

5

utility installations

5.1 ELECTRICAL

5.1.1 Prior to Concrete Placement

Planning

Subsequent to wall assembly, examine the building plans carefully to note locations of electrical service entry, the electrical panel, external outlet locations, and exterior light locations. These locations should be marked clearly on the interior face (and exterior as required) of the Arxx™ forms. In addition, consider options for panel installation at this time (see below) and mark accordingly. Though chases will be created after concrete placement, consider the locations of chases that will have to be cut to run wires behind rim joists such as wires that will be feeding low wall outlets, etc. Chases that will have to run behind partitions that will be abutting Arxx walls should also be considered. Locate and mark these locations for future reference.

❖ If 4" forms will be used and decision is made to use standard depth fixtures, locations for receptacle boxes must be identified, located, and marked at this time.

Through-Wall Penetrations

Wherever exterior electrical outlets or light fixtures are anticipated, insert $\frac{3}{4}$ " (19 mm) diameter or larger PVC sleeves laterally through the forms at the required height above the finished floor level. These should be located approximately 6" (150 mm) horizontally offset from the finished fixture location to allow the wire to enter at the side of the utility box. Sleeve length can match form width, although some electrical contractors may prefer the sleeves to be shorter to allow for expansion foam to be squirted around the sleeve ends to act as a thermal break. To make the sleeve cut, use the sleeve as a template and mark the circumference on the foam. Cut the hole with either a key-hole saw (easiest) or drill the hole clear through both foam panels to the exterior. A snug fit is preferred, but the hole can be cut larger if the contractor prefers expansion foam to seal around the sleeve.

Service Entry

On the wall at the designated panel location, provide access for the electrical service by cutting and inserting a 4" to 6" (100–150 mm) diameter PVC sleeve laterally through the Arxx form to the exterior at the required height above the floor. Again, a tight sleeve fit is preferred.

4" Form or Deep Utility Box Preparations (Figure 5.1)

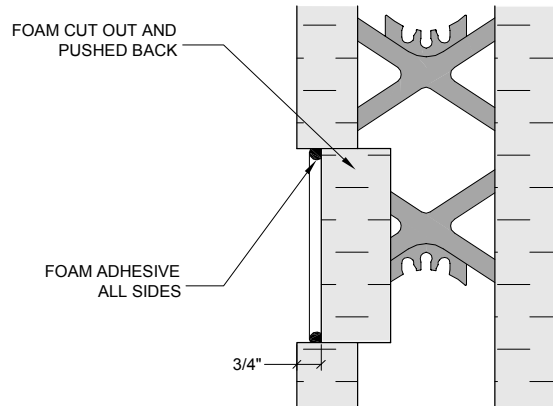
If 4" forms are to be used in conjunction with standard depth electrical boxes (boxes greater than $1\frac{7}{8}$ " [50 mm] thick from the drywall backing plate to the back of the box), installation can be easily accommodated at this time by making 6"x 6" (150 x 150 mm) square cuts into the foam at the box locations and carefully pushing the foam squares into the forming cavity by approximately $\frac{3}{4}$ " (19 mm). Seal the foam insets in place using expansion foam adhesive. This same installation method can be used to accommodate deeper electrical boxes should local code require them.



ALL THROUGH WALL PENETRATIONS SHOULD BE SEALED AIR TIGHT WITH CAULKING OR EXPANSION FOAM ON BOTH SIDES OF THE WALL.



FIGURE 5.1 – ELECTRICAL BOX IN 4" FORM



5.1.2 After Concrete Placement

Wire Chases

After concrete placement, the wire chases can then be cut into the foam. Chases should be cut to provide for the largest thickness of wire to be used plus a minimum coverage of 1 1/4" (32 mm) to conform to US-NEC and CAN4 S124 standards. Several options for cutting chases are available, but the cleanest and fastest include the following tools:

- › **Chainsaw:** Make a depth stop for a small blade electric chainsaw by drilling a 3/8" (10 mm) diameter clear hole through the bar at an appropriate location to allow for the chase depth and mounting, and insert a 3/8" (10 mm) diameter x 3" (75 mm) long threaded rod. Anchor the rod in place by mounting nuts on each side of the bar.
- › **Hot Knife:** These often come with their own depth stop clamping plate and a variety of interchangeable knife profiles and lengths.
- › **Side Grinder:** Simply grind the wheel into the foam so that it nicks the concrete. Choose a grinding disc to match the maximum wire diameter.

Chase Cutting Procedure and Planning

Using the cutting tool, run cuts horizontally or vertically to sleeve or utility box locations as required, always cutting to the required depth. Horizontal cuts are easier if they are made along one of the horizontal joint lines between the courses of form units. This method eliminates cutting through the plastic webs. At sleeve locations, make sure chase cuts are completed from the sleeve location back to the utility box location it is serving. Turn cuts vertically up or down between webs to run to a utility box.

5.1 ELECTRICAL

Some chases will need to be cut in advance of floor or interior partition placement. This will eliminate time-consuming cuts having to be carved behind these elements after they are in place. Cut these chases, accordingly, at the locations marked during the planning phase. If wiring requires a series of single wire chases to be cut in close proximity, it is much easier to cut several single chases than a single, wide chase. This practice ensures each wire is retained snug inside its own chase. Finally, where wires are returning to the main panel, plan to run wires through the ceiling or floor joist spaces wherever possible.

Wiring

Standard Romex/Lomex type wire can be tucked easily into the chase cuts and will stay adequately in place under friction fit. Wider chases will require small foam scraps to be inserted to hold the wire in place, or spots of expanding foam can be used to anchor the wire. Some electrical codes may require a secure anchor on the wire within 8" of a box. Since staples are not an option in foam, use a small nylon cable zip tie or a cable clamp with a manufactured eyelet to accept a short concrete screw to anchor the wire in place.

Conduit

Metal or plastic conduit can be installed in the same manner as standard cable within cut chases after concrete placement. If the installation is a larger job where the electrician is already on-site at the same time as form installation is occurring, plastic conduit can be installed within the form work as required and embedded in the concrete. These installations will require 90° elbow fittings and utility boxes to be fitted prior to concrete placement. Conduit boxes are 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 faster and less expensive, however, to run conduit in the foam after concrete placement.

Boxes

Either metal or plastic electrical boxes can be used with Arxx™. A hot knife makes the cleanest foam cut, but other tools can be used to clear the foam at the box locations, such as a standard saw, keyhole saw, or long blade utility knife. A heated metal box can also be used as a “branding iron.” It is much easier to run the wires into the box prior to anchoring it into the wall. Boxes that are fitted with a stud flange can be screwed directly into the face of the webs for easy anchorage using shallow truss head or bugle headed screws. Other box types can be anchored through the back of the box to the concrete with a concrete screw or powder actuated nail. The size of the box selected for use will be dictated by the number of wires running to the box and by the local governing electrical code. The code will specify the cubic volume required for the box depending on wire size and quantity.

For most circuit requirements a standard 2 1/4" (57 mm) deep utility box will serve most purposes within 6" and 8" forms. For 4" forms, the reduced foam thickness requires pre-planning of box locations (see Section 5.1.1, Prior to Concrete Placement, Planning) or use of shallow boxes (less than 1 7/8" (48 mm) deep from face of drywall to back of box). When larger volumes are required, they can be accommodated using larger 4" x 4" (100x100 mm) shallow boxes with plaster ring attachments. Where 3-gang or 4-gang wall switches are required, these are best constructed using the foam cut-in pre-planned method.



Main Panel

Electrical panels can be installed using any one of the following methods:

Interior Wall Method: Select an interior wall located near the service location running perpendicular to the floor joist span. The service is run through the joist space to the interior wall and wires are fed from the top of the panel into the joist space.

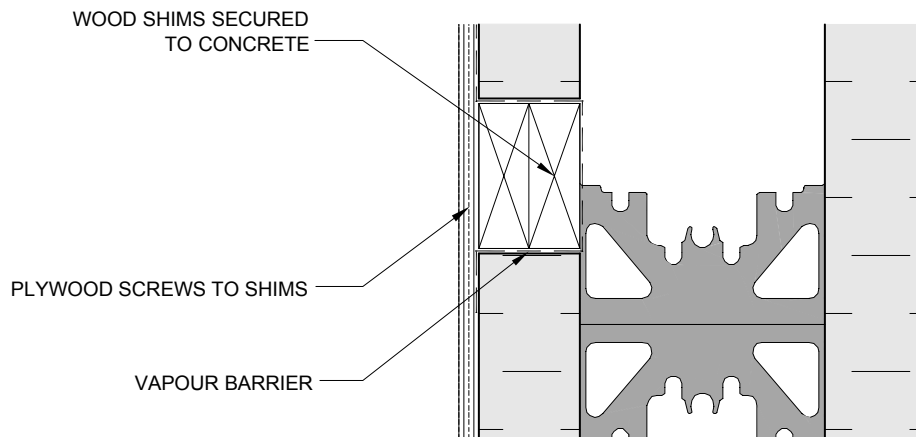
Arxx™ Wall; Face Mount: The panel is mounted on a larger plywood base which enables the wires to be stapled to the plywood neatly for easy circuit tracing. If wires must be concealed, simply fur out around the plywood base mount with 2x4 studs.

Arxx Wall; Recessed Mount: The circuit breaker panel is mounted flush to the face of the Arxx wall by embedding a 2x4 and plywood-backed window buck within the wall flush to the interior wall face. This still allows some concrete to flow behind the partial depth buck assembly.

Meter Assembly (Figure 5.2)

To mount the meter enclosure panel on the exterior face of a Arxx wall, first install $\frac{5}{8}$ " (16 mm) or $\frac{3}{4}$ " (19 mm) exterior grade plywood sheet, slightly smaller than the mounting panel. Mark and cut the service entry sleeve diameter on the plywood and cut to suit the sleeve. Next, anchor the mounting plywood in place over the sleeve using galvanized concrete screws with wood shims to support the plywood at each screw. Finally, mount the meter panel to the plywood with galvanized screws.

FIGURE 5.2 – METER ASSEMBLY MOUNTING



ALL ELECTRICAL WIRING AND FIXTURE BOX PLACEMENT MUST BE IN ACCORDANCE WITH THE APPROPRIATE AUTHORITY ENFORCING THE APPLICABLE ELECTRICAL CODES AND STANDARDS.



5.2 PLUMBING/PIPING/MECHANICAL

5.2.1 Prior to Concrete Placement

Planning

Subsequent to wall assembly, examine the building plans carefully to note locations of all required plumbing and mechanical penetrations which will be required to pass through the Arxx™ wall. A typical checklist should include the following:

- › Water supply entry (municipal service)
- › Pump electrical and water supply leads (well water supply)
- › Waste water sewer/septic leads
- › Exterior hose bibs
- › Sump pump waste water discharge
- › Gas/propane service entry/exterior fixture leads (barbecue), etc.
- › Oil fill and vent pipes (where applicable)
- › Furnace air intake and exhaust vents
- › HRV or heat exchanger intake and exhaust ports
- › Hot water power vent exhaust leads
- › Kitchen exhaust vents
- › Wall-mounted bathroom exhaust fan leads
- › Dryer vents
- › Passive crawl space/cold room vents
- › Central vacuum lines to adjacent garage spaces

These service locations should be marked clearly on the interior face (and exterior as required) of the Arxx wall. Though plumbing cuts have to be made after concrete placement, consider marking the locations of vent chases that will have to be cut to run vents behind rim joists, such as vents that will be located within exterior walls running vertically between floor levels. Chases that will have to run behind partitions that will be abutting Arxx should also be considered. Locate and mark these locations for future reference.

Through-Wall Penetrations

PVC or metal pipe sleeves should be supplied to the site one size larger than the pipe or duct that will be running through the wall at a particular location. This allows tolerance in pipe alignment from the inside, while at the same time it allows for backfill settlement on the outside without damaging the service lead running through the sleeve. The annular space between the sleeve and the pipe or duct is filled with either water plug or an EPS-compatible expanding foam. Expansion foam is used to seal around the sleeve. Sleeve lengths can be cut the same length as the overall form width so that they are flush with the inside and outside faces of the form.

To cut the holes for each sleeve, use the sleeve as a template and pencil mark the circumference onto the foam face at the required location. A hand-held keyhole saw is the preferred cutting tool for a snug fit. Remember that the most likely location for horizontal rebar is a few inches above the centerline of the form unit, so the best location for sleeves to penetrate the wall is near the horizontal joints between courses.



Embedded Pipe

For maintenance reasons, it is **not** a good practice to embed pipe directly in the concrete core. Access becomes extremely limited in the event of a blockage. Embedded pipe also creates weak spots in the wall which may require an engineer to specify extra steel reinforcing for the concrete near the embedment. If larger pipes must be suspended within the form core, this can be accomplished by simply lashing the pipe to the webs with wire, nylon zip ties, or tape. Plumbing access must be made through the addition of pipe elbows and nipples. In almost every case, the best alternative to this scenario is to build out a pipe chase around the larger pipe with wood or metal to hide the pieces for easy maintenance.

5.2.2 After Concrete Placement

Pipe Chases

After concrete has been placed, pipe chases can be cut into the foam to permit running small diameter pipe (up to 1 1/2" diameter) beneath the wall finish material. Remember to consider the wider diameter of pipe fittings when calculating the maximum size of pipe to fit within the foam. Many tools can be used for making these cuts. However, field experience has shown that an electric chainsaw, a hot knife, and side grinder are the fastest and cleanest installation tools for preparing foam cuts for sleeves.



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