

9.0 OPENINGS

This section of the manual is intended to give the contractor/installer guidance for installation of the doors and windows into the rough openings that were created prior to concrete placement outlined in Chapter 6, Section 6.5. As with all installations, NUDURA recommends that the contractor/installer follow all of the window and door manufacturer's installation methods. Window and door locations within the opening will be determined from the details within the plans and specifications.

9.1 OPENING PREPARATIONS

This Section is intended to help guide a window installer in one suggested method of preparing an opening to receive a window or door. However, prior to commencing any work, the Installer should follow the FOLLOWING practices:

1. Consult all local governing Codes and Standards to determine applicable legislation pertaining to requirements for flashing of window and door openings: These may include or refer to the following applicable standards.
 - a) USA - ASTM E2112 - 07 Standard Practice for Installation of Exterior Windows, Doors and Skylights
 - b) CAN – CSA A440.4-07 Window, Door, and Skylight Installation (Revised - 2012)
2. Consult with the supplying door or window manufacturer for their recommended procedures as it pertains to installation of their product into ICF for the local prevailing jurisdiction. In case of conflict, note that the prevailing local code and standard will govern the method to be followed over manufacturer or the following suggested methods.

Before windows and doors can be installed, the owner will need to know the designer's preferred placement position of the window or door frame within the depth of the NUDURA Wall (this is also discussed earlier under Section 6.5). This is necessary as it will vary how the installer will prepare the opening for receiving the window or door. (The various typical positions of window installation are reviewed under Section 9.2)

The following steps describe one suggested method for preparing an opening when installed in NUDURA forms. The method presented here concentrates on the required installation operations for flashing and installing windows that have been fitted with nailing strips that are intended to position the window frame towards the EXTERIOR surface of the NUDURA wall (as opposed to the center or interior of the depth of a NUDURA Wall), however, the same principles used to effect flashing and required drainage in this description can be applied to doors or any other type of through wall penetration occurring through a NUDURA Wall and to a variety of frame depth settings within the wall.

Prior to beginning installation, the installer should first consider what type of sill drainage will be used below the window. The drainage can be facilitated by:

- a) a membrane based flashing system that will be installed to positively drain any potential leakage from below the sill area OUT to the exterior of the opening.
 - b) a pre-manufactured plastic or metal sill pan accessory or
 - c) a combination of both materials for double protection if desired
1. Begin by cutting several 6" (152 mm) wide lengths of NUDURA Waterproofing Membrane complete with paper backing installed on the material. This material may need to be cut wider depending on the depth at which the frame will be final positioned within the wall. In lieu of NUDURA Waterproofing Membrane, other APPROVED flashing materials may be considered for use - however it is vitally important that the material selected have excellent adhesion qualities with EPS foam AND that it is able to take significant exposure to repeated freeze-thaw cycle without risk of the adhesion system breaking down over time.
 2. Ensure the opening surfaces at the window opening area have been cut reasonably square and flat and that any voids in the EPS foam have been filled and trimmed to smooth plane surface of the intended daylight

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opening for the window. The surfaces being prepared should be clean, dry and free of dirt, dust or debris that could potentially reduce or impair proper adhesion of the membrane. Also, check the level of the sill both horizontally and back to front of the opening depth to ensure that it is reasonably level and not negatively sloping inward across the window depth. Take measures to CORRECT any negative slope of this surface before window installation continues by adding material as required. This can often be remedied by purchasing a non-wood based beveled siding material cut to the full width of the opening and screwing it in place to the concrete or to the top of the NUDURA web materials. Screw the material to ensure that it is positively sloping downward towards the exterior of the opening. If you elect to use a beveled product at the base, be sure to cut two or three 1" (25 mm) wide segments of the same material to use as shim blocks for later setting of the base of the window to keep it level.

3. If using a membrane sill flashing, begin by measuring the distance from the projected final interior edge of the window frame to the interior surface of the NUDURA wall and rip cutting a 3/8" (10 mm) thickness of plywood to this width. Finally, cut this plywood piece to the width of the opening and nail it in position at the sill to provide a water dam that will prevent any moisture that might collect below the window sill from getting farther inside the opening. (This 3/8" thickness MUST be accommodated in the window rough opening size prior to concrete placement). (NOTE: A dam strip is NOT required if a sill pan is being used)
4. Using a strip of NUDURA flashing, peel back the paper release and carefully apply the membrane over the sill area – ensuring the end of the cut strip will lap UPWARD on either the left or right jamb condition by a minimum of 4" (102 mm) AND so that the interior edge of the membrane will lap UPWARD and over the vertical surface of the plywood dam strip.
5. Press the membrane into position smoothing the surface into the surface of the EPS foam and concrete as required, ensuring that the interior corners where the dam strip meets the jamb condition are appropriately trimmed and caulked or sealed to assure that no moisture can flow inward through these locations.
6. Repeat step 4 for the opposite jamb and lap the materials in the center of the opening. On wider windows, cut an additional strip to fill the gap between both jambs taking care to lap each material by at least 2 to 3 inches (50 to 76 mm) and ensuring each piece laps upward over the front edge of the plywood dam strip.
7. At the exterior surface, care must be taken to cut and lap the flashings at the corner conditions. In each case the jamb flashing must positively discharge OVER the sill portion of the flashing. If for whatever reason, the architect or local codes require a weatherization barrier such as Tyvek or Typar to be applied over the complete exterior wall surface, the NUDURA Membrane must lap OUTWARD and seal positively OVER TOP of this material.
8. In lieu of or in addition to the above method, the area below the window can be fitted with a 2 piece expandable plastic or metal sill pan accessory that has been design to flash upward on all edges and be fully sealed at each interior corner, which eliminates the need for the dam strip and contains the added bonus of providing a monolithically formed exterior fin that positively seals against the front face of the opening. The sill pan should be opened to the full extent of the window width and secured temporarily in position. Since it is usually a 2 component accessory, the joint needs to be fully sealed using a segment of one of the strips of NUDURA Waterproofing membrane. Be sure the membrane laps and seals upward on the rear upturn of the pan.
9. Next, apply jambs flashings using the NUDURA waterproofing membrane strips by lapping the 4" (102 mm) upturn at each jamb and continuing up the jamb to the head condition. Again, the front facing portion of the flashing must positively discharge overtop of the sill flashing and if using a sill pan, be sure this flashing positively overlaps and seals the jamb fin of the pan. Ideally the NUDURA WP Membrane strips should be cut longitudinally for this purpose so that they can be applied in one continuous strip. If the strips have been cut in 36 inch segments, be sure that they are applied in shingle fashion starting at the sill and working your way to the top of the opening positively lapping and adhering each segment OVER the segment below assuring a minimum 2 inch (50 mm) lap. As in Step 7, if Air Barrier membrane has been required to be applied to the exterior, the jamb flashing must seal OVER this material at the window opening.
10. On the interior, be sure that a vapor barrier material (ideally 6mil minimum thickness polyethylene vapor barrier sheet) is extended from the interior surface of the NUDURA form around the complete perimeter of the window or door opening and extending inward towards the frame's intended final position to meet the exterior flashing materials that were installed in the steps above. This is to be sure that the window or door frame can be final sealed in contact with this barrier once the window or door is installed.
11. The opening is now ready for window (or door) installation.

9.2 WINDOW AND DOOR INSTALLATION METHODS

The installation of doors and windows into their associated openings must be performed as per the manufacturer's installation instructions. With that in mind, as stated earlier in this section, the location within the rough opening can vary depending upon the requirements of the building and the designers' specifications.

WINDOWS

For windows there can be 3 different locations for installation into the rough opening.

1. Locations of frames flush to the outside of the wall assembly (most popular for North American Locations). Care must be taken to ensure that proper flashing installation will shed any moisture around the opening and down to ground level. If a manufacturer recommends the flange on a window frame be nailed to the wall assembly, NUDURA recommends, in lieu of nails, the window needs to be fixed to either the webs or the surrounding buck materials installed within the wall, using screws.

Since window frame depths will typically vary from as little as 2 1/2" (64 mm) to usually no more than 5" (125 mm) typically, the difference in thickness between the inside of the frame and the interior finish surface of the wall is usually made up by installing wood jamb extensions or gypsum board returns for head and jambs, and usually wood or laminate board or ceramic tile or marble finish for the sill extension. (Gypsum board is normally not recommended for sill returns due to the wear that they may receive from use.) Windows and doors can be ordered with a return "J" and then trimmed with the preferred jamb material.

Another option would be to order the windows and doors with the required jamb depth already installed onto the frame. This may be the preferred method if the contractor's/installer's clientele does not want a joint or seam around the window or door. Some contractors/installers might prefer to use drywall returns in this area along with a tile sill as an option. Again all of these methods are based upon preference of the contractor/installer or the client the building is being constructed for.

2. Location of frames at the center of the depth of the opening. Again, care must be taken to ensure that proper flashing is in place, as outlined previously, before and after the installation of the window. Exterior finishes will determine the type and method of flashing to be used around these areas. The window will need to be fastened into the rough opening using screws either into the buck material or directly into the concrete. Remember that shims may be necessary to ensure the window is level and plumb within the opening.
3. Location of the frames fully to the inside of the rough opening, with the exterior finish wrapping into the opening area. (This method is more preferred for European Installations.) Again, the contractor/installer needs to install proper flashing as required. The fastening will now take place on the inside face of the wall using screws as the method of connection. Remember that a solid connection into the concrete or the buck material must be completed using the appropriate screw type. These types of windows can have jambs that accept drywall returns instead of extended wood or gypsum board returns at jamb and head.

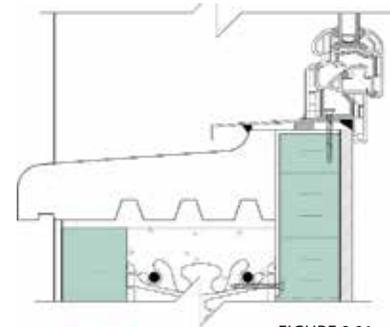


FIGURE 9.01

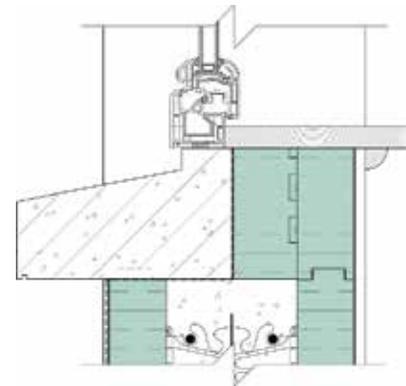


FIGURE 9.02

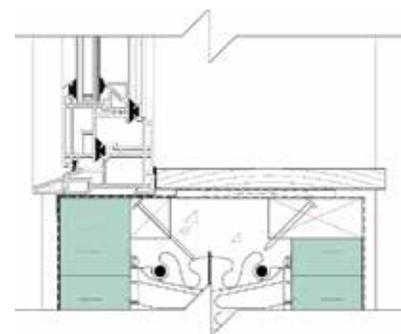


FIGURE 9.03

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DOORS

Doors typically have only 2 options for installation to allow for the maximum swing of the door to occur during operation. The most common method for door installation in most North American residential applications is to install the door towards the inside face of the wall assembly. This will allow the door to swing inward from 90° up to approximately 180°, depending upon interior walls. A solid buck material will be required for the hinge side of the door to ensure a long lifespan for the hinge connection point. This buck material should have minimal flex to ensure that there is no movement when the door is in operation.

Alternatively, should the design call for the door to be placed towards the outside of the wall assembly, the door will have to be fastened the same as the option above, but swinging outward (this may be dictated by code if required for fire exit or egress). Again, the intention is to maximize the swing of the door when fully opened (though this will be limited as normal with brick veneer finishes if no glazed sidelights are provided in the door frame). Shimming may be required to ensure the door is plumb once fastened to the buck material. Additional anchorage also needs to be provided for reinforcing of the door locks and dead bolt locks to ensure proper depth and security is achieved.



FIGURE 9.04

9.3 FLASHINGS – DRIP FLASHINGS AND FINISH AIR BARRIER SEALS

After window and door installation has been completed, the openings must be properly sealed and flashed, both inside and out.

Again the same caveats for following local Codes, Applicable Standards and manufacture instruction for flashing within ICFs (as noted under Section 9.1 (Page 105) shall apply and take precedent over any suggested methods outlined below:

EXTERIOR

The following suggested method can be used to complete the installation of the required flashings around the windows and doors once they have been installed regardless if the frames contain nailing strips or not. For frames without nailing strips, however, additional care must be taken in the application of the membrane to allow the membrane to lap outward onto the portion of the frame that is projecting beyond the surface of the NUDURA form and taking care to shingle lap the membrane downward over the corners at the head of the frame of the frame:

1. Position precut shim blocks at $\frac{1}{4}$ points in the opening, set and level the window per manufacturer's recommendations. The nailing strip can be pre-caulked to provide additional protection, however- refer to the window manufacturer's recommendations with respect to this operation. Center the window in the opening, and secure in position as per their instructions and test the window to ensure opening mechanisms function properly.
2. Apply NUDURA WP Membrane strips vertically down each jamb to lap OVER the Window Nailing strips. DO NOT apply membrane along the sill area as this MUST be left clear to enable the sill pan or sill flashing to drain should water succeed in getting through to the pan area.
3. Apply head flashing continuous over the top nailing strip. Care must be taken at the corners as shown to positively lap the head flashing OVER the jamb flashings. For radius top windows, the NUDURA membrane should be applied in short segments starting at the base of the curve and shingle lapping the segment upward and around the radius.



FIGURE 9.05

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FIGURE 9.06



FIGURE 9.07

4. Finally, make a horizontal angular upward kerf cut into the NUDURA EPS foam above the head of the window 1" to 1 ½" (25 to 40 mm) deep, for the full jamb width plus 2" (50 mm) on each side of the jambs. Cut and bend an aluminum drip cap flashing to match the kerf cut slope and length and friction fit the flashing upward into the kerf cut to assure positive drainage out overtop of the head flashing.
5. If air barrier membrane is additionally required to cover the NUDURA wall, in lieu of Step 4, and prior to Step 12, the air barrier film must be cut upward and outward at a 45° angle sufficient to allow for the head flashing to be installed. This material will be taped temporarily curled up out of position. After completion (assuring that the NUDURA WP Membrane covers the full width and height of the cuts made above), the air barrier material will then be lapped downward over the NUDURA WP Membrane strip and "skip-taped" using approved air barrier tape to allow for drainage of the air barrier ABOVE the window. Do NOT tape continuously at this location.



FIGURE 9.08

The opening is NOW ready for final exterior cladding to be applied.

INTERIOR

The only remaining detail is to caulk or foam seal the window and door frames to the vapor barrier seal applied around the inside perimeter at the frame extension area of the opening. Once this is completed, interior finishes can be applied as outlined under Chapter 13.



FIGURE 9.09