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ARCHITECTURAL PRODUCTS

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Assembly and Installation Guidelines for

Sill Starters and Receptor Systems

Approved 03/21/2022

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 receptor 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.

Sill Starters & Receptor Systems

Thank you for your purchase of Graham Architectural Products. These instructions include the assembly and installation guidelines for the receptor systems. Read these instructions before starting any installation.

Receiving, Handling, and Storage

The proper receiving, handling and storage of windows and receptors 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 off the windows and receptors, ensure that there is an adequate location to receive the products 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’s 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.

Note: If the windows have interior guardian panels, manipulators and glass cups cannot be applied to the guardian panel to lift the window.

- Be careful handling windows with pre-loaded sash or vents. Make sure pre-loaded sash or vents are fully locked prior to moving windows. Never have fingers or hands inside the operating area of a sash or vent.
- Do not use any of the hardware or grids for lifting or manipulating the window or door. Glazed products must always be transported vertically.

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Storage:

- The storage location for any finished products must be cordoned off to prevent damage from other trades, such as moving equipment.
- Ensure that the products cannot be blown over by the wind and limited to stacking of 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 finished products 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 or door. 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, doors and receptors 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/*

Sill Starters & Receptor Systems

General Installation Instructions

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

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			

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

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. Drilling through the sill starter should be avoided, if possible. If fasteners are required to penetrate the sill starter; 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. There should be a minimum of ¼” between the receptor and the rough opening on all sides. Backer rod must be used. Graham recommends an interior perimeter seal.

H. Insulate between the receptor and the rough opening, and between the receptor and the head and jambs of the window or door. It is not recommended to install insulation in the sill starter. Insulation in the receptor should be water repellant (hydrophobic).

I. In addition to these instructions follow the installation instructions for the windows or doors being installed.

Sill Starters & Receptor Systems

RECEPTOR ASSEMBLY AND INSTALLATION

A. Measure and check the square of the window opening, and the level of the sill (Refer to Table #1). If the opening is not square or level, the opening shall need modified.

B. Field cut all members true and square.

C. The standard installation sequence shall be sill, head, and then jambs.

D. These instructions show the most common type of receptor installation. If the receptor is installed in an exterior set/install configuration (receptor clip on the exterior), some sealant details may differ.

SILL STARTER (RECEPTOR) INSTALLATION:

A. The sill starter is the most important member of the receptor system. It must be set true and level with adequate support and properly sealed.

B. Cut sill starter extrusion smaller than the openings width, but not smaller than the window width. This gap (typically ½") is intended to accommodate the end dams, screw heads, and allow for expansion and contraction of the sill starter.

Note: *If no jamb receptors are used; the sill starter must be sized such that window openings (single or multiple) fit properly*

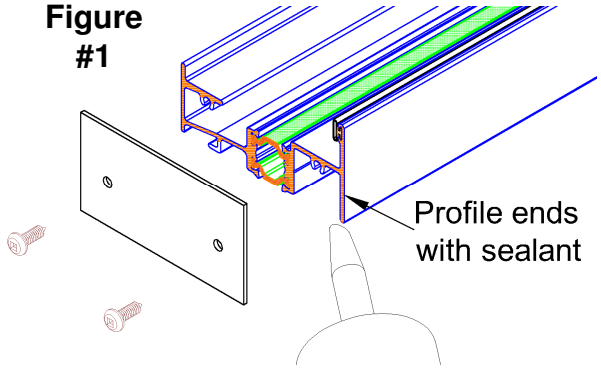
C. Profile the end of the sill starter with sealant and install end dams (See Figures #1 and # 2) with the fasteners provided.

D. Tool squeeze out or add sealant to create a back-seal between the end dam and the sill starter. (See Figure #3)

E. Install sill starter by method shown on shop drawings. Note the following:

   a. Non-metal shims must be placed directly under each fastener to prevent sagging (continuous blocking is recommended).

Figure #1



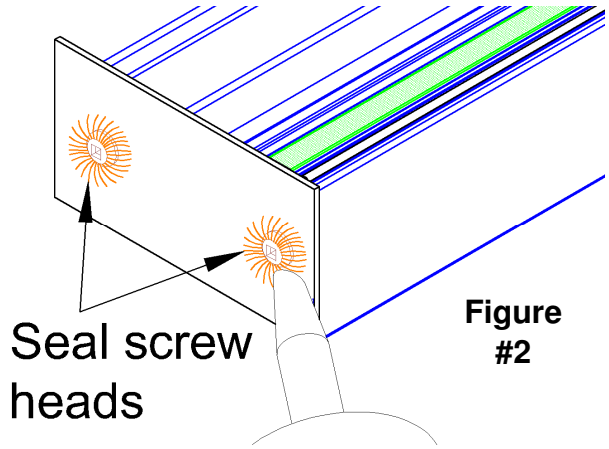


Figure #2

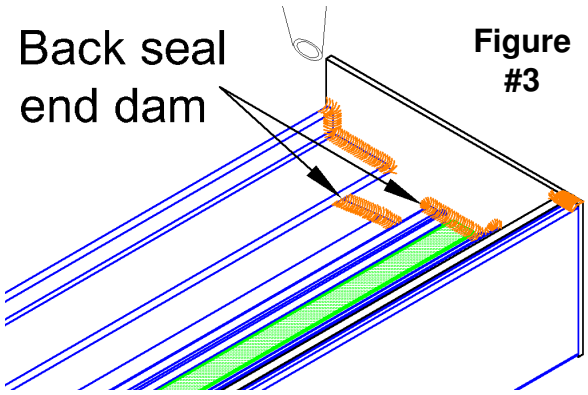


Figure #3

b. Drill holes which are required for proper installation. Any holes that do not receive fasteners must be carefully sealed to prevent leakage. Recommended 18" on center minimum, or as per applicable structural calculations and approved shop drawings.

c. 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. (See Figure # 4)

d. If there is no jamb receptor, seal the top and front edge of the end dam to the rough opening. This sealant bead must tie into the sealant at the sill. (See Figure #5)

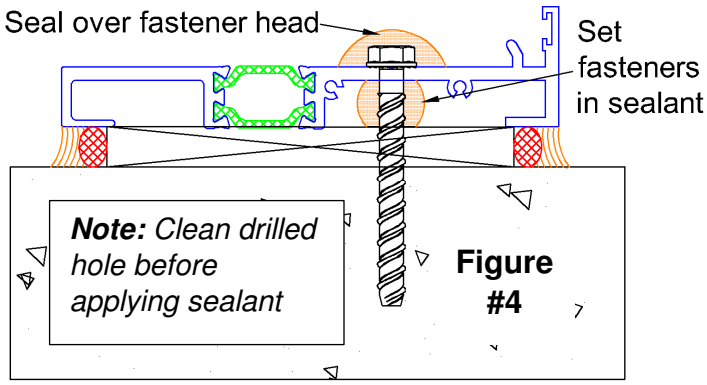


Figure #4

Apply backer rod and sealant between end dam and perimeter condition

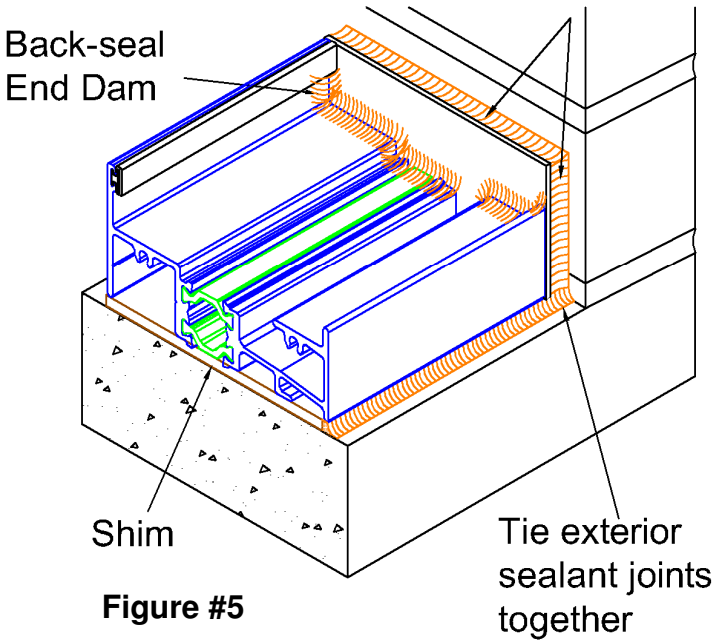


Figure #5

HEAD RECEPTOR INSTALLATION:

A. If end dams are used at the head, cut the head receptor at least ½" smaller than the opening width; or as directed in the approved shop drawings to accommodate the end dams, screw heads, and allow for expansion and contraction.

Note: *Head receptor end dam is optional (if required per shop or contract drawings) special order part. Step B below is only if head receptor end dams are used.*

B. If head receptor end dams are required, profile the end of the head receptor with sealant and install end dams, if required, (See Figure # 6) with fasteners provided. Back seal the interior joint between the end dam and the head receptor.

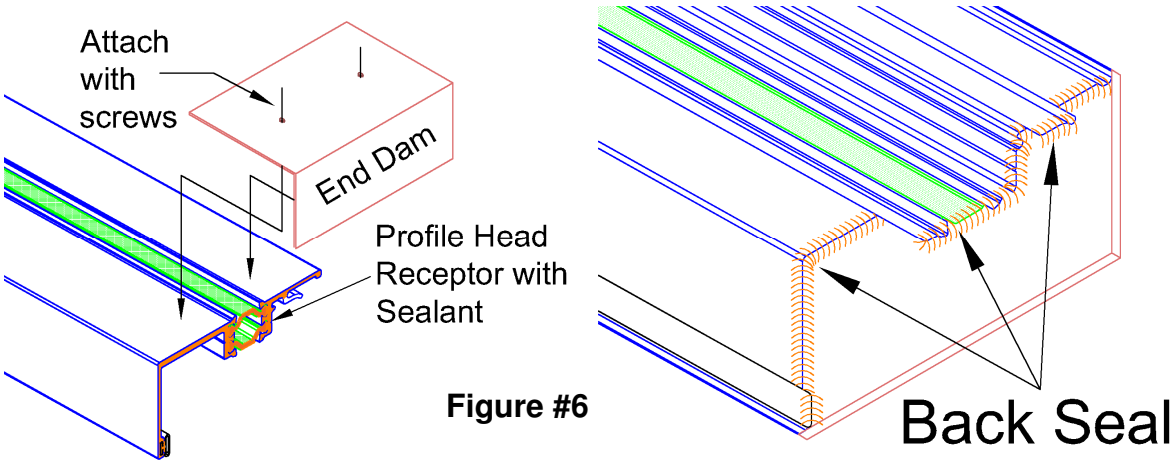


Figure #6

C. Install the head receptor as shown on approved shop drawings. Note the following:

a. Drill fastener holes which are required for proper installation. Any holes that do not receive fasteners must be carefully sealed to prevent leakage. Recommended 18" on center minimum or as per applicable structural calculations and approved shop drawings.

b. Be careful when drilling or shooting an anchor not to pierce the building flashing system as this will cause water to penetrate the receptor system.

c. Shims must be properly placed under each fastener. *<u>Note:</u> Shim head receptor sufficiently to maintain the proper penetration of the window head as shown on approved shop drawings.*

d. Thoroughly clean area per sealant manufacturer's recommendations, then set all fasteners in sealant that penetrate head receptor.

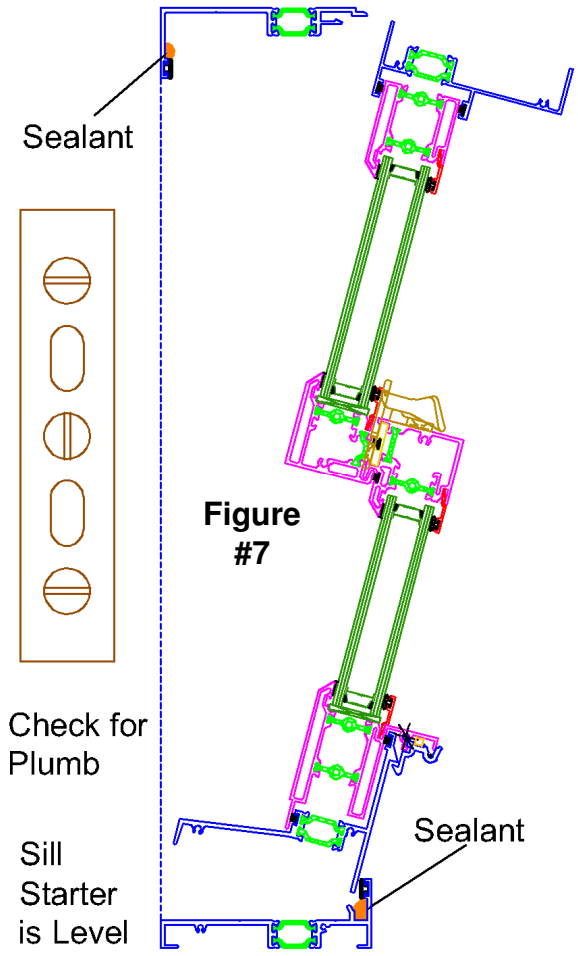


Figure #7

e. The head receptor should be installed level and plumb to the sill starter (refer to Table 1 for tolerances). Note: Use plumb bob, laser, or equivalent, to properly position head member in relation to sill. (See Figure #7)

JAMB RECEPTOR INSTALLATION:

A. Cut jamb receptor to correct length.

B. If using a non-weeped sill starter, field notch bottom of jamb receptor as shown in Figure #8.

C. Install jambs by method shown on shop drawings. Note the following:

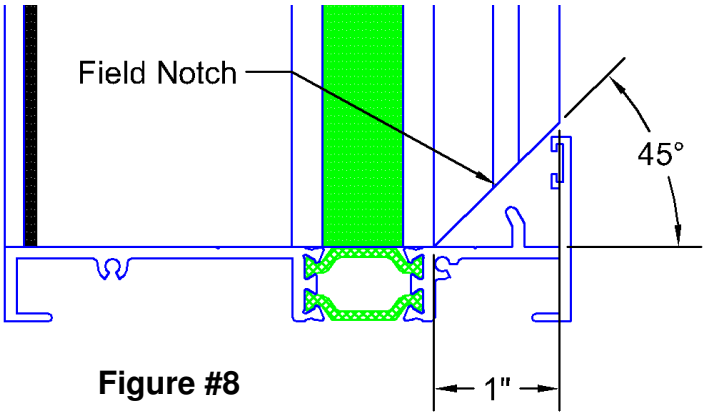


Figure #8

a. Drill only holes which are required.

b. Shim jamb receptor at each fastener location to be plumb and true with head and sill members.

c. Apply a beading bead of sealant along the top and back edges of the end dam where it will make contact with the jamb receptor.

d. Install the jamb receptor and seal the bottom end of the jamb receptor to the sill starter and end dams (see Figures #9 and # 10).

e. Seal ends of jamb receptor to head receptor end dams, if applicable (see Figure # 11).

f. All fastener heads must be thoroughly sealed to prevent water leakage.

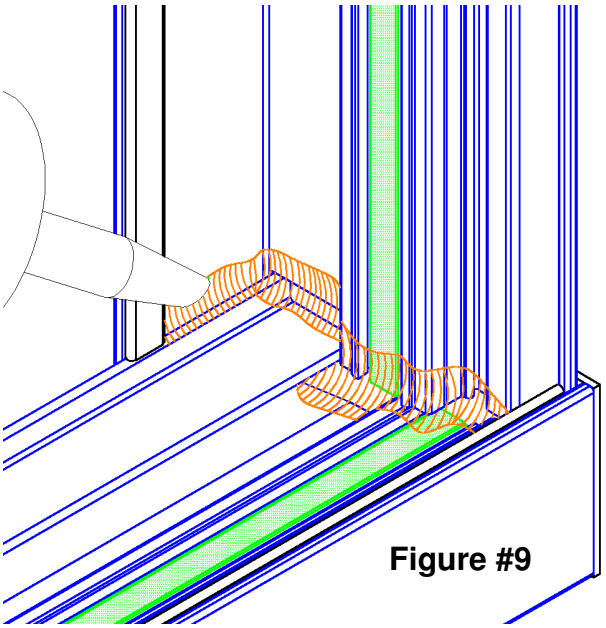


Figure #9

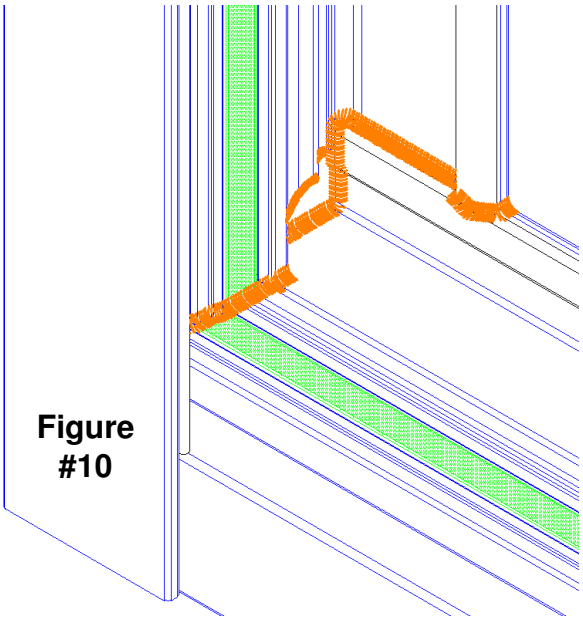


Figure #10

Sill Starters & Receptor Systems

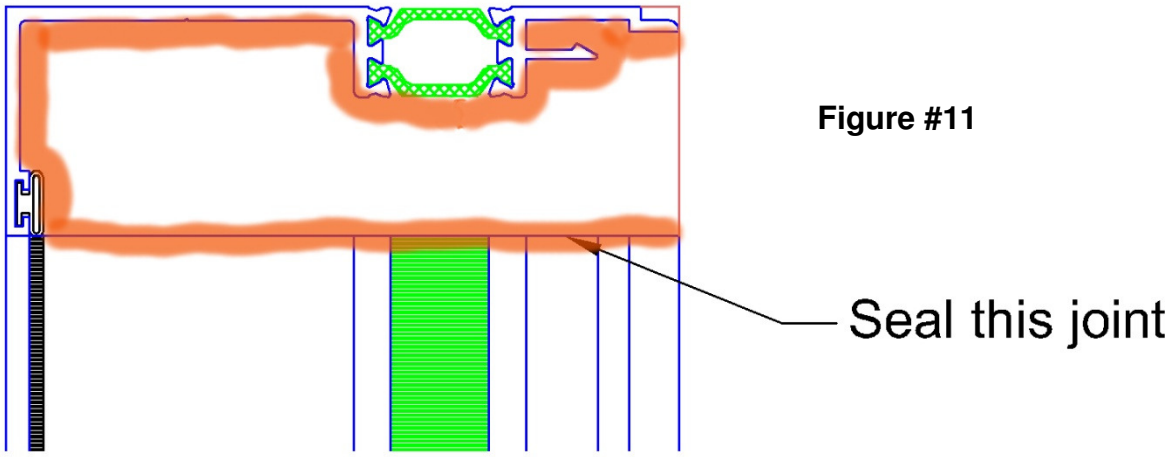


Figure #11

SPLICE PLATES:

General Instructions: Splice plates may be required when more than one length of receptor is required. Several options are available, detailed below is the GAP recommendation.

Sill Starter Splice Plates - Non-weeped sill starter

A. Place the sill starter interior splice plate where the splice will occur and seal the plate to the rough opening (See Figure #12).

B. Install the sill starters, allowing ¼" space between extrusions for expansion and contraction (See Figure #13).

C. Place backer rod in the joint between the sill starters and apply a sealant joint (See Figure #13).

D. Apply a bead of sealant approximately 1" from each end of the sill starters and install the sill starter exterior splice plate (See Figure #14).

E. Splices should not occur directly under a mullion.

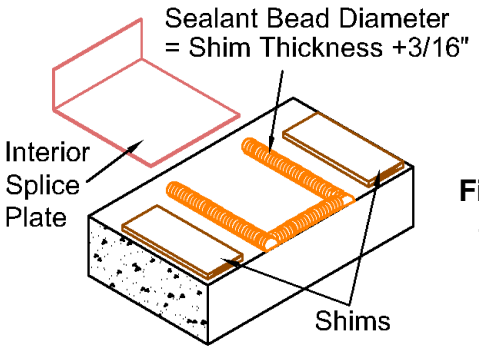


Figure #12

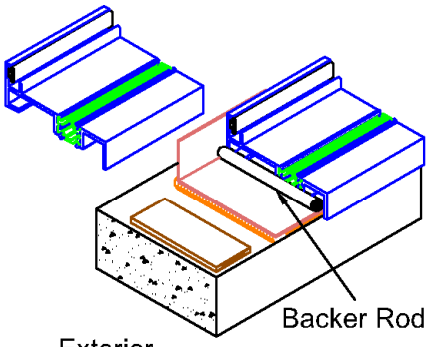


Figure #13

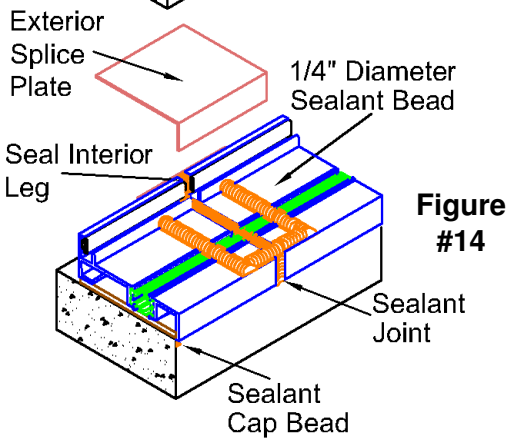


Figure #14

Sill Starters & Receptor Systems

Sill Starter Joints - Weeped (Tank type) Sill Starter

Note: Although slice plates can be made for weeped sill starters, it is not recommended. The procedure below is the recommended method.

A. Cut two sill end plates to allow the sill of the window to be installed against each other.

B. End one receptor and apply sill end plates as described on page 6 (See Figure #15). These end dams will have to be cut low enough to allow the window sill to be installed over the top of the end dam.

C. Leaving ½" gap between the sill starters, start another sill starter using the sill end plates as described on page 6 (See Figure #16)

D. Using backer rod, seal the end plates to each other (See Figure #17).

E. Back-seal the end dams. After the windows are installed, seal the interior legs of the sills together (See Figure #18).

Figure #15

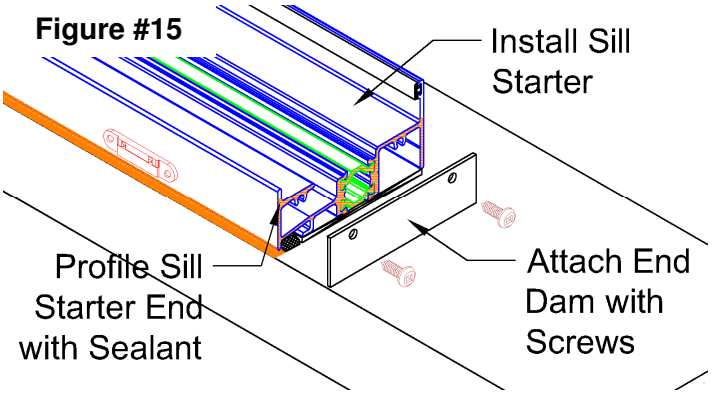


Figure #16

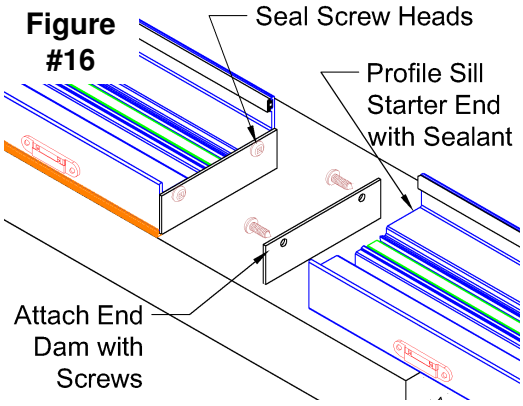


Figure #17

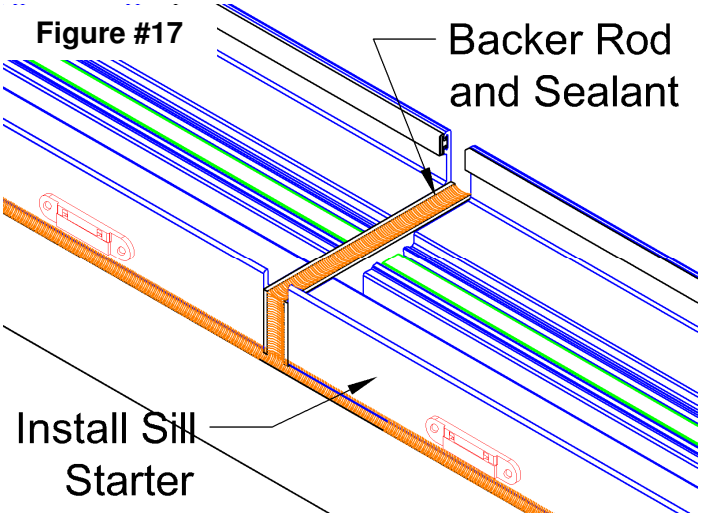
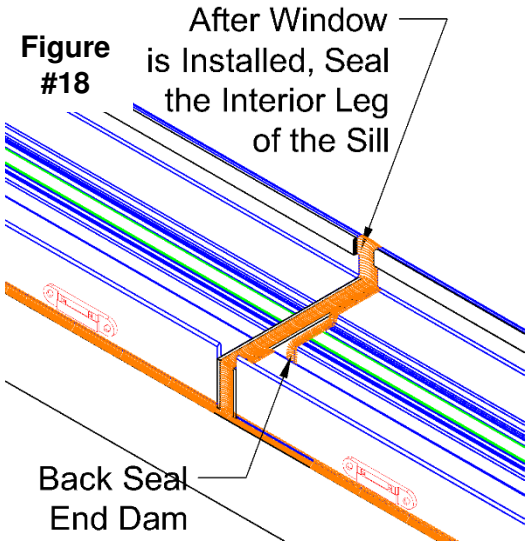


Figure #18



Sill Starters & Receptor Systems

Head Receptor Splice Plates

A. The receptor clip splice should never occur at the same location as the splice for the head receptor (See Figure #20). Receptor clips can be butted together and sealed.

B. Place sealant to the perimeter of the receptor splice plate, and bond breaker tape to the center of the splice plate as shown in Figure #19

C. Allow ¼" space between the head receptors for expansion and contraction.

D. Seal the edges of the head receptors as shown in Figure # 20.

E. Splices should not occur directly at a mullion.

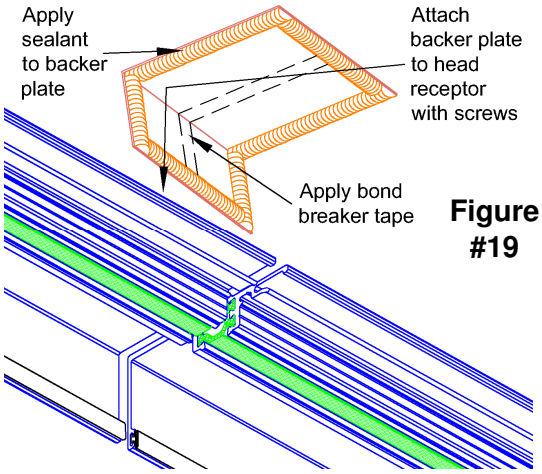


Figure #19

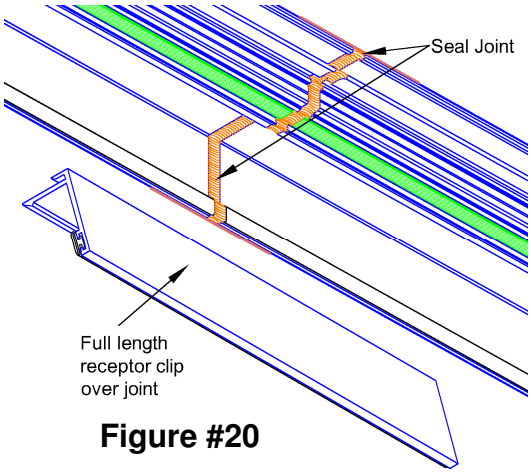


Figure #20

VERTICAL MULLIONS:

Note: *If the receptor is being installed in an exterior set configuration, then the vertical mullions will be installed with the pressure plate on the exterior.*

A. Locate mullions as required.

B. Cut mullion to correct length by cutting the top portion of the mullion. Notch the ends if required, so mullion fits squarely between the head receptor and the sill starter.

C. Use anchor clip to secure head and sill, if required. Screws through the sill must be thoroughly sealed. Place generous amount of sealant over and around pre-drilled holes prior to placing anchor clips. Cover screw threads and underside of the clip with sealant then fasten clip in place. Apply sealant around complete perimeter of clip at sill. Seal over screw heads (See Figure #21).

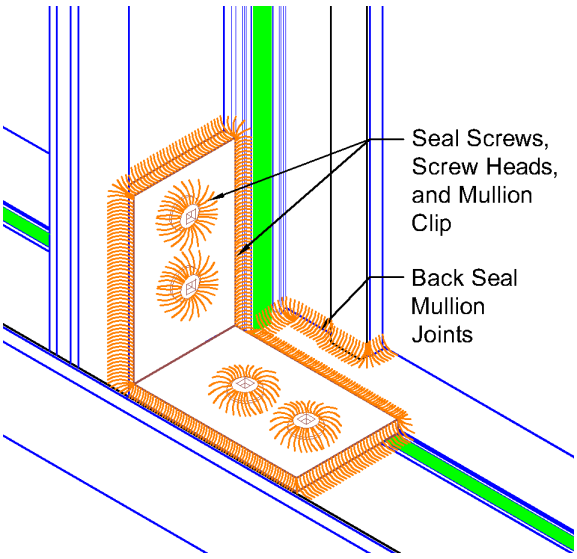


Figure #21

Sill Starters & Receptor Systems

WINDOW INSTALLATION

A. The windows are now ready to be installed into the receptor system. Consult the "Installation Manual" for each of the window types specified on the shop drawings.

B. Most windows will need to have blocking or shims between the window frame and the receptor system. Vertically swinging products (casements, swing doors, tilt-turn, etc.) will need cross-blocking and anchoring, as a minimum, to prevent the windows from shifting out of square within the receptor system when they are opened. (See Figure #22)

C. Install a bedding bead of sealant to the bulb gasket of the exterior leg of the receptor (head and jambs). (See Figure #23)

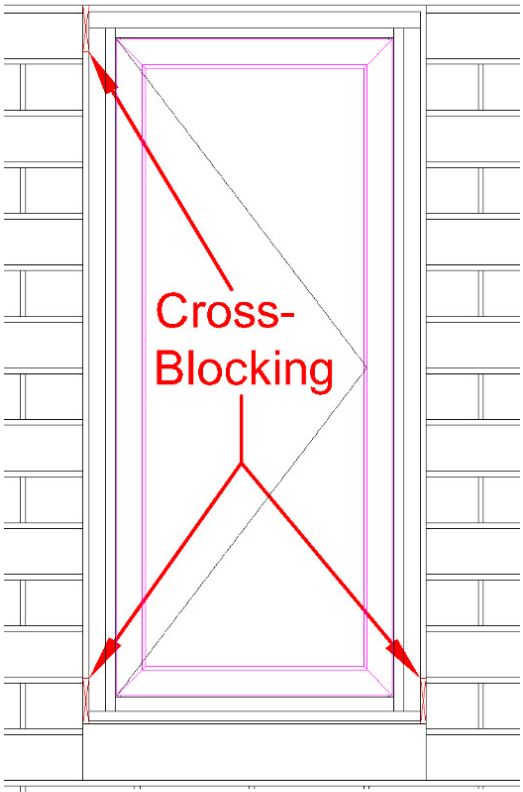
D. Install a bead of sealant on the sill starter where interior leg of window sets in the sill starter. Fill this trough continuously to the end dam (See Figure #24). If a weeped (tank) sill starter is used, apply a bedding bead of sealant in the exterior leg of the sill starter.

E. Set window frames into receptor as indicated on approved shop drawings.

Note: *Temporary clips 1" long can be used during window installation to prevent units from being blown in by wind gusts. These temporary clips must be removed prior to installing full receptor clips.*

F. Install windows square, level and plumb (refer to Table 1 for tolerances).

Figure #22



Note: *Figure is shown without the receptor for illustration purposes.*

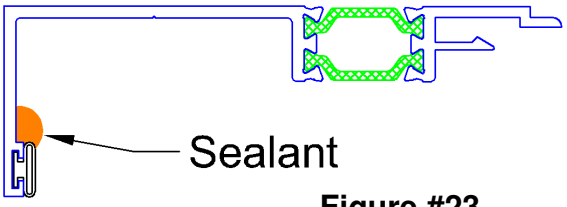


Figure #23

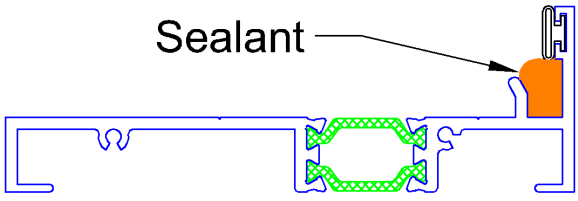


Figure #24

Note: *If the receptor has been installed in an exterior set configuration the sealant beads on the receptor will be on the interior leg of the receptor and will need to tie into the seal in the sill starter.*

G. If the product uses butt hinges, fasteners must be applied close to the hinges and the lock points. (See Figure #25) Hung windows will need blocking at the ends of the meeting rails to prevent bowing of the jambs. Sliding windows and doors will need blocking at the jambs to prevent the product from shifting out of square.

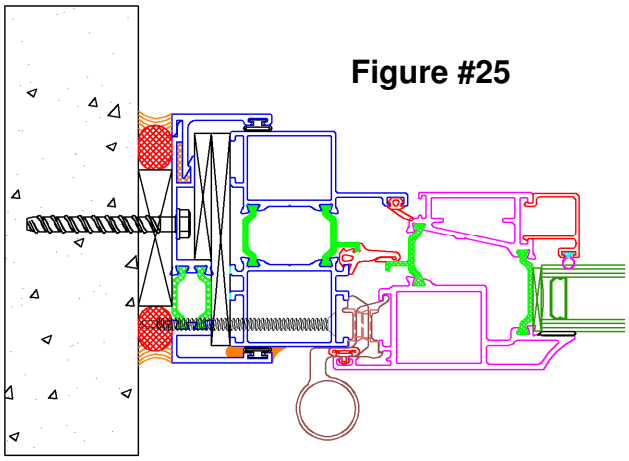


Figure #25

MULLION INSTALLATION: (If applicable) - When mullions are used these steps shall be followed.

A. If horizontal mullions are being used, set bottom window frames into receptor as indicated on approved shop drawings.

B. Depending on the project requirements, this mullion may have to be anchored to the jambs of the opening. Contact GAP Engineering for further information.

C. There will be a total of 4 lines of sealant used for this process as indicated in Figure #26.

D. Once the bottom frame is set in place, locate the pre-cut stack mullion for the window mark.

E. Using compatible silicone sealant, run two full, uninterrupted beads at areas indicated in Figure #27. The stack mullion has been turned upside down in this figure to make the sealant application easier.

F. Flip stack mullion to proper orientation such that seals just placed, are facing downward.

G. Install stack mullion onto top of bottom window frame as shown in Figure #28.

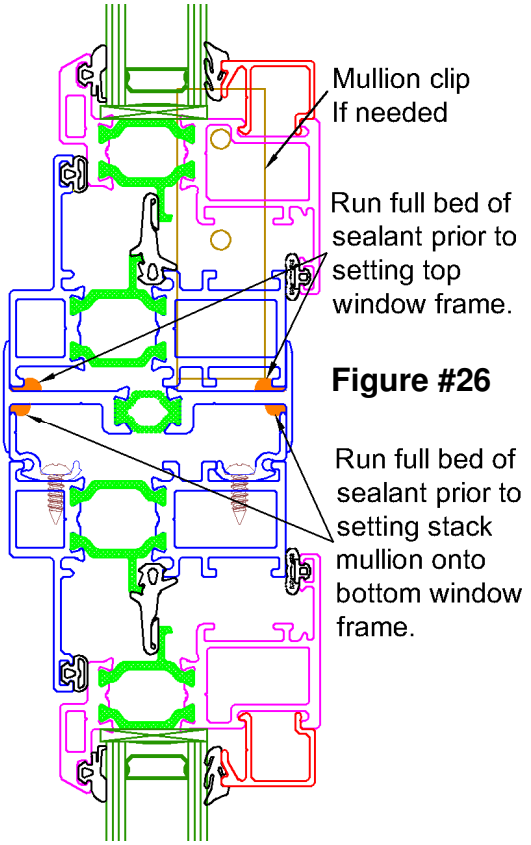


Figure #26

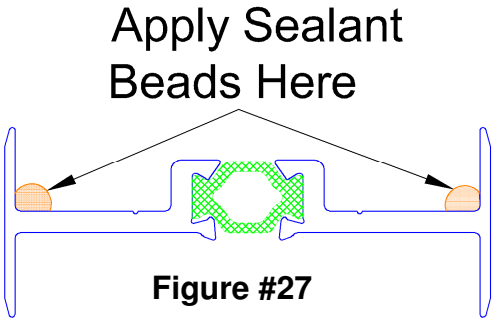


Figure #27

Sill Starters & Receptor Systems

H. If required by the project requirements, install mullion clip (brackets) to the ends of the mullion, attached to the jambs of the opening.

I. Using compatible silicone sealant run two full, uninterrupted beads at areas indicated in Figure #28. In addition, seal any voids at ends of stack mullion.

J. Set top window frame onto stack mullion. Tool and wipe any excess sealant from stack joints.

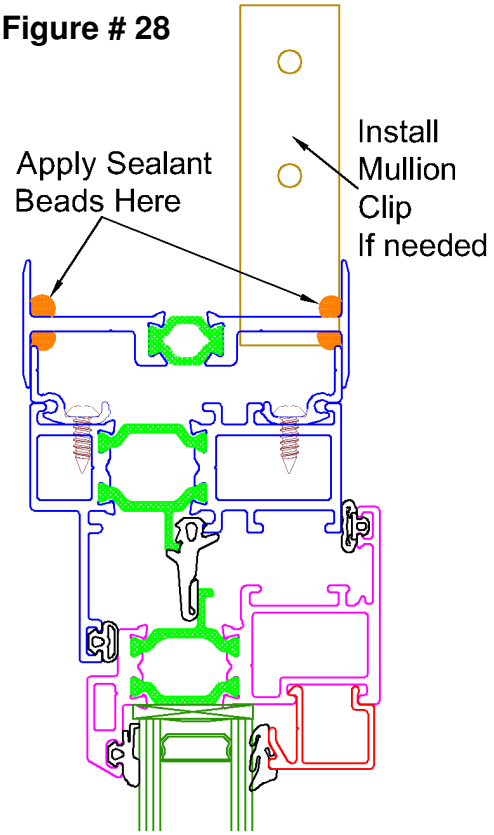
K. If 3-piece vertical mullions are being used, profile the bottom edge of the pressure plate with sealant. Apply a bead of sealant on each edge of the pressure plate starting at the bottom and going up at least 6" (See Figure #29).

L. Install the pressure plate onto the mullion. Fasteners are to be no more than 16" apart, or as per applicable structural calculations and approved shop drawings.

M. If self-mullions or 1/16" vertical mullions are being used, they are installed as the window installation progresses.

N. Self-mullions (male/female) and 1/16" mullions need sealant applied to the interior and exterior legs of the jamb prior to final assembly (See Figure #30). Self-mullions also need cap sealed.

Figure # 28



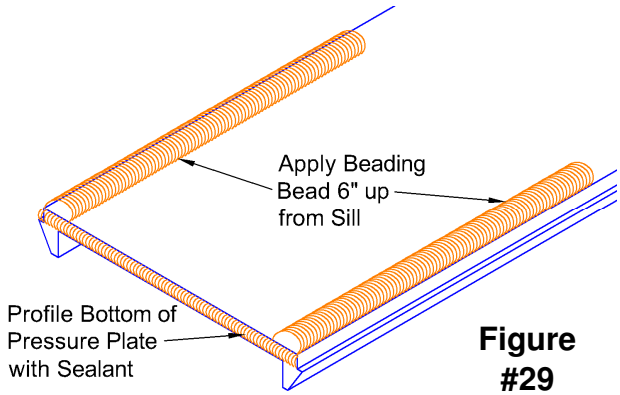
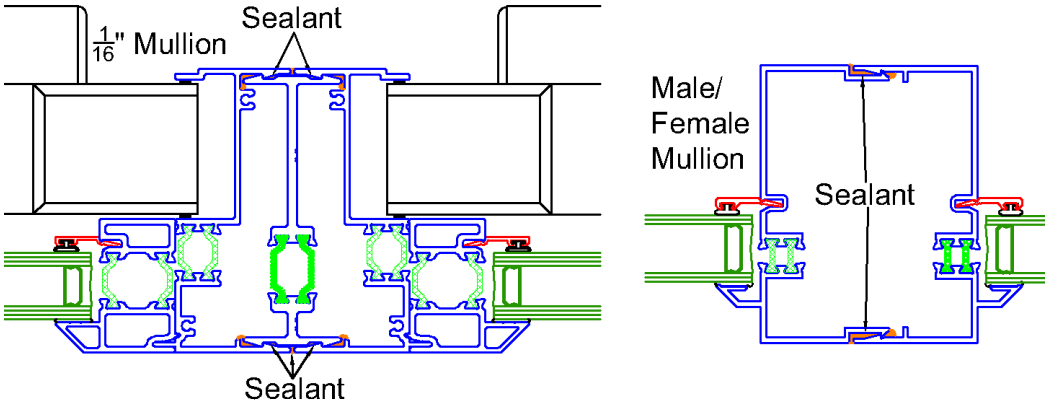


Figure #29

Figure #30



Sill Starters & Receptor Systems

WINDOW SEALING:

A. Fill the receptor clip track of the jamb receptor starting at the sill and continuing up the jamb at least 6” (see Figure #31). *Note: This step is not necessary if the receptor is installed in an exterior set/install configuration (receptor clip on the exterior).*

B. Depending on project requirements a sill dam may be necessary at the bottom of the jambs, apply sealant as follows:

   Build a dam with sealant approximately 1” high bridging the gap from window to receptor or mullion base. Be certain to overlap window frame and top of the sill starter interior leg as well as to the receptor (See Figure #32).

C. Apply sealant to the bottom of the receptor clip (See Figure #33). Insert the receptor clips at a slight angle and drive on using a wood block until snapped-in-place. Seal over the clip to the sill starter joint. The receptor clip must be sealed at least 6” up the clip to the window joint (See Figure #34).

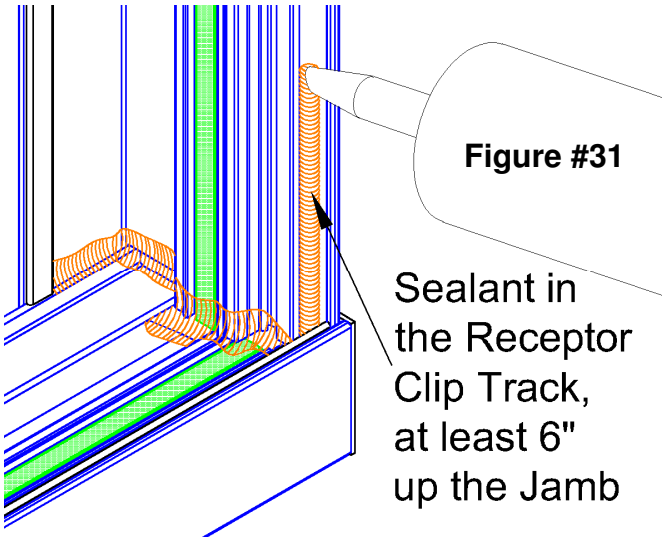


Figure #31

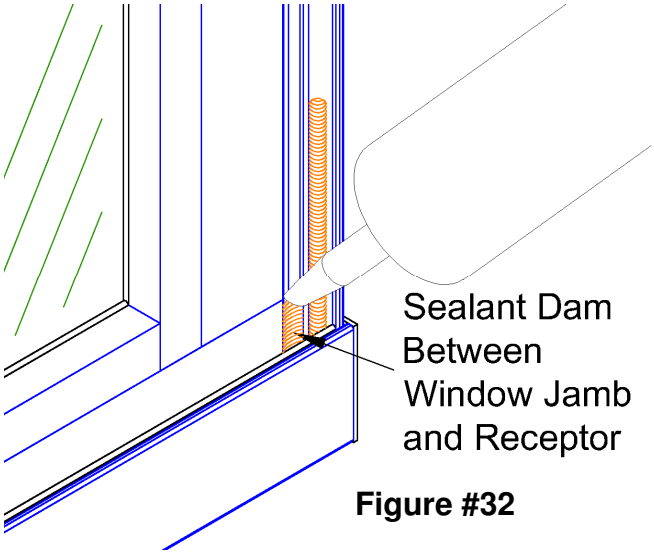


Figure #32

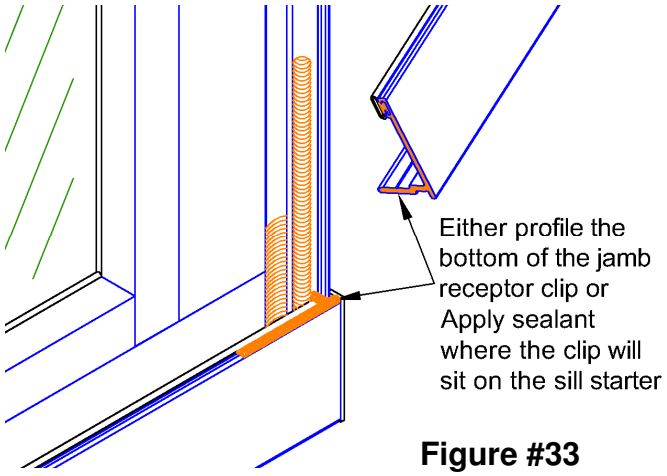


Figure #33

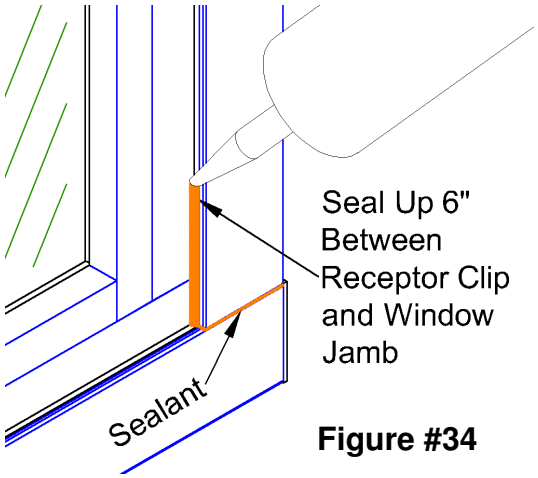


Figure #34

Sill Starters & Receptor Systems

D. Apply all interior perimeter sealant as required and shown on the approved shop drawings.

E. Apply a cap bead to the joint between the exterior leg of the receptor and the window (or door) frame at the head and jambs (See Figure #35).

F. Also apply a cap bead to the joint between the interior leg of the sill starter and the sill of the window (See Figure #35). This bead must tie to the cap bead between the window jamb and the receptor clip joint.

G. Apply a cap bead between the sill starter and the exterior leg of the sill, leaving 1" weeps at each end, for drainage from the sill starter (See Figure #35). If a sill starter is being installed without a receptor, the 1" weeps are not necessary.

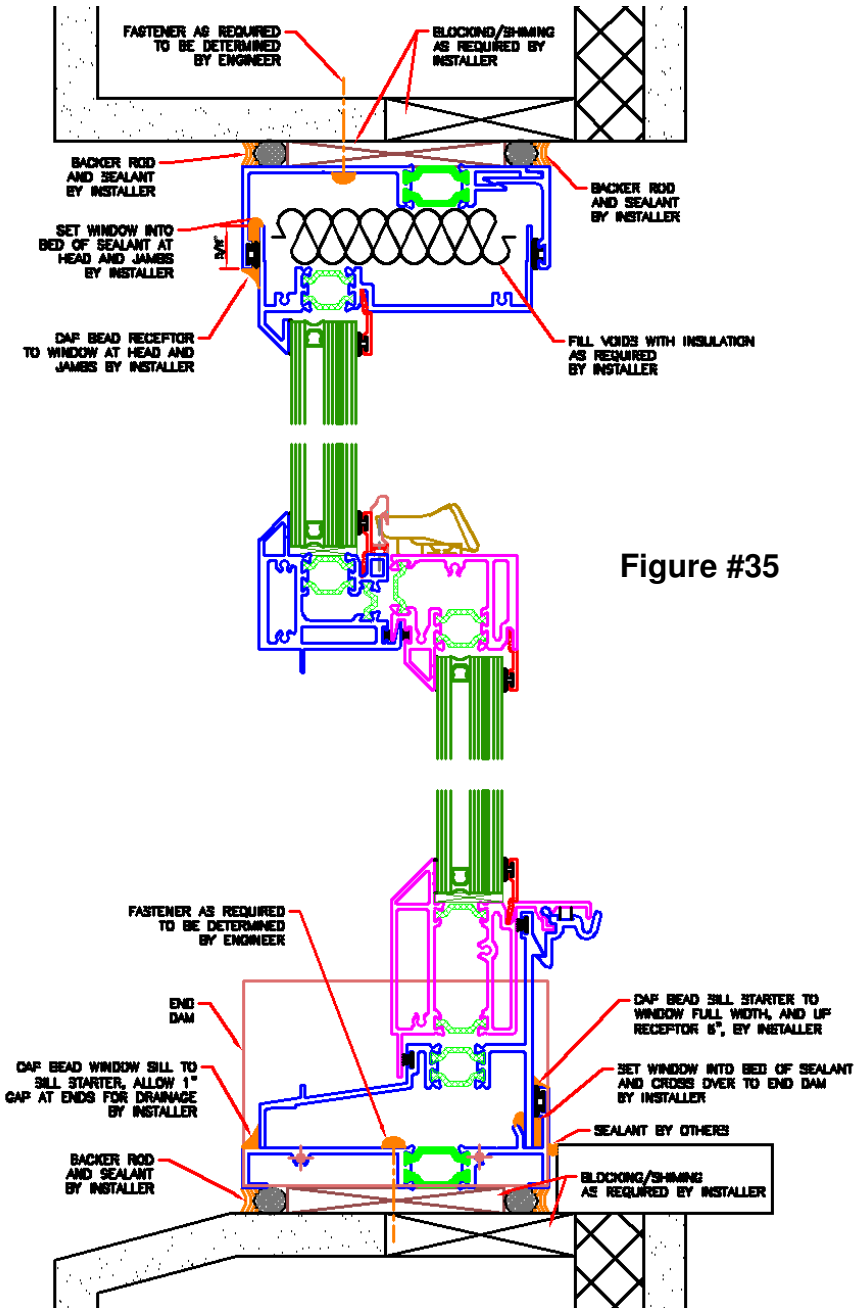


Figure #35

Note: *The sealant locations in steps A, B, C, and F do not need to be applied when using a weeped (tank) sill starter, as long as the expected water performance does not exceed the performance of the sill starter. However, a continuous bead of sealant is needed between the interior and exterior legs of the window and sill starter.*

Sill Starters & Receptor Systems

Project conditions may vary from information foreseen in the writing of this document.

The details on this page delineate a fixed window installed in a receptor system with a weeped sill starter and a three-piece mullion.

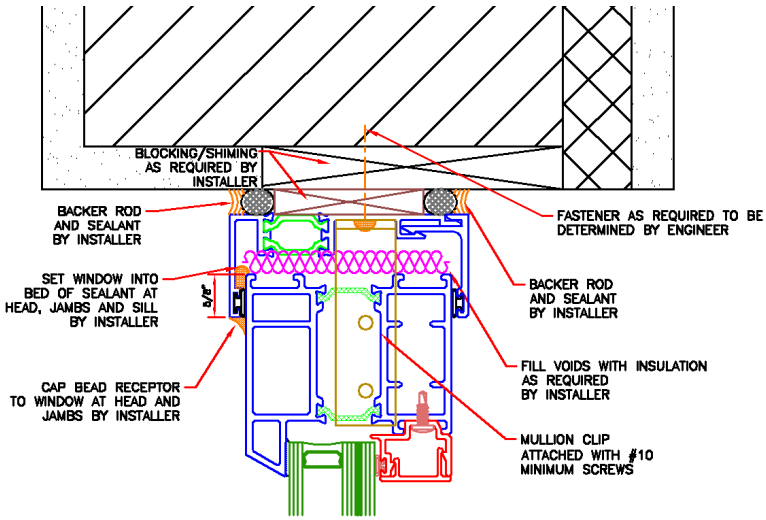
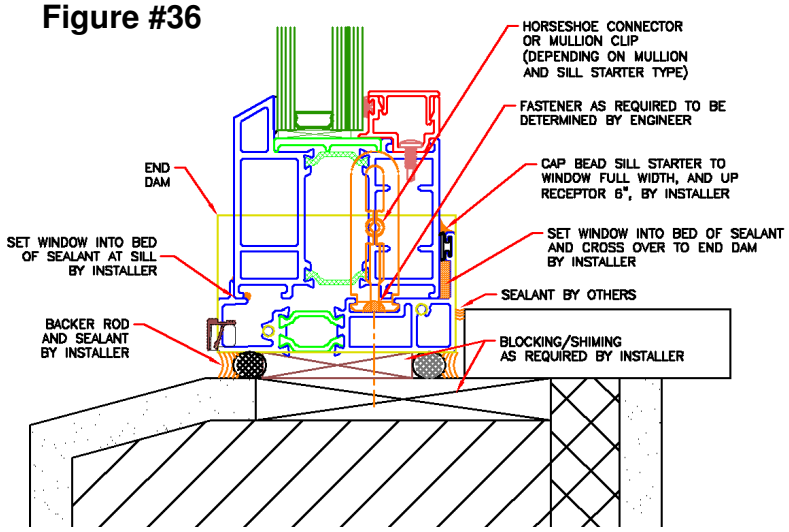


Figure #36



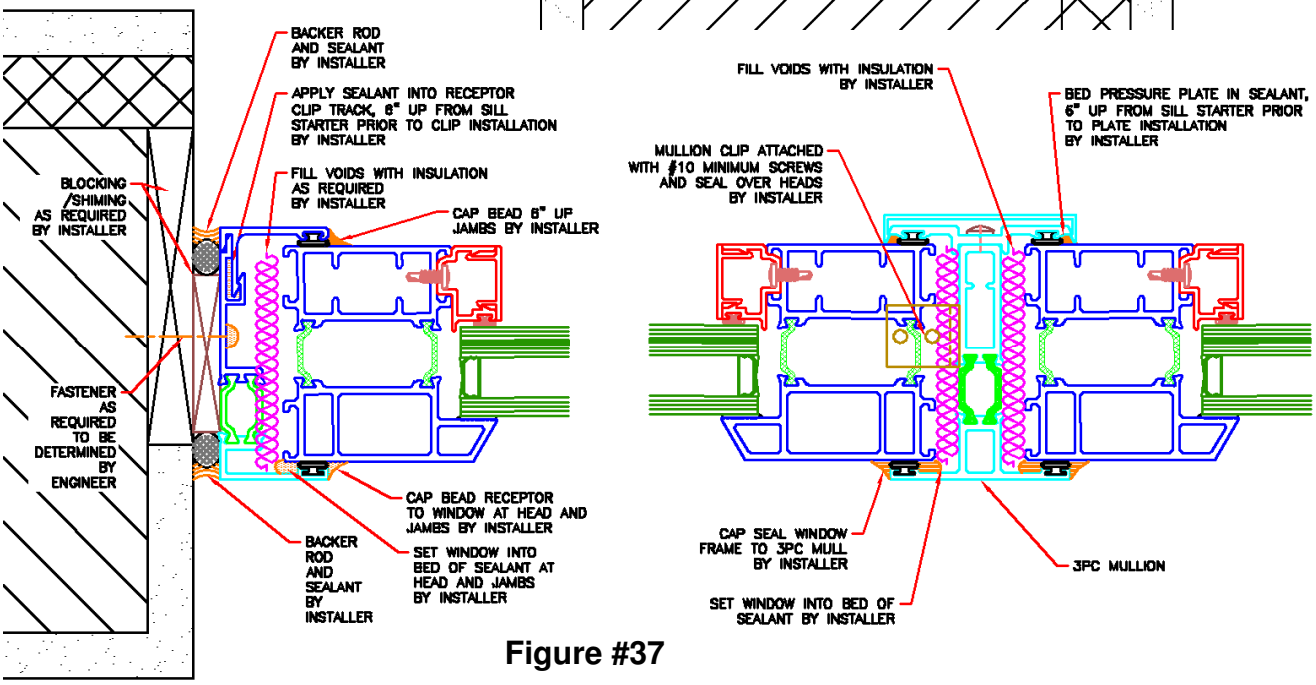


Figure #37

Sill Starters & Receptor Systems

Installation Using Sill Starter Only:

A. Install the sill starter as described above in pages 6 & 7 and 10 & 11.

B. Install a bead of sealant on the sill starter where interior leg of window sets in the sill starter. Fill this trough continuously to the end dam (See Figure #38). If a weeped (tank) sill starter is used, apply a bedding bead of sealant in the exterior leg of the sill starter.

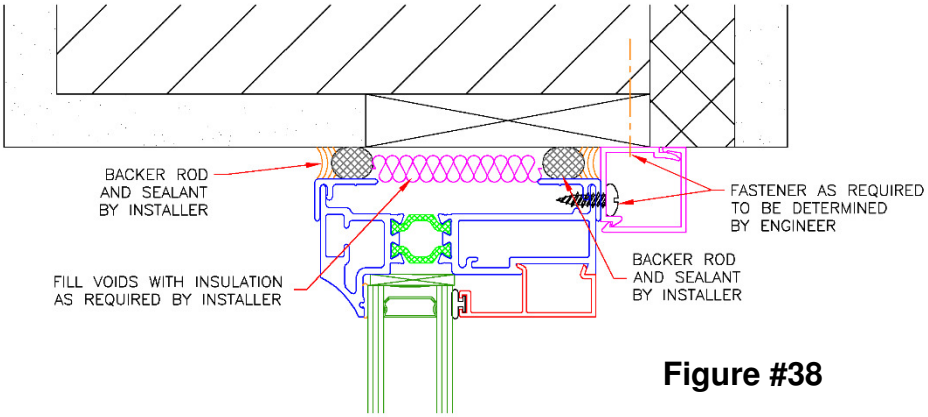
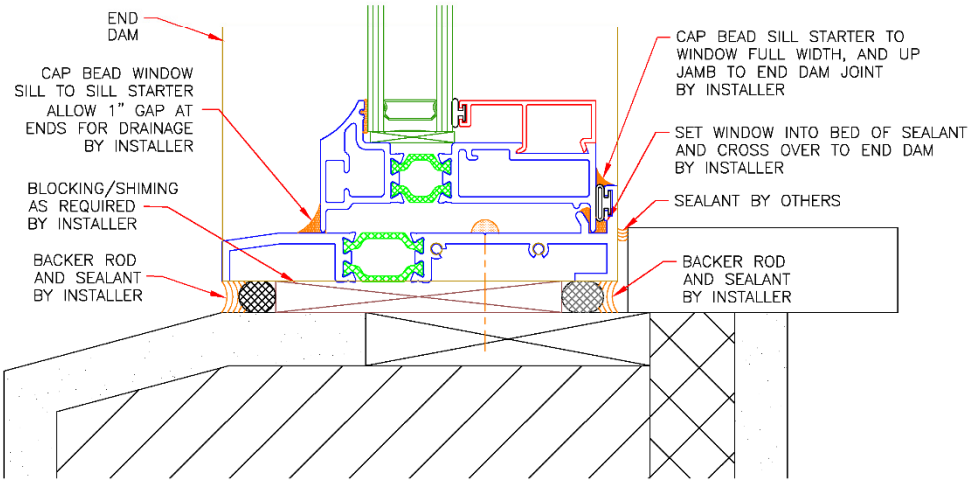


Figure #38



C. 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.

D. 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). (See Figure #39)

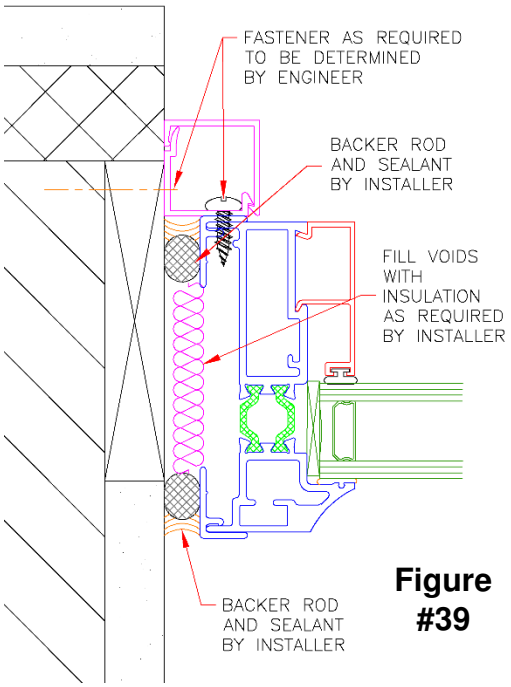


Figure #39

Note: *Strap anchors can be used instead of trim and clip.*

E. 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)

F. Apply a cap bead to the joint between the interior leg of the sill starter and the sill of the window. This bead must continue up the window jamb to end dam joint (See Figure #40).

G. Apply an exterior and interior sealant joint between the window frame and the rough opening. A butt joint with backer rod is recommended (See Figures #38 and #39)

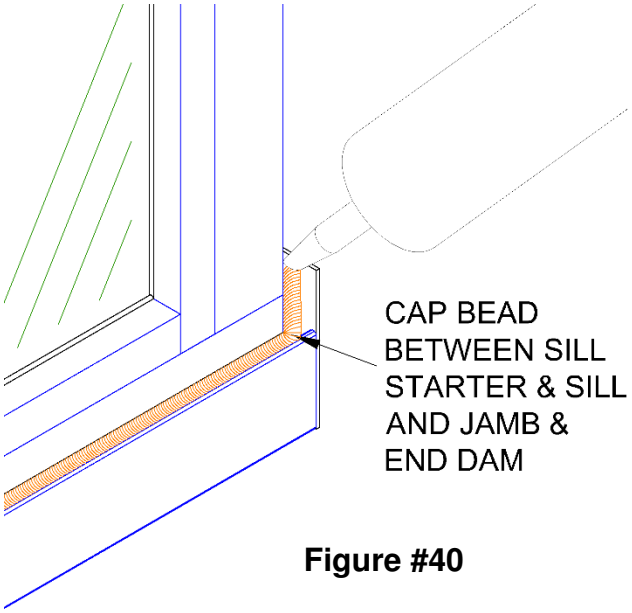


Figure #40

H. Apply a cap bead between the sill starter and the exterior leg of the sill, leaving 1” weeps at each end, for drainage from the sill starter (See Figure #38).

I. The head and (if used) the sill trim covers are field cut to size. 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.

J. 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.

K. The window must be level, plum and square in accordance with Table #1.