

## 13.0 INTERIOR FINISHES

### 13.1 VAPOR BARRIER/VAPOR RETARDER REQUIREMENTS

As with all traditionally constructed buildings, the interior finishes for a NUDURA building can vary throughout the world. What might be very common in one region might not be available in another. As with EPS (expanded polystyrene) the material typically must be covered with a thermal barrier if the space is considered habitable by the local building codes.

One of the most common questions asked by both design professionals and building officials with respect to NUDURA Integrated Building Technology is whether or not an additional vapor barrier or vapor retarder is required to be applied over the interior surface (or depending upon geographic location – on the exterior) of the NUDURA Wall System.

The clauses of most American Building Codes (including the International Code Family) are structured in such a way that they provide for the fact that plain and reinforced concrete or masonry walls constructed in accordance with the Code (or constructed of materials that are not susceptible to damage from moisture) are not required to have additional vapor retarder materials applied to them. In the USA, Vapor Retarders are defined as any material that limits the permeance of moisture through an assembly to a maximum of 1 perm-inch (57.692 ng/Pa.s.m<sup>2</sup>).

The MAXIMUM allowable vapor permeance of a wall assembly in Canada under the National Building Code and all Provincial Building Codes is noted as 60 ng/Pa.s.m<sup>2</sup> (nanograms per Pascal second meter squared) almost identical to the requirement of the US Code.

NUDURA's Integrated Building Technology has been analyzed by Intertek Testing Services North America Ltd., who have confirmed that the calculated vapor permeance of the 2 5/8" (67 mm) thickness of NUDURA foam on the interior panel of the concrete wall assembly achieves a MAXIMUM vapor permeance of 36 ng/Pa.s.m<sup>2</sup>. Using the same conversion rate applied above, verifies that the Permeance Rating of 2 5/8" (67 mm) of NUDURA EPS foam is equal to 0.624 perm inches and therefore achieves a resulting vapor permeance performance that is 38% better than the MAXIMUM allowable vapor permeance set forth by both Canadian and the US International Building Codes.

Remember that this rate has been determined independent of any resistance to vapor permeance that the monolithic concrete wall itself provides within the wall assembly. Therefore, in the vast majority of installations, an additional vapor barrier is NOT REQUIRED, except as previously noted in Chapter 9 to complete vapor barrier elements around building openings.

The ONLY exceptions to this rule should apply in areas where high humidity will ALWAYS be prevalent (i.e. indoor pools or saunas etc.) AND where a finish applied may be in danger of trapping moisture behind it such as ceramic tile, vapor sealed paints and wallpapers. In such areas an additional vapor barrier capable of reducing vapor permeance to a maximum of 0.260 Perm-Inch (or 15 Ng.Pa.s.m<sup>2</sup>) is recommended, and is a requirement by Canadian Code.

### 13.2 THERMAL BARRIER PROTECTION

Most building codes state that all foam plastic insulation must be covered with an approved thermal barrier. In Canada, the specified standard under the NBC (CAN/ULC S-101) requires that the thermal barrier must prevent a rise in temperature of the EPS foam behind it to below an average of 284° F (140° C) as recorded at 10 minutes from the start of the test. In the USA, the thermal barrier test is less severe and conducted to a completely different standard (NFPA 275), but requires that



FIGURE 13.01



FIGURE 13.02

there be no evidence of edge melting of the EPS foam, or de-lamination of the thermal barrier after 15 minutes of testing. Individual provinces or states may have bylaws or Codes that increase the time that the thermal barrier has to stay in place. Please check with the regional code bodies for their interpretation of thermal barrier, and stay in place requirements.

Building codes will also require that the thermal barriers be installed where the space is considered habitable living area. Check with the local building department as to the interpretation of habitable living area (i.e. below grade full height foundations). NOTE: The contractor should review this carefully with a client who requests that their basement be supplied un-finished in the contract. In many areas, the Building Official for the region may insist that the thermal barrier be installed as a condition of final occupancy. Should this be necessary, most building officials will permit horizontal gypsum board installation, with joints remaining un-taped so that the wall areas can be easily accessed later for electrical installation with minimum disturbance of the gypsum board. Responsibility for the expense for this compliance should be agreed upon by client and contractor PRIOR to the start of the contract.



FIGURE 13.03

Thermal Barriers can include some of the following products: ½" (13 mm) gypsum wall board, ½" (13 mm) plywood, ½" (13 mm) tongue and groove wood, plaster finishes, or any material that, by code, can provide testing over EPS foam plastic to the applicable standard adopted under the prevailing code for the area. It is always recommended to check in the local codes for a list of materials recognized as meeting these requirements.

## 13.3 FINISHES AND TRIM OPTIONS

Before finishes are applied to the NUDURA EPS the contractor/installer needs to take into consideration some additional fastening requirements needed for hand rails, curtain rods, heavy wall hangings (i.e. large mirrors, heavy artwork), upper kitchen cabinets, and handicap bathroom rails. These can consist of solid blocking mechanically fastened to the concrete, or light gauge metal mechanically connected to the fastening strips.

In many instances, the ideal scenario is to rip 4" (102 mm) wide (or wider if needed to suit application) segments of ½" (13 mm) thick plywood for the regions where fastening will be required as noted above (such as horizontally in line with the anchor reinforcement boards of upper cabinets in kitchen areas). Using a hot knife attachment formatted for this purpose, rake any EPS foam clear to the level of the fastening surface of the webs. Then, cut the plywood segments to the required length and screw fasten them with No. 8 flathead coarse thread screws into the webs of the inset areas that have been raked clear with the hot knife. You now have solid continuous fastening exactly in line with whatever trade arrives AFTER the drywall trades have finished their work AND no disruption or special requirements imposed on the drywall contractor.



FIGURE 13.04



FIGURE 13.05



FIGURE 13.06

NUDURA recommends that the interior finish materials used be mechanically connected to the fastening strips using screws. Should the contractor decide to use ½" (13 mm) gypsum wall board or plywood, NUDURA recommends the wall board be fastened onto the wall using a 1 ⅝" (41 mm) minimum coarse thread drywall screw. For all other finishes the manufacturer's installation instructions need to be followed. However, if the manufacturer recommends the finish be nailed in place, contact the local distributor for assistance and NUDURA will work with the finishing company to find a suitable type of screw for fastening.

Windows and doors can have different options for jamb materials as previously discussed in Chapter 9 of this manual. Fastening will depend upon the buck material used when the opening was created or if the buck material was removed then fastening to the concrete will be required. Trim casing can be fastened to the jamb and gypsum wall board using a combination of adhesive and nails. Pneumatic air nailers can be used for the inside trim work where required. Using caulking, and also nailing the mitered corners together will ensure a tight finish. Gypsum wall board can also be used as the jamb material for finishing out the openings.

Baseboards can be fastened directly to the gypsum wall board using a combination of adhesive and nails. Should the contractor decide to attach a band of plywood the same thickness as the gypsum wall board this needs to be completed before the wall board is installed. The band of plywood height should be approximately 1" (25 mm) less the height of the baseboard material. Again, pneumatic nailers can be used in this finishing process.



FIGURE 13.07



FIGURE 13.08

## 13.4 POST OCCUPANCY FIXTURE MOUNTING TIPS FOR HOME AND BUILDING OWNERS

Once an owner takes occupancy, if a contractor should ever be asked for anchorage tips on how to work with NUDURA for a home renovation or "Do It Yourself" job, refer to the following pages. This answers most typical questions posed by building owners on this subject. Any additional questions not addressed by this bulletin can be directed to NUDURA through your local distributor.

# INTERIOR FINISHES

## NOTE TO THE CONTRACTOR

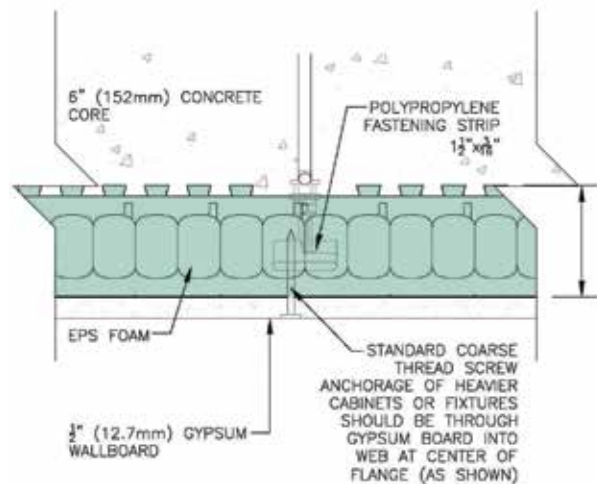
The following information is provided here in your manual to assist you in addressing questions from your end use client who may be encountering living/working in a NUDURA home or building for the first time and may not be fully familiar with the differences between traditional wood frame or furred out concrete block technology and ICF Wall Technology in the context of adding decorations, fixtures or cabinets to their new home or building. Should any question arise that is NOT covered in this brief summary of topics, please contact NUDURA through your distributor. NUDURA's staff will work to get the answers you require.

## POST INSTALLATION FIXTURE AND CABINET ATTACHMENT METHODS INTO FINISHED NUDURA WALL ASSEMBLIES

One of the first questions that comes to mind of any new owner or operator of a NUDURA structure (particularly if you have never had any experience with or knowledge of Insulated Concrete Form Systems) – is: How do I attach fixtures, decorations or cabinetry to the walls?

To understand better how NUDURA affects this process, you first have to know how NUDURA walls differ from traditional frame or strapped block walls.

Unlike traditional wood stud, metal frame or even furred out concrete block wall construction. Instead of studs (furring strips) and hollow space behind the gypsum board finish, the plan view of a NUDURA wall looks similar to the detail shown at right – which consists of a solid 2 5/8" (67 mm) thickness of expanded polystyrene foam plastic insulation backing the entire wall surface over a solid reinforced concrete core. At 8" (203 mm) intervals, there are a series of vertically placed 1 1/2" (38 mm) wide x 3/16" (5 mm) thick high density high impact polystyrene plastic web fastening strips (each embedded below the surface of the EPS foam about 1/2" (12.7 mm). This very tough high-impact plastic is capable of holding screws to an ultimate direct pullout withdrawal pressure of anywhere between 210 to 275 lbs (0.934 to 1.223 kN) of force.



### Q: HOW DO I TELL WHERE A FASTENING STRIP IS LOCATED?

Contrary to popular opinion, an electronic density stud finder will not always work with NUDURA walls since, the fastening strips are embedded 1/2" (12.7 mm) below the foam surface – and as a result, the webs won't ALWAYS reveal themselves when scanned through drywall finish.

Probably the best method for locating studs is by using a magnetic stud finder which, instead, locates the drywall screws that are anchoring the drywall to the fastening strips. Once ONE screw is located, most fastening strips can then be located at 8" or 16" (203 mm or 406 mm) centers from this screw. If you lose the pattern (i.e. wherever the NUDURA installer varied from the standard 8" (203 mm) stack pattern to accommodate a custom cut joint along usually near the center of a wall length), you can be certain that for most rooms, the pattern of webs will be at a constant 8" (203 mm) increment starting 1/2" (12.7 mm) away from a 90 degree corner (the web pattern starts with the center of web fastening strips being located starting this distance from the inside corner conditions).

**Q: FOR LIGHTWEIGHT PICTURES, ETC. CAN I STILL USE NAIL OR PIN TYPE HANGERS ?**

Yes: Most light or medium duty drywall type picture hangers that do NOT rely on anchorage directly into wood or metal studs or strapping that you have been use to using for drywall finishes over standard frame construction can still be used with NUDURA walls as well. Finishing nail, pin hangers, plastic plugs, even expansion sleeve screws etc. will all still work with NUDURA when anchoring into drywall between the web flanges. Only spring type clip fasteners that relying on spring loaded cams opening behind the gypsum board finish will not work with NUDURA since the EPS foam will prevent the cam from springing outward behind the panel.

**Q: FOR HEAVIER WEIGHT ARTWORK, WALL DECORATIONS OR FIXTURES, ETC. WHAT SHOULD BE USED ?**

Use screws (not nails). No. 6, No. 8 or No. 10 dia. coarse thread screws (11-14 threads per inch (25 mm)) with a sharp penetration point should be used. Remember that the shaft length needs to penetrate BOTH the drywall and a ½” (12.7 mm) thickness of EPS foam PLUS the fastening flange to embed into solid anchorage so 2” (50 mm) long screws work best. The larger diameter the screw - the more holding power can be attained. With a 3 times safety factor applied, use the following table as a guide for maximum hold pressure for each type of screw being used for anchorage:

Screw Diameter	Tested Ultimate Withdrawal	Suggested Factored Safe Load
No. 6	210 lbs. (0.934 kN)	70 lbs (0.311 kN)
No. 8	240 lbs. (1.068 kN)	80 lbs (0.356 kN)
No. 10	275 lbs. (1.223 kN)	90 lbs.(0.400 kN)

When fastening - simply snug the screw against whatever is being mounted over the drywall (such as a bracket or clip). If a finish harder than drywall is used (i.e. perlite plaster over lath or concrete board) - do NOT over-tighten screws as this can cause the screw to burr out the plastic of the webs.

**Q: I AM MOUNTING A CLOSED IN BACK CABINET WHICH WILL EXERT MORE WEIGHT PER SCREW THAT I SEE IN THE ABOVE TABLE. HOW CAN I MOUNT THIS TYPE OF CABINET?**

If a new cabinet or similar heavy storage device is being considered for mounting (i.e. an object with a closed backing and solid wood or metal mounting bars or brackets) and you calculate that 4 screws will NOT be enough to anchor the object, consider replacing the drywall with plywood behind the cabinet. Simply outline the proposed location of the cabinet with a lightly drawn pencil mark on the drywall.

Then draw a line inboard ½” (12.7 mm) all around from the projected outer edge of the cabinet and make a clean cut of the drywall at this mark full depth of the drywall using a utility knife. Next, locate & remove the screws in this area using a Philips head screw driver so that the webs are not damaged and, finally, remove the drywall. Replace this section with ½” (12.7 mm) thick plywood and anchor to the webs (identified by a “diamond” pattern in the foam surface) with as many screws as may be required to hang the object with sufficient safety factor to be less than 90 lbs (41 kg) per No. 10 screw. Finally, remount and level the object and secure with screws in position through the plywood to firmly anchor the object to the wall. The plywood will be completely concealed by the object.

**Q: I AM MOUNTING A PLASMA OR LCD TV WHICH WILL EXERT MORE WEIGHT PER SCREW THAT I SEE IN THE ABOVE TABLE. HOW CAN I MOUNT THIS TYPE OF FIXTURE?**

If it is a plasma or LCD TV mounting bracket that is being anchored, use the mounting bracket as a template and align the wall mount studs of the mounting bracket with the NUDURA fastening strips. Most mounting studs will provide options for more than 2 screws (vertically in line) per mount. Follow the instructions provided for your mounting bracket. Depending on bracket design and configuration, if it is a movable or pivot mount design that enables the screen to be moved or pivoted away from the wall, the amount that your screen weighs should be multiplied by a specific factor noted in your bracket manual to account for the addition moment condition that will be created when pivoted away from the wall (NOTE: Standard US based measure only is used for the calculation example given below). Whatever the maximum factored weight of the unit will be fully extended, divide this weight by 90 lbs (41 kg) /screw limit. This will tell you how many No. 10 screws will be required to anchor the wall mount studs to the NUDURA wall.

For example, if the unit weighs 200 lbs (91 kg) and the bracket mount instructions suggest that fully extended the screen will exert a force 3 times greater; 600 (272 kg) divide 600 (272 kg) by 90 (41 kg) = 6.7. In this case it's best to mount using 8 screws - 2 per corner of the mounting frame for a total safe factored weight carrying capability of 720 lbs (326 kg).

**Q: WHAT IF WHAT I AM ANCHORING IS TO A SINGLE POINT LESS THAN 1 FOOT SQUARE (0.09 METER SQUARE) AND ANTICIPATING A FORCE IN EXCESS OF 360 LBS (1.6 KN)? HOW CAN I MOUNT THIS TYPE OF FIXTURE?**

In instances like this, again the gypsum board may have to be removed and replaced with a square of plywood so that the plywood segment spans at least 2 fastening strips. Anchor the plywood with the appropriate number of countersunk screws to resist the weight and finish the plywood joints and screw embeds with drywall compound to blend it in with the drywall and finish and paint to match the space. Now the object can be mounted to the plywood as required.

If even more anchorage strength would be required, consider the above solution in conjunction with removal of the foam below the plywood and custom cut blocking that is lag bolt mounted directly to the concrete behind the plywood.

Any questions further to this information should be directed to NUDURA through your local NUDURA distributor. Together, we will work with your distributor to find an anchorage solution to fit your specific needs.