealed to the frame of the window above and below. The exterior legs must be sealed, and Graham Architectural recommends that the interior legs are sealed (See Figure #10). Self-mullions can be used to stack windows.

B. Mullion anchor clips may be required depending on the size of the window, and/or the design load requirements. Reference the project shop drawings or contact the Engineering Department of Graham Architectural to determine when mullion anchor clips are needed for each type of stack mullion.

C. If multiple stack mullions are used in an opening, clearance will be needed between the stack mullion and the window below. Contact the Engineering Department of Graham Architectural for the clearance recommendations for each specific project.

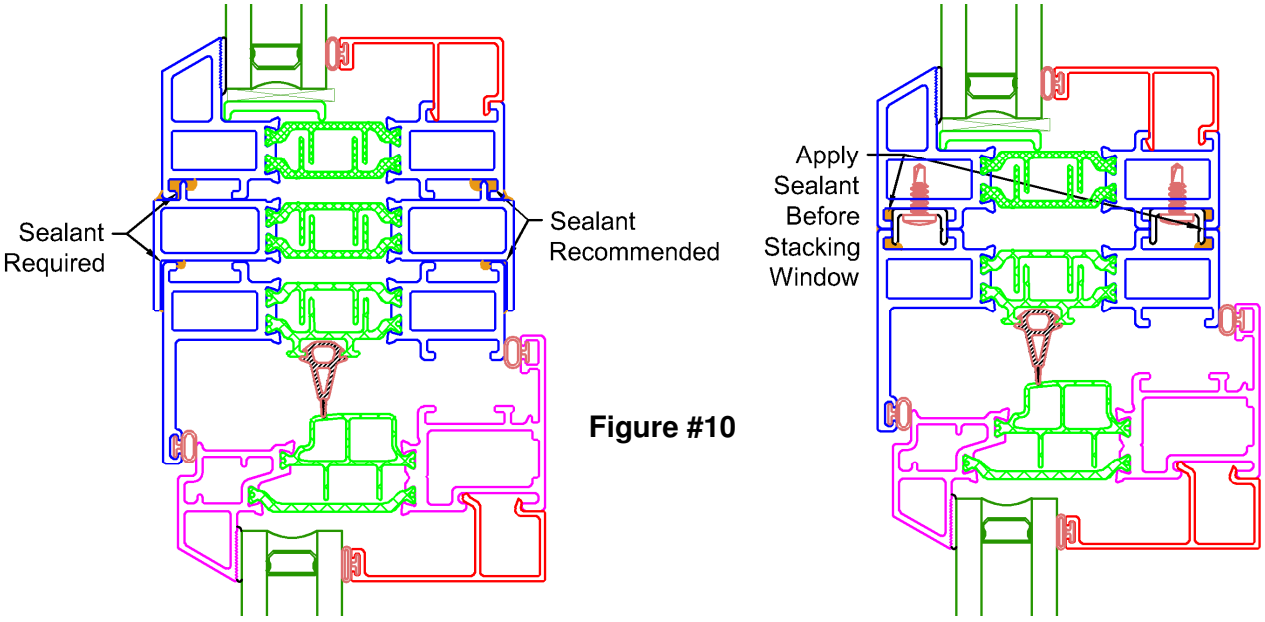


Figure #10

Limited Opening Dual Action Windows

Vent Operation

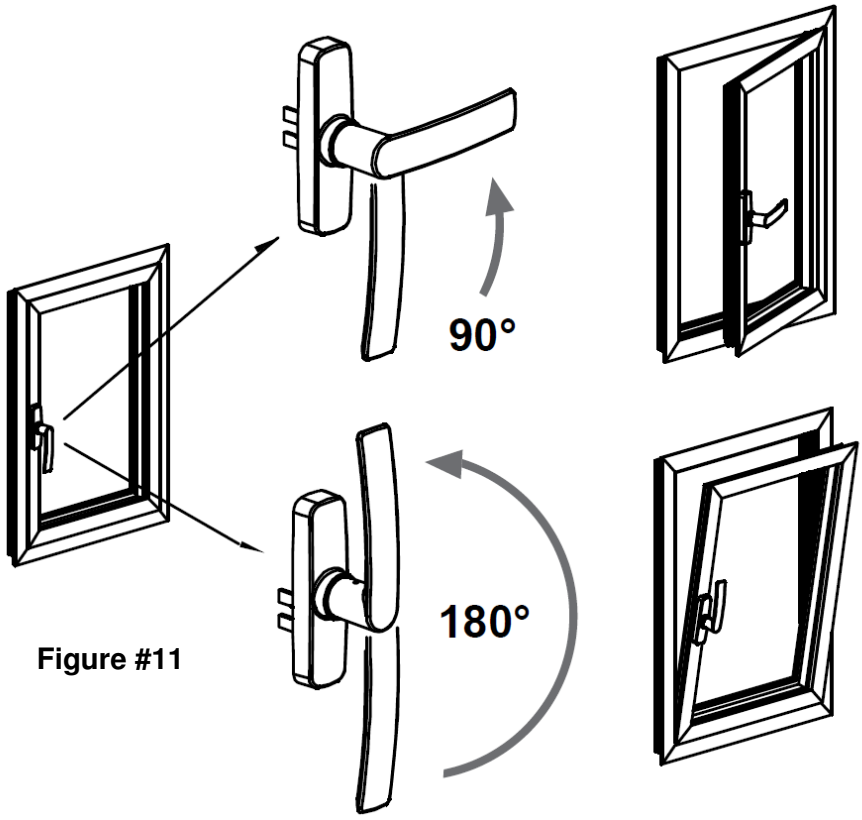


Figure #11

Keyed Operations

Figure #12a

Locked - No Operation

Figure #12b

Casement Mode Only

Figure #12c

Unlocked - Full Operation

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Operation Cautions

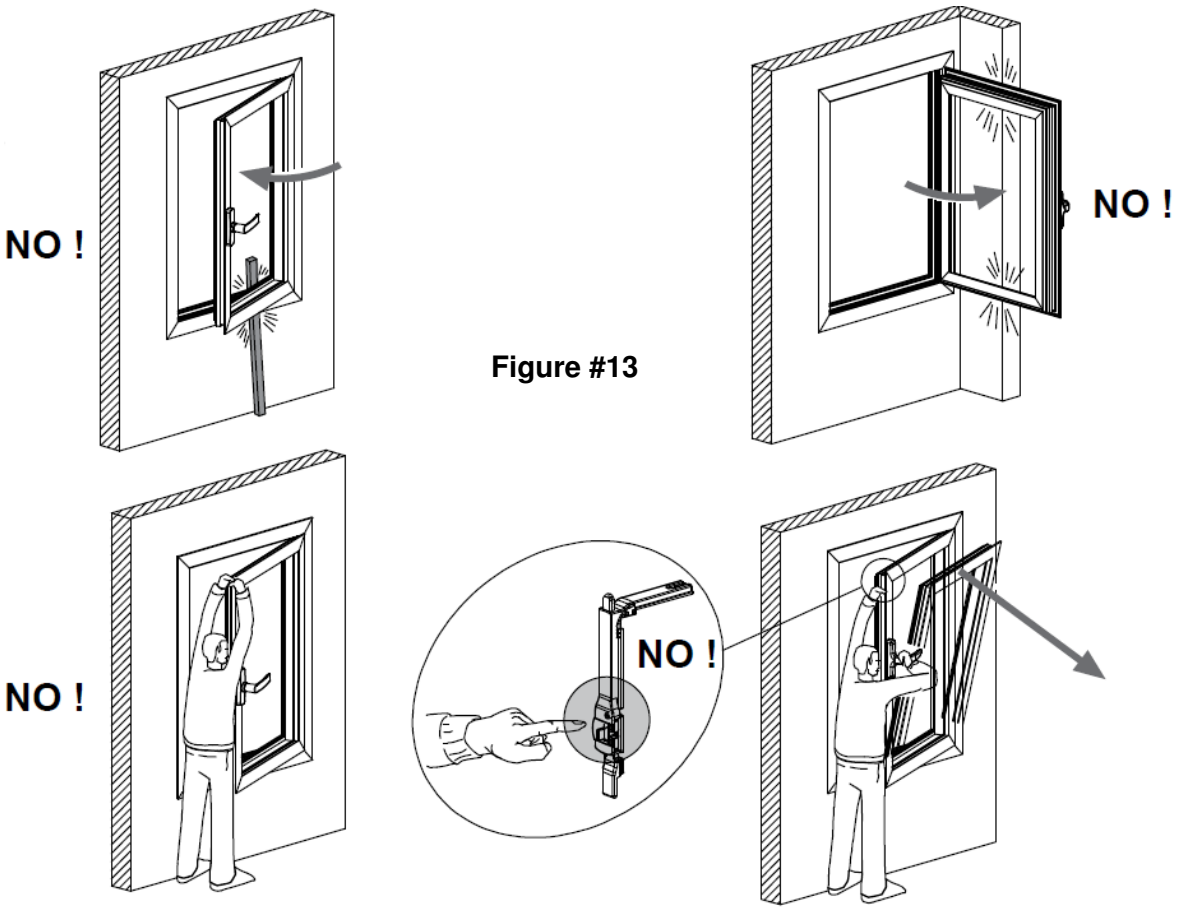

Figure #13

Limit Arms

A. The limit arms can be disconnected to allow the vent to swing fully in casement mode. Once the vent is open in casement mode, use the Fapim FBFF key to turn the shoe, which can then be removed from the hardware bar (See Figure #14).

B. The limit arms must be disconnected in order to make the adjustments to the vent.

NOTE: The limit arms must be re-connected before closing the vent.

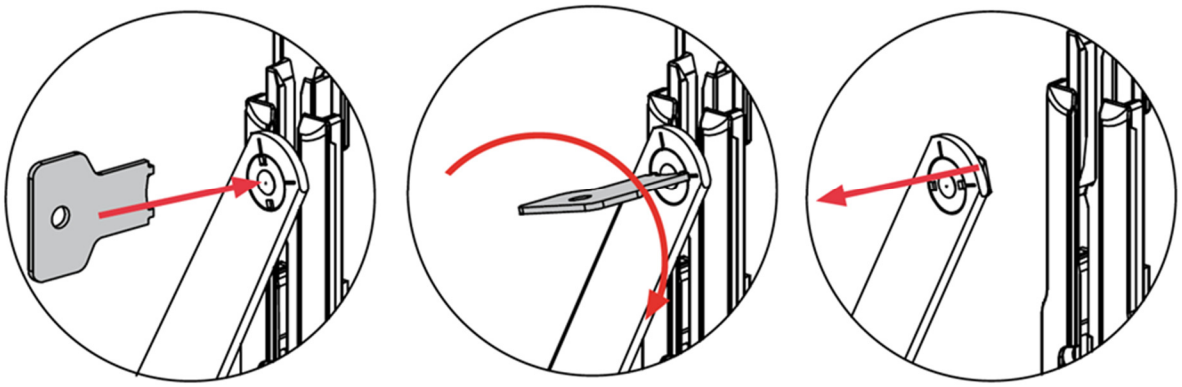

Figure #14

Limited Opening Dual Action Windows

Hinges

Note: *The final adjustment of the hinges after installation of the product is the responsibility of the installer.*

A. Graham Architectural offers the Dual Action Window with an adjustable hinge system.

B. Once the window is installed, look at the margin between the vent and the frame (See Figure #15). If the margin is not even around the perimeter of the vent, the window will need adjustment. Determine which direction the vent needs the adjustment. The vent needs uniformly centered in the frame.

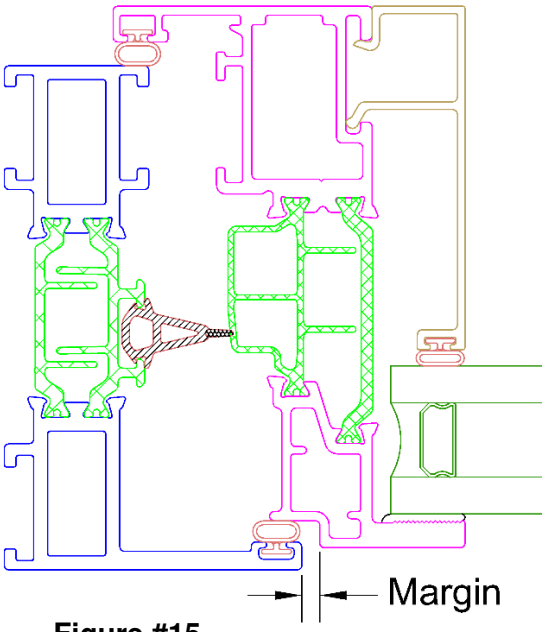

Figure #15

C. If the vent needs adjusted up or down, open the vent to access the hinges. Use a hex key to adjust the hinge as shown in Figure #16.

D. If the bottom of the vent needs adjusted side to side, open the vent to access the bottom hinge. Use a hex key to adjust the bottom hinge as shown in Figure #17.

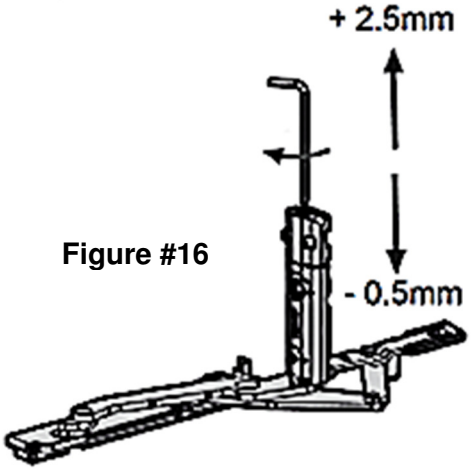

Figure #16

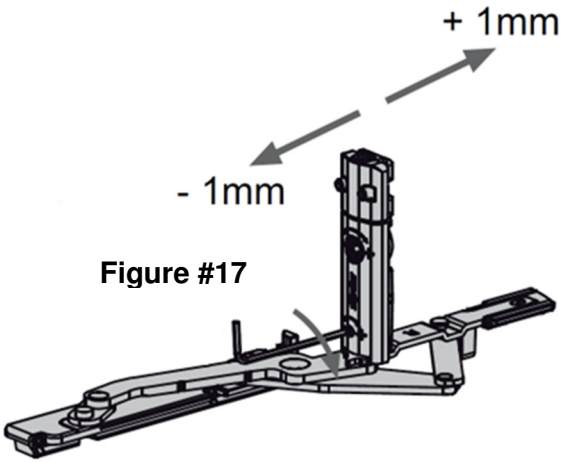

Figure #17

E. If the top of the vent needs adjusted side to side, open the vent to access the top hinge. Use a hex key to adjust the hinge as shown in Figure #18.

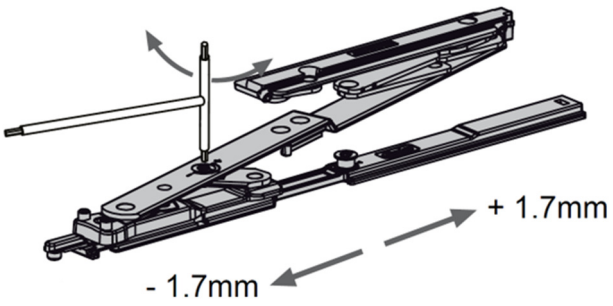

Figure #18

Limited Opening Dual Action Windows

Lock Adjustment

Note: *The final adjustment of the locks after installation of the product is the responsibility of the installer.*

A. Check the alignment of the lock points, by opening the window, engage the locks, almost close the window, and the lock points should align with the keepers.

B. If a keeper needs adjusted parallel to the frame, loosen the Lateral Adjustment Screw and slide as needed (See Picture #21). Re-tighten the screws.

C. Check the compression of the weatherstrip by inserting a piece of flexible paper (dollar bill) between the vent and the frame and closing and locking the window. If the paper pulls out easily, the vent will need tightened.

D. Open and close the window a couple of times. If the handle is hard to turn, the vent will need to be loosened.

E. The hinges can be adjusted in or out by adjusting the hinge as shown in Figure #19.

F. The lock points can be adjusted with a hex key as shown in Figure #20.

G. The lock keepers can be adjusted using the Keeper Adjustment Screw (See Figure#21)

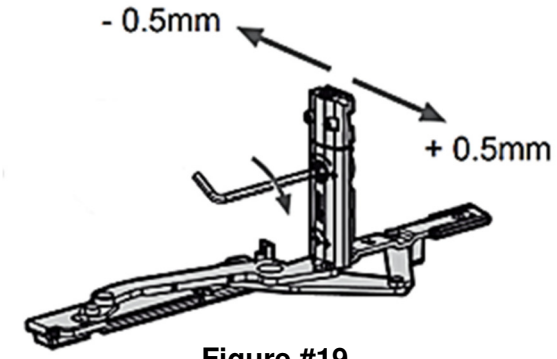

Figure #19

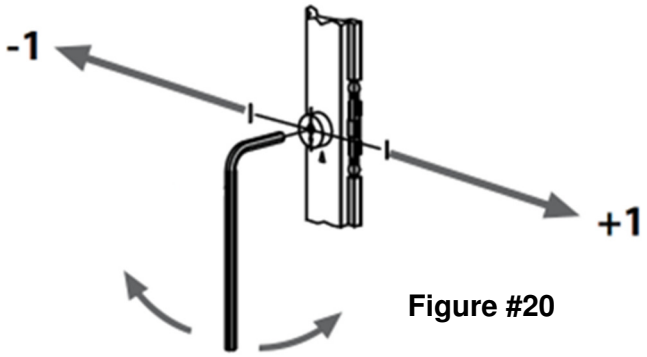

Figure #20

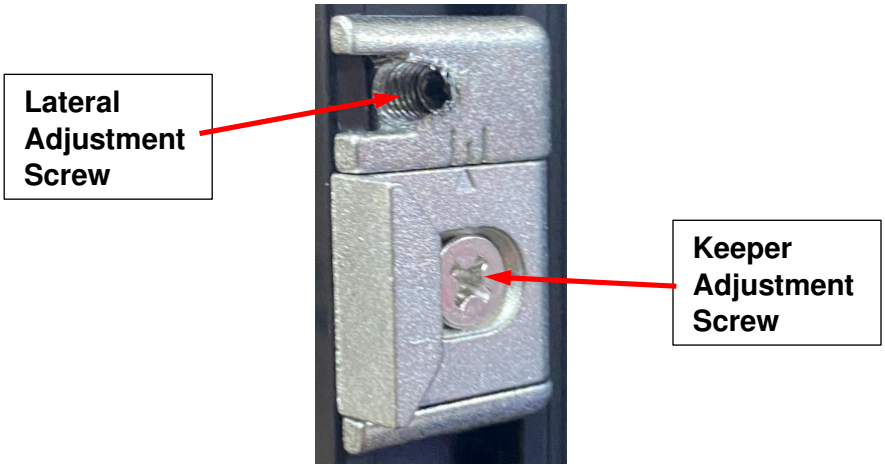

Figure #21

Limited Opening Dual Action Windows

Screen Installation

Graham offers several screen options. The following are basic instructions for each type.

Spring Loaded – Most dual-action windows use a screen on the exterior that has springs at the side that load into an exterior track. Push the spring side of the screen into the screen track, and then rotate the screen until the other side is seated into the track (See Figure #22).

Pin Clips - Some screens use pin clips. Hook the top pin clip and then rotate the screen until the bottom of the screen is snapped into the lower spring pins (See Figure #23).

Note: *Security screens are usually attached at the factory, therefore these instructions do not include the installation of those products.*

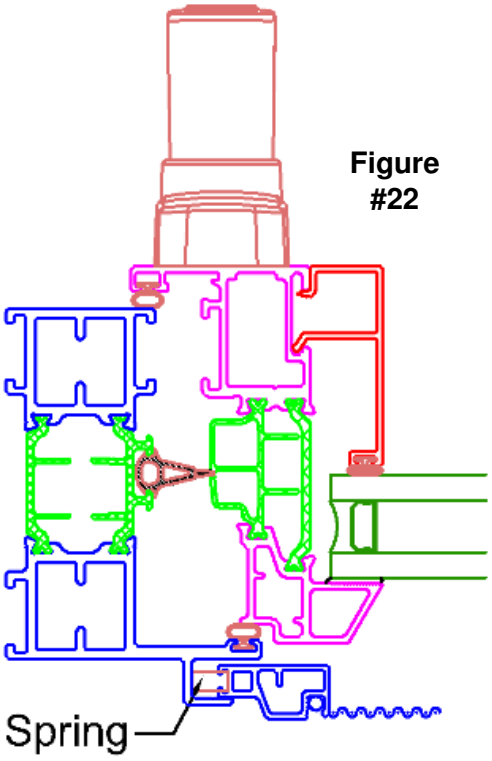

Figure #22

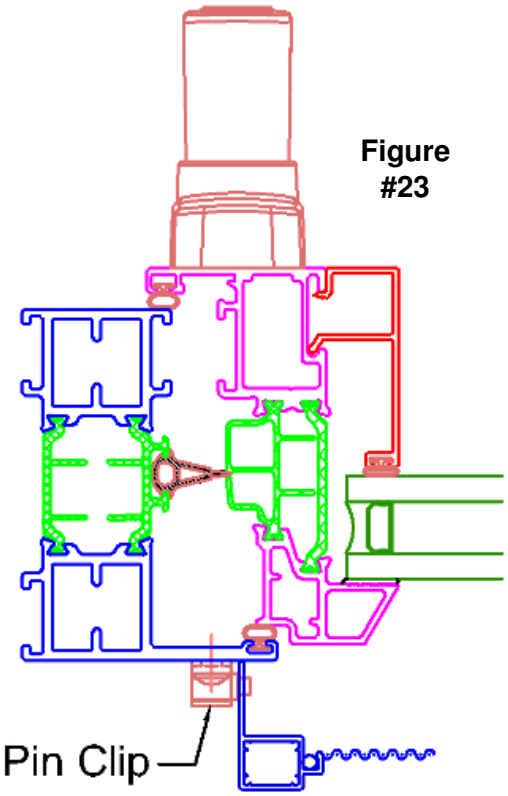

Figure #23

Limited Opening Dual Action Windows

Guardian Panels

Graham offers guardian panels on the Dual Action windows, which are glazed panels that are installed into the interior glazing bead. They come in either pivoted (side hinged) or lift-in versions and can have blinds in between the guardian panel and the window glazing. The blinds can be pivoted but cannot be raised or lowered once the guardian panel is closed. The blinds have to be lowered by the installer before the panel is closed. These are the instructions for dealing with these panels and the blinds.

General Instructions:

A. NEVER lift the window with suctions cups on the guardian panel.

B. If the window has blinds, the blinds will be secured in the raised position with either rubber bands or zip-ties. DO NOT remove the rubber bands or zip-ties until the windows are installed.

Figure #24

Lift-in Guardians:

A. Lift-in guardians are sometimes shipped separately from the window. If it is installed in the window, the panel will have to be removed to lower the blind.

B. If there are blinds, they will be attached to the windows frame or vent. Hold onto the pull string, and then remove the rubber bands or zip-ties and carefully lower the blind until it is at the bottom of the windows frame or vent.

C. Make sure there are setting blocks in the bottom channel that the guardian sits in.

D. Lift the top of the panel into the top channel and rotate the guardian panel into the frame or vent.

E. Lower the panel into the bottom channel and install the set screw into the top channel.

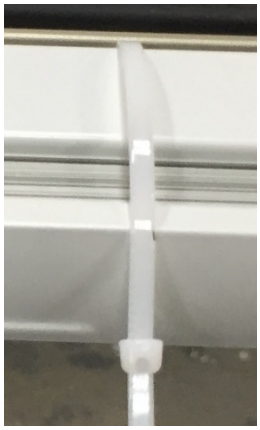

Figure #25

Pivot Guardians:

A. Once the windows are installed, use a hex key to turn the locking pawls ¼ turn to open the panels (See Figure #26).

B. Hold onto the pull string, and then remove the rubber bands or zip-ties. Carefully lower the blind until it is at the bottom of the panel.

C. Close the panel and lock the locking pawls.

Figure #26