10.0 ELECTRICAL

10.1 CODE COMPLIANCE

As with all aspects of construction, the electrical within a building is also dependent upon code compliance. The electrical will need to conform to the local electrical authority or the appropriate code body and the applicable standards for the region. Local inspections of the electrical will be required before additional work commences on a building.

There are some differences from conventional building material, compared to the NUDURA Integrated Building Technology, when running the wiring and affixing the electrical boxes to the EPS that is explained in detail below. Panel locations and installation options will also need to be planned for as these also might differ from conventional building techniques.

10.2 THROUGH WALL PENETRATIONS

As mentioned earlier in Section 6.7 (Service Penetrations), before concrete is placed within the forms, the NUDURA contractor/installer will need to install the required size of PVC sleeves through the forms, and use the low expansion spray foam to secure these sleeves in place wherever electrical service needs to be run IN or OUT through the exterior walls (i.e. incoming electrical service from the meter, exterior lighting, exterior electrical outlets, service to out buildings on the site or pole lighting etc. on the property). Locate the sleeves approximately 6" (152 mm) offset from the exterior box location. This permits the wire to come into the side of a box and it also allows for proper attachment of the box to the concrete wall. The sleeve length can be the same as the form width, though many electricians make it shorter so that, after wire installation, NUDURA low expansion spray foam can be used around the sleeve ends to provide a thermal break.

To make the hole for the sleeve, use the sleeve as a template and pencil mark the circumference on the foam. A keyhole saw is often easier than a drill to cut the hole. A snug fit is preferred by most, but some will make oversized holes and fill the annular space with the low expansion spray foam. After the pour, when cutting the wire chase up to the sleeve, simply cut and break out the sleeve wall back to the face of concrete to enable the wire to bend over into the foam chase and run to the box. In lieu of a sleeve, a hole can be drilled through the concrete after the pour, or a wire chase can be cut down the exterior foam panel from the top of the wall. After the wire is pulled through the sleeve or hole, low expansion spray foam should be used around the wire to seal the opening.

FIGURE 10.01

10.3 PANEL LOCATION

To gain easy wiring access to the main circuit breaker panel through the floor or ceiling, it's best to install the panel on the opposite side of where the meter will be installed. If this option cannot be achieved then the panel will need to be installed as close to the main electrical wire coming from the meter as possible. If mounting the main panel onto the NUDURA Integrated Building Technology, it has been found easiest to attach the panel on a larger ½" (50 mm) thick plywood base. The plywood base can then be either fixed using screws to the fastening strips or a longer concrete screw can be used for direct connection to the concrete wall. This enables the wires to be stapled to the plywood in a neat series of lines for easy tracing.

FIGURE 10.02

If concealing the wires is a requirement, fur out around the plywood base mount with 2"x4" (38 mm x 89 mm) studs. Remember that the EPS will require a thermal barrier attached to the foam before the lumber is attached. The contractor will need to know what exterior finish is going to be used on the wall before mounting the meter panel. For finishes other than brick the meter panel will mount on the exterior of the NUDURA Integrated Building Technology by first installing ⅝" (16 mm) or ¾ " (19 mm) exterior grade plywood, slightly smaller than the size of the panel. Then anchor back through wood shims to the concrete with galvanized concrete screws. If the breaker panel is located on the opposite side of the wall; create a circular cut out in the plywood to fit the wall sleeve, and mount the meter panel to the plywood with galvanized screws.

10.4 WIRE CHASES

After the NUDURA walls are completed, poured, and typically the roof has been completed, the wire chases can now be cut into the EPS. Of the many tools used to cut a wire chase, the three fastest and cleanest are an electric chainsaw, hot knife, and reciprocating saw.

FIGURE 10.03

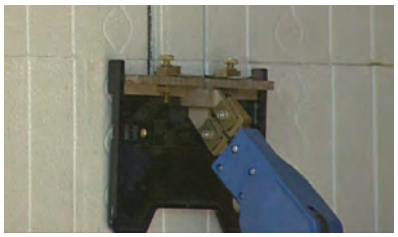

FIGURE 10.04

- Chainsaw: To make a depth stop on a small electric chain saw, measure the depth of chase required back from the tip of the chain, drill a hole in the bar, install a 3/8" (10 mm) diameter x 3" (76 mm) long all thread rod, and nut each side. This prevents the chain from extending to far into the foam and hitting the concrete. The width of the bar and chain make an ideal chase for the wiring to fit snugly into the EPS.
- Hot Knives: These often come with a depth stop clamping plate along with various metal cutting blades that can be bent to create any width or profile needed to create the chase. One downfall to the hot knife is ensuring the blade maintains a constant heat to melt the EPS. The hot knife technique is ideal for cutting out the boxes as it has the ability to create a smooth finish at the back of the cutout.
- Reciprocating Saw: The reciprocating saw can also be used to create a chase within the EPS. The contractor will have to modify the blade for depth as to not hit the concrete when the saw is in operation. The blade on the saw should be cut so that it will penetrate the foam no deeper than 2" (50 mm). An easy way to maintain straightness along the wall in the horizontal direction is to snap a chalk line and simply cut to the line. If cutting chases vertically the contractor simply has to follow the 2" (50 mm) cut lines on the forms.

Another thing to remember when the building is being constructed, before the attachment of the floor the electrician may want to layout the location of chases going between the rim joist and EPS. This can be a chase cut into the EPS or a piece of conduit mechanically fastened to the concrete.

10.5 ELECTRICAL BOXES

Both metal and plastic boxes can be used with NUDURA Integrated Building Technology. The cleanest cut out is accomplished after the pour with a hot knife box attachment, or using a heated metal box as a branding iron. Once the location for the box has been established and the required amount of EPS has been removed, it is recommended to run wires into the box prior to anchoring the box to the wall.

FIGURE 10.05

Boxes with a stud flange can be screwed to the polypropylene fastening strips located every 8" (203 mm) on center. Other box types can be anchored through the back of the box to the concrete with a concrete screw or nylon plug and screw combination. Should a box require multiple wires within it, the electrical code or authority will dictate the number of

allowable wires that can be installed within a box. When a multi-gang box is required, additional mechanical fastening into the concrete might be required. Again check with the local electrical authority on the number of wires that are allowed within these boxes.

FIGURE 10.06

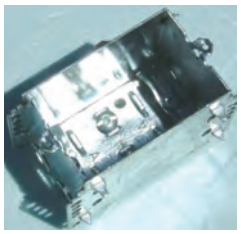

FIGURE 10.07

The use of sealed vinyl boxes is recommended to aid in mitigating the transfer of water vapor into the box. Although NUDURA always purports that an additional vapor barrier is not required on EPS, once the EPS has been cut to install the box, the overall thickness has been compromised and therefore a vapor barrier is needed where the box is located only. If a metal box is being used, consider fitting the hole with pre-molded polyethylene box inserts prior to installation of the box and taping this insert to the face of the foam with approved air/vapor barrier tape.

10.6 ELECTRICAL WIRING (NM OR NMD TYPE)

Tucking Romex/Lomex (non-metallic sheathed, NM or NMD) type wire into a snug fitting chase is the easiest method of keeping a wire in place. Wider chases will require NUDURA low expansion spray foam to be used in the chase to hold the wire back. Should the low expansion spray foam not be available, a clip that can be mechanically fastened to the concrete will be necessary. Remember to follow the applicable Electrical Code or Electrical Safety Standards for your region. Most North American Codes require a minimum of 1 ¼ ″ (32 mm) clearance between the outer most surface of the embedded wire sheathing and the backside of the thermal barrier material that's protecting the EPS foam of the NUDURA form surface. As with traditional residential construction, wherever this is NOT possible, a protective galvanized metal plate shall be installed in front of the wire wherever the wire is (for some reason) required to be closer to the form surface that the above noted dimension. This serves to protect the wiring from accidental penetration by contractors who would be applying interior wall finishes after electrical installations have bee completed. Some Codes require a secure anchor on the wire within 8″ (203 mm) of a box. As staples won't work in foam or concrete, use a small nylon cable zip tie or cable clamp with a manufactured eyelet to accept a short concrete screw, or simply use low expansion spray foam to secure the wire into the chase at the box.

10.7 CONDUIT

Metal or plastic conduit can also be installed into NUDURA forms in the same manner as Romex/Lomex™ cables are, within cut chases after the pour. When electricians are on the job every day, plastic conduit can be embedded directly in the wall cavity and encased in concrete. Embedding conduit in the cavity requires a 90° piece of conduit and the box to be installed prior to the pour. The box is typically mounted to a shimmed out plywood patch which is screwed to the face of the plastic webs to allow the box to extend beyond the face of the foam. It is far more efficient, and less expensive, to run conduit in the foam, after the concrete pour (if conduit is necessary). Remember, however, that conduit run in this manner must be mechanically anchored with clips and screws into the concrete core.

FIGURE 10.08

10.8 RECESSED LIGHTING AND OTHER TYPE OF CEILING FIXTURES INSTALLED WITH NUDURA® CEILING TECHNOLOGY

Prior to any installation of the NUDURA Ceiling Technology, pre-planning placement of any lighting fixtures must be completed to ensure the proper support has been provided for the required fixtures. Recessed pot lighting will require a plywood box finished with drywall to be built to dissipate heat from the pot light. Follow the pot light manufacturer's recommendations for size and depth of the box. Remember that since clearance above the lamp will be required, the box will have to be insulated to the same level as the Ceiling Technology on both side and top, projecting above the ceiling chords of the truss or ceiling joists.

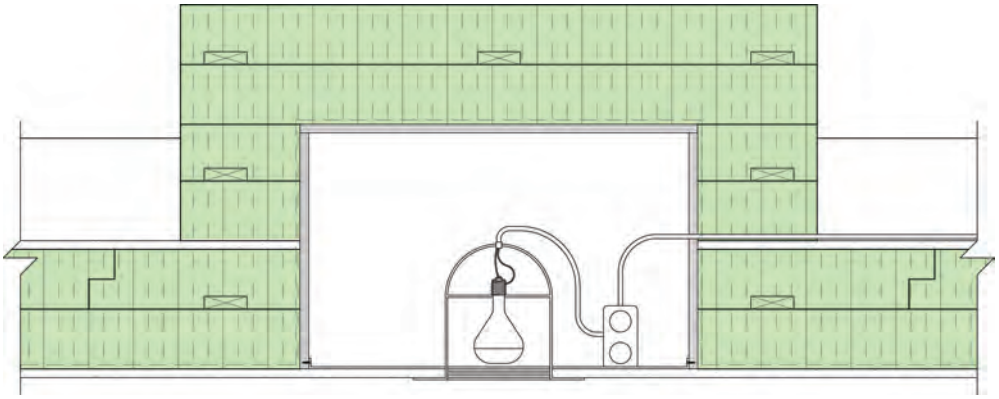

FIGURE 10.09

Ceiling fans should have additional solid support to limit the movement of the solid stem of the fan during operation. A length of solid threaded steel rod fitted with washers and nuts that is attached to the ceiling joist will provide the necessary support to prevent additional movement. Additional wood blocking will also help to reduce movement of the fixture during operation. Again the blocking will have to be secured to the ceiling joist or truss chord above.

Finally heavy fixtures such as chandeliers might require solid blocking to the ceiling joists as well that are capable of resisting the additional weight of the fixture. Again a solid threaded steel rod can be used for this application. Solid blocking the entire depth of the insulation may also be used to support the weight.

One thing to note is that should the method being used penetrate through the entire depth of the insulation, a vapor barrier will be required around that penetration, connected onto the surrounding ceiling technology, to prevent moisture from escaping through this area.