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ELECTRICAL GUIDE

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FORWARD

Enercept has been manufacturing Structural Insulated Panels (SIP's) for residential, commercial and agricultural buildings since 1980. We understand and respect the concerns electricians have about wiring our panels. We humbly ask that you give us a chance to help your awareness of the issues relating to the wiring of Enercept panels. *Enercept is the only panel manufacture that has a patent (#4852310) on the electrical chases.

While wiring of Enercept panels is different from the wiring of a standard wood frame structure, by reviewing installation concepts, basic wiring designs and some pre-planning, you will find that the work can be completed easily.

It is important that you read this wiring guide to become acquainted with our wiring techniques. There is an index in the front of this guide as well as a glossary of commonly used terms.

Whether you are the owner of an Enercept building, the contractor building it, or the electrician, this guide was written to provide you with the best information available to complete the wiring project in a safe and orderly manner.

We recommend that you consult local electrical / building authorities regarding licensing and specific wiring standards that may apply in your area. Any code references that are included as information for wiring techniques, the electrician or wireman doing the work is ultimately responsible for satisfying the authority with jurisdiction for appropriate codes.

It is not the intent of Enercept or this guide to provide information on wiring techniques which may contradict inspecting authorities at point of construction. Enercept extends no authority to any person to wire this building without permission by the authority having jurisdiction.

Though this information is presented primarily with wiring methods for residential applications, Enercept panels can be modified to meet the requirements of the commercial electrical codes. Consult Enercept if you have questions about commercial wiring provisions for our panels.

INDEX

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Forward	*	*	*	*	*	*	*	*	Page 1
Index	*	*	*	*	*	*	*	*	Page 2
General Notes		*	*	*	*	*	*	*	Page 3
Panel Wiring		*	*	*	*	*	*	*	Page 4-12
Foam Sealant Installation	*		*	*	*	*	*	*	Page 13
Suggested Electrical Materials			*	*	*	*	*	*	Page 14-15
National Electrical Code (N.E.C.) References	*				*	*	*	*	Page 16
Wall / Roof Panel Opening Checklist				*	*	*	*	*	Page 17
Glossary	*	*	*	*	*	*	*	*	Page 18

GENERAL NOTES

I.

This guide will familiarize you with the basic techniques we have developed to wire our buildings. We encourage you to read it thoroughly. Enercept will continue to update this source of technical information.

II.

In any building project, planning is extremely important to assure that the owner is satisfied with the finished project. Enercept buildings are no exception. As you would plan door openings and window placements, you must also plan the locations of electrical openings where Enercept panels are installed. (*Enercept typically provides a 1 1/4 inch Horizontal Chase 16 inches from the bottom in all wall panels, 44 inch Chases are provided in kitchen & utility rooms where countertops would be located, Vertical chases from the bottom of the panel to the 16 inch chase are provided in 4' wide panels and below window openings. A 1 1/4 inch Vertical chase is typically provided in each panel adjacent to door & window openings*) A floor plan should be obtained which contains actual dimensions of all wall, window, and door swing locations. The electrician must mark on this plan where they will need non-standard chases or larger chases to accommodate multiple wires along with the N.E.C. required receptacles, switches, light fixtures, etc. and then consult the owner as to his or her preference on locations for these and other electrical needs. We have included in this guide a checklist (pg. 17) of possible openings that may assist you in your evaluation of each wall's need for wiring. When the electrical layout has been approved by the owner and, both of you are in full understanding of what is to be installed and where, then the electrician must redline-in the additional locations that non-standard wiring chases must be added. The owner/electrician then submits this drawing to Enercept, and we will review the plans and design the panels with the wire chases as designated.

- **IT IS EXTREMELY IMPORTANT TO MAKE SURE THAT ALL ADDITIONALLY REQUIRED NON-STANDARD WIRING CHASES and/or CHASE SIZES ARE SHOWN ON THE APPROVAL DRAWING YOU PROVIDE TO THE FACTORY FOR PANEL CONSTRUCTION. Be sure to note any computer, communication or entertainment cabling since it is recommended to separate these from power cables.**
- **Never cut through or across panel connection points**
- **No horizontal/vertical cuts longer than 6" on the wall or roof panels -CALL BEFORE YOU CUT!**
- **Recessed light/heating fixtures are not allowed.**

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PANEL WIRING

I.

Enercept has developed a very practical method to assist the person(s) installing electrical wiring in the new building. We provide a 1-1/4" wire chase in each one of our panels for the purpose of electrical wiring installation and ONLY for wiring installation. It is not for the plumber, or the H.V.A.C. contractor; these wire chases are strictly for the electrician. **DO NOT CUT ACROSS THE PANEL FACE/SKIN FOR WIRING CHASES.** **Note: We mark the interior side of the panel with blue permanent ink indicating the location of the chase inside the panel.**

II.

Horizontal wire chases are installed 16" from the bottom of the Wall panel. In the kitchen and utility areas a 44" wire chase is installed to accommodate outlets above the countertops. Single gang electrical box knockouts measuring 2 1/2" x 3 3/8" (16" wire chases only) are typically cut into all 4' wide panels and lower Window panels. *Vertical chases from the bottom of the panel to the 16" chase are provided in 4' wide panels and below window openings for access from the floor system. (The builder should bore these holes as the panels are being set)* The electrician may choose to use the cutouts or cut in their own where they need them. **All Wire chases are marked in blue on the interior sheathing.** (example pg. 5) ***Foundation / Basement panels do not have Horizontal chases**

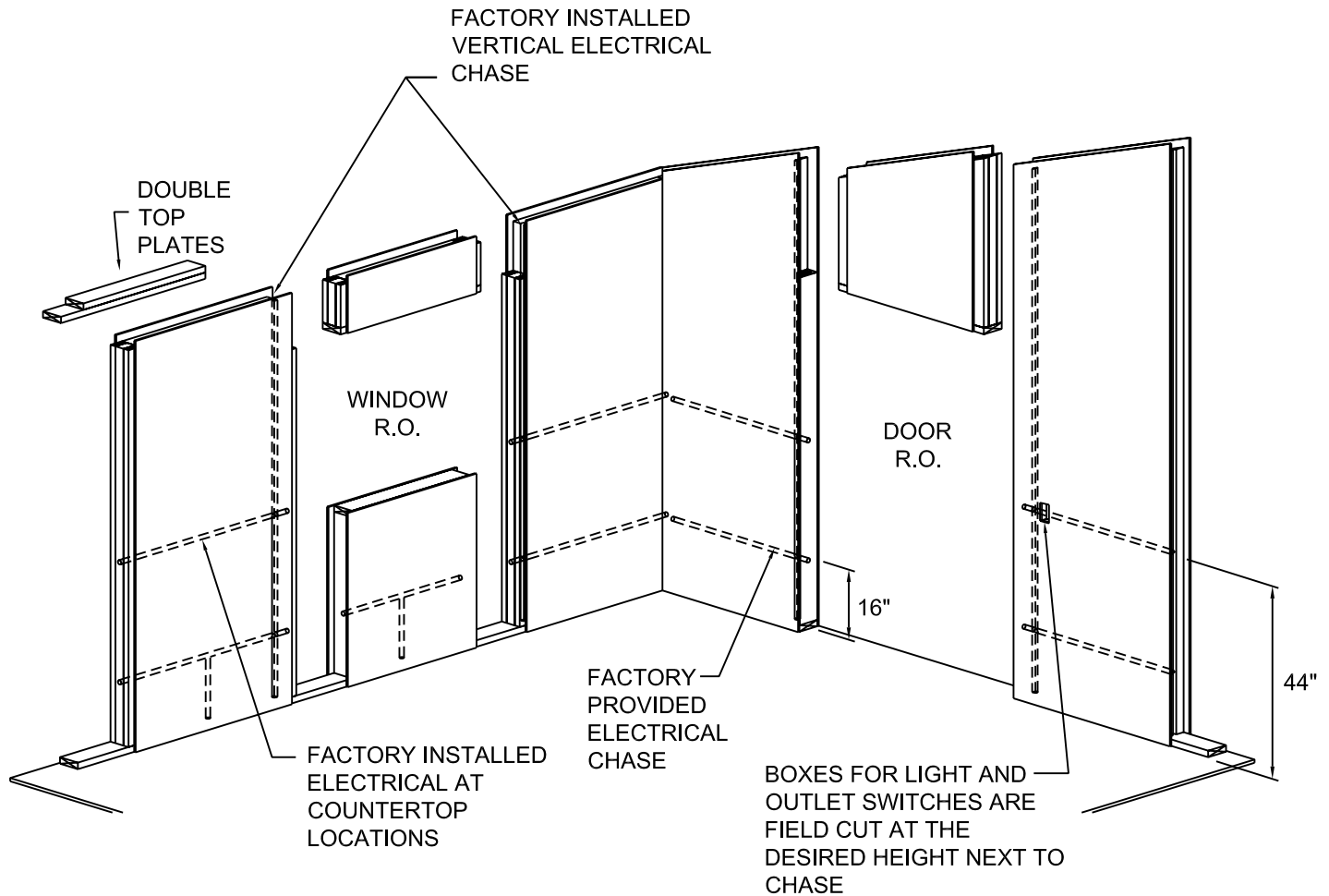
III.

Vertical wire chases are installed within 6" of the Door and Window panel rough opening. (*The builder should bore this hole as the panels are being set*), or the electrician must bore a 1-1/4" hole in the sill and top plates to align with the wire chase(s) in the panel. This enables wiring to be pulled to the sublevel or roof areas. Holes should be cleaned of woodchips and other debris to facilitate easy wire pulls. **All wire chases are marked in blue on the interior sheathing.** (example pg. 5) ***Foundation / Basement panels have vertical chases at the edge of each panel.**

IV.

Roof/Ceiling: (Do not use recessed lighting fixtures in EPS Core panels) Depending on the design requested, the Enercept roof panels may have factory installed 12-3 Type NM-B cable in place for ceiling wiring (pg. 6). When installing these pre-wired roof panels, the builder or electrician must route the wiring originating from the roof panel into the appropriate vertical wire chase in the wall panels leading to switches, electrical termination or source(s), for low slope/roof pitch wiring may have to be routed as panels are being installed. If wiring is not in the roof panels *, you must first install the wiring, and then as they are set in place, route or pull the wires to their point of termination or source. **All Enercept roof panels with factory installed wiring will have a 2 1/4" x 9 1/2" backer board. Additional support / engineering may be needed for fixtures in excess of 90 lbs. And must be noted on the electrical drawings. *NOTE: Please contact Enercept for assistance, if wiring must be added before or after the panels have been set in place**

PANEL WIRING

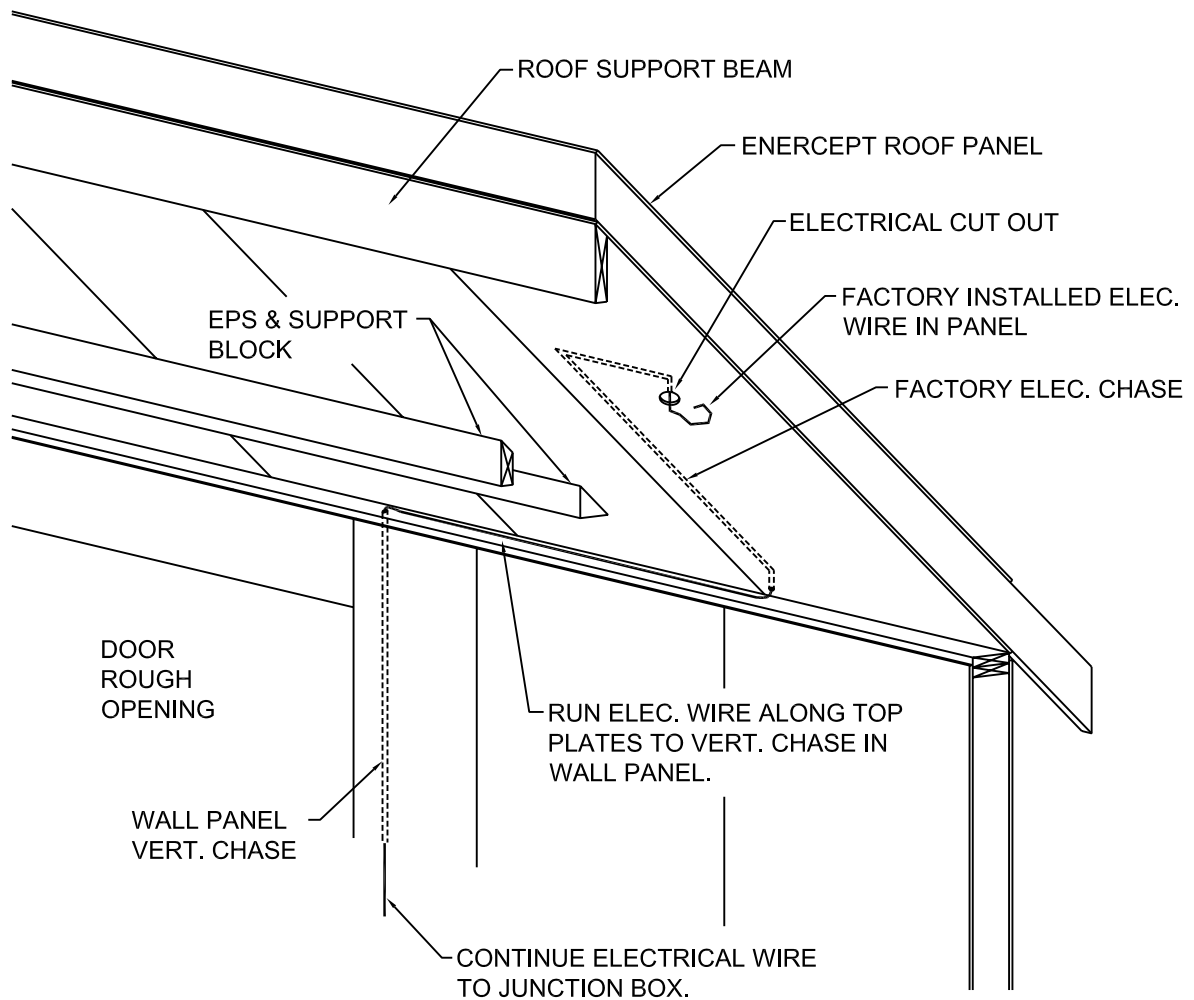


- All penetrations through the panel exterior and door edges must be resealed with foamed-in-place insulation.
- Custom electrical chase locations provided upon request.
- Electrical chase locations will be marked in blue ink on the interior surface of panels.
- Where panels are used in slab on grade applications, it is suggested that conduit in slab be utilized to route electrical wiring.
- Centered vertical chase and factory cut-outs are provided in all 4' panels, corners, and window lowers.

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PANEL WIRING



- Electrical wire should be pulled through vertical wall chase when roof panel is being placed.
- Support blocking will be provided in roof panels at all electrical locations.
- Pre-drill the electrical chases in the top plates before installing the roof panels.

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PANEL WIRING

V.

We recommend the following methods for wiring inside or outside corners of wall panels:

- 1. Field Routing** As panels are set in place by the building contractor, wiring should be pulled to the corner and then routed through the opposite wall panel at the corner.
- 2.** At the last outlet or opening before the corner, route the wire down thru the floor system through a vertical wire chase and back up the opposite wall through a vertical wire chase. (example pg.8)
- 3.** Like method 2 above, but instead of going down through a chase, use the vertical chase to go up through a panel into the rafter system then back down through a vertical chase on the opposite wall. (example pg. 10)

Note: *The best method of wiring a corner is to plan as much wire and cable routing as possible to be placed in the interior stud walls.*

VI

We recommend that the electrician indicate on a drawing the actual routing of the wiring. This can easily prevent confusion if questions arise as to changes, troubleshooting, or wire locations.

NOTE: *This Drawing should be left with the owner when the project is completed. Idea: Place it in a poly bag and tape it to the exterior of the main electrical box.*

VII

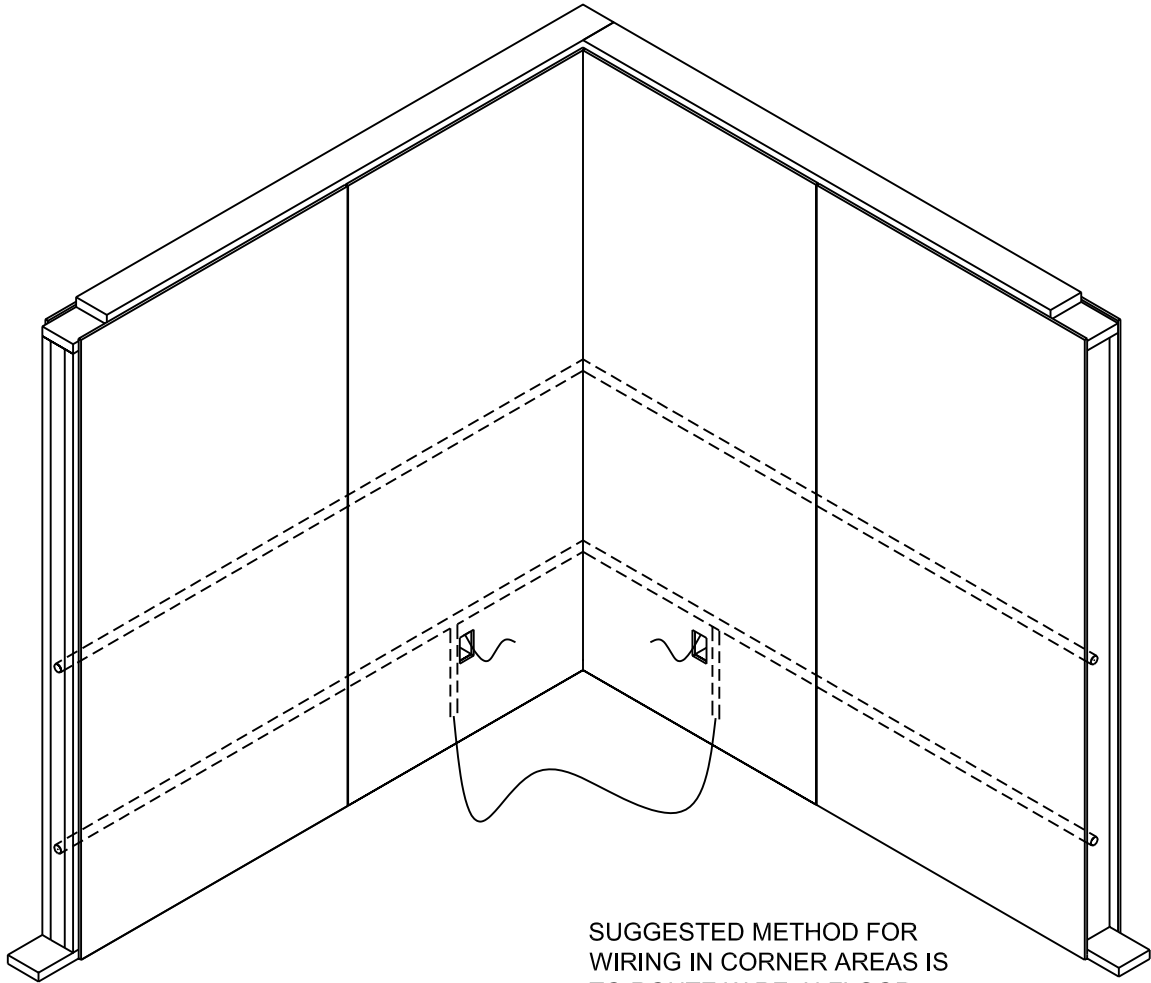
When routing wiring in walls, carefully tape wires on fish tape (some electricians have also used a Plumbers tape/sink snake to minimize damage to the foam) and gently pull through wire chases. Care is required here because panel "R-value" can be impaired if excessive foam is removed from around the wire chases. Also when removing foam for installation of boxes, be careful to remove only that foam which is required to seat the box.

NOTE: *If excessive foam is removed, we recommend usage of a foam sealant to maintain the energy efficiency of the panels (example pg. 13)*

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PANEL WIRING

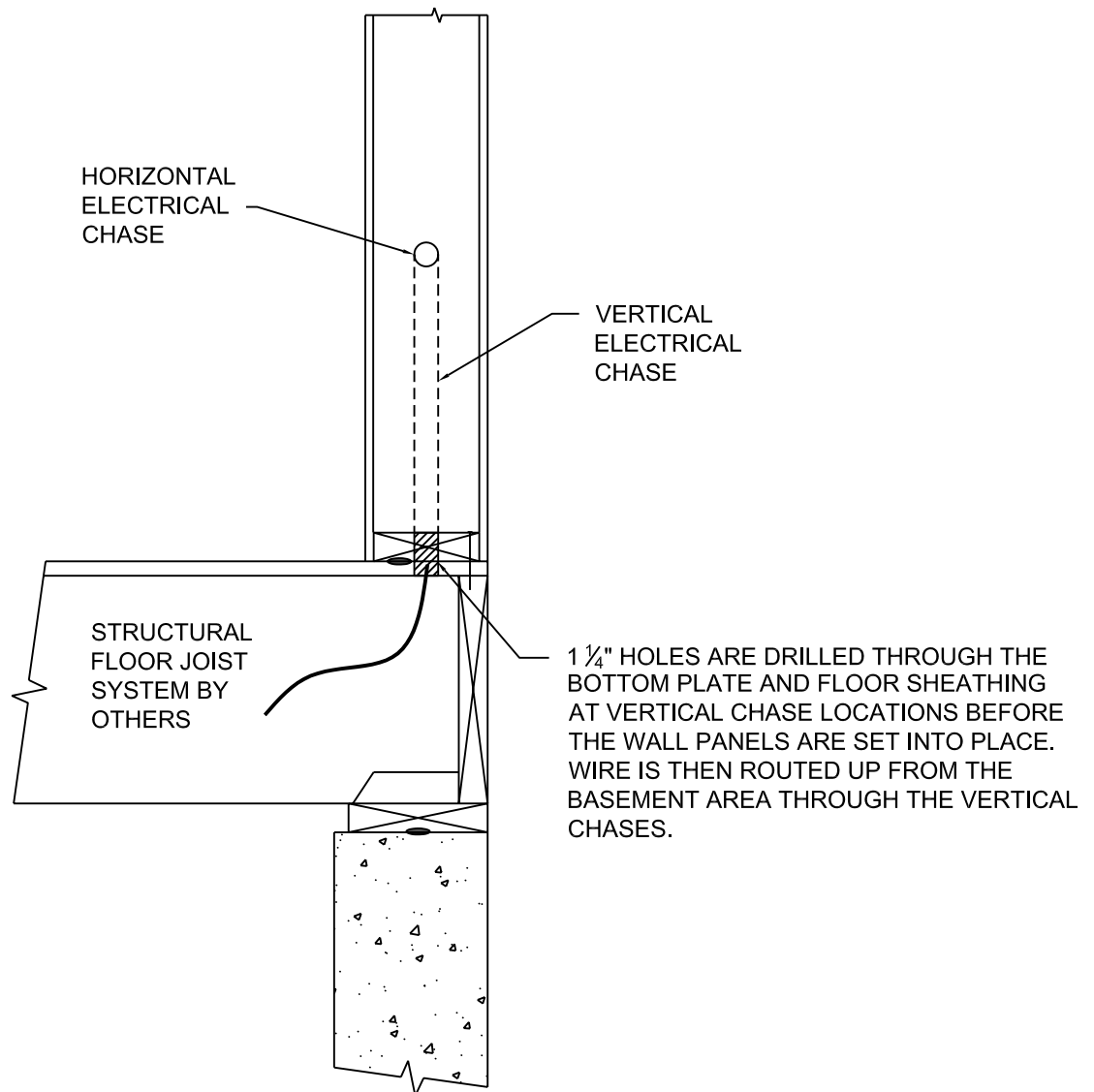


SUGGESTED METHOD FOR
WIRING IN CORNER AREAS IS
TO ROUTE WIRE IN FLOOR
SYSTEM AND UP THROUGH
SUPPLIED VERTICALS

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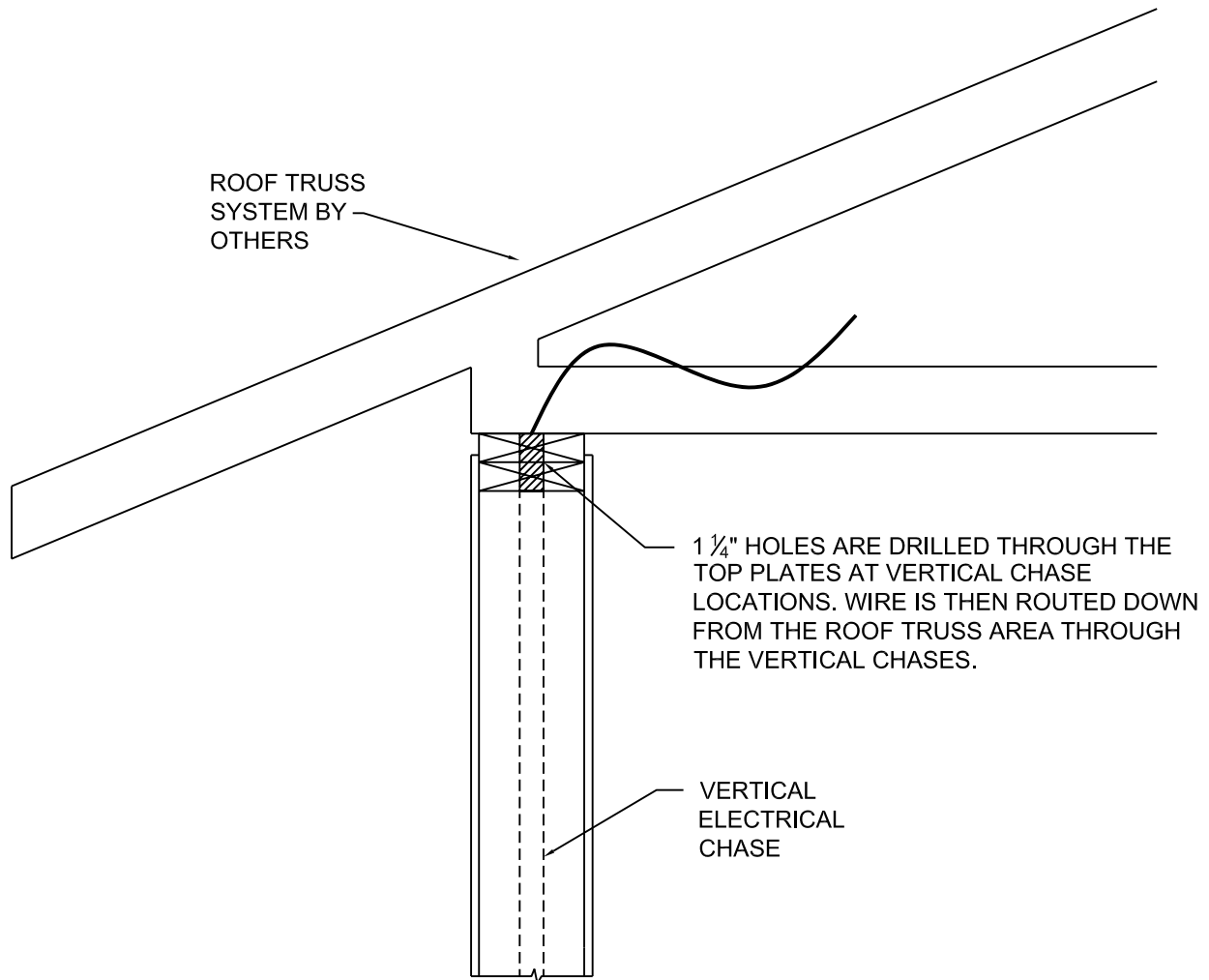
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PANEL WIRING

VIII.

Electrical boxes should be mounted after wiring has been pulled. Check the box size and adjust the factory opening if available, or cut in an opening where desired using a router, jig saw or sawzall, then use a sharp knife (fisherman's file knife) to cut the foam to the shape of the box opening. Slice the foam the depth of the box and remove *. With the foam removed and the wire pulled, the box is ready to be installed. We recommend that the electrician turn the ears around on the steel box and adjust them so that once the box is set into the foam opening, the face of the box will be flush with the (sheetrock) *finished* wall or ceiling surface. The box is secured to the panel by four sheet rock screws through the box ears into the wood. Make certain that care is taken in bringing wire(s) into boxes. If a short circuit is encountered when the power is applied, usually this is a result of a skinned wire grounding out to the box. Tighten cable clamps of box. ****Enercept requires that any excess foam that was removed be replaced with a foam sealant around the box to maintain an air tight, energy efficient building (pg. 13)***

IX.

To be in compliance with N.E.C. standards associated with supporting light fixtures or dynamic structural stress of ceiling fans in our roof panels, we install a 2 ¼" x 9 ½" wide backer board that spans the width of the roof panel. This allows the use of differing sizes, shapes and depth of boxes. **Additional support / engineering may be needed for fixtures in excess of 90 lbs . *** ***Please note this backer board is an integral part of the panel, and its location must be specified on the approval drawing for this support to be installed in the appropriate place.***

X.

When making transitions in wire pulls from a vertical to a horizontal wire chase, or from a wire chase to an internal stud wall, the electrician must remove the box opening that has been routed at the factory, or field cut an opening at the desired location, and remove the foam material in the same manner as for installing a device box. After pulling wiring through at that point in the panel, push (or pull with a fish tape) the wire through to the next termination point. ***Please use foam sealant in the cut out area and reinsert the piece that was removed for the opening. This will maintain the integrity of the insulation value of the panel (pg. 13)***

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PANEL WIRING

XI.

For structures that are being constructed on concrete slabs, Enercept suggests the following wiring procedures:

(1.) Structures using Enercept Wall panels with manufactured roof trusses

Run Main line from the Service Meter either under the concrete slab or through the Enercept Wall panel into a Interior stud wall where the Main Breaker box will be located. Wires can then be routed through the stud walls into the Truss area and brought down through the double top plate into the panels using the vertical wire chases and can be routed into the horizontal wire chases. (Wires should be routed in interior stud walls as much as possible.)

(2.) On Slab structures using Enercept Wall & Structural Roof panels;

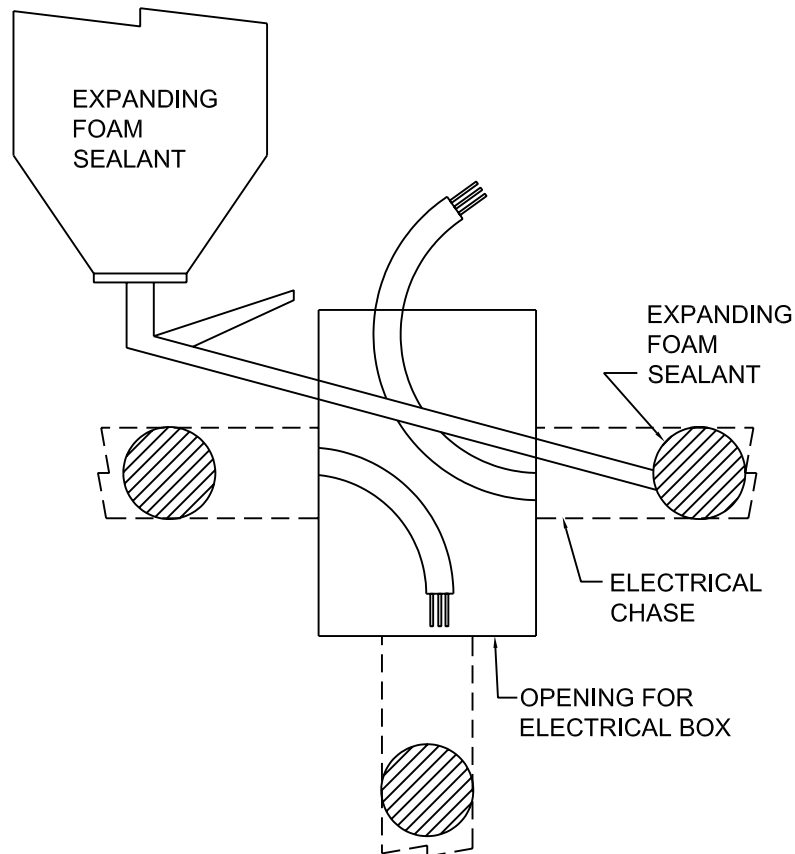
Run Main line from the Service Meter either under the concrete slab or through the Enercept Wall panel into a Interior Stud wall where the Main Breaker Box will be located. Wires can then be routed through the stud walls into the 16" Horizontal Electrical Chase and pulled to the termination point, or into the Vertical Electrical Chase and routed between the Double Top Plate and the bottom of the Roof Panel / Wall Panel Junction. Wires can then be routed back down into the Horizontal wire chases utilizing the Vertical Wire chases.

NOTE: Areas where there are no interior walls to run the wiring through should utilize a below slab conduit system to route wiring into the wall system. (*This needs to be done before concrete work is done*)

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FOAM SEALANT INSTALLATION



ELECTRICAL CHASE SEALING WITH FOAM SEALANT

After pulling all wires, but before receptacles and/or switches are installed, ensure the elimination of air infiltration by sealing each electrical channel as shown. Use only enough insulation to seal the channel without expanding into the electrical box.

Note: Allow foam to cure before installing fixtures and connecting the wires.

SUGGESTED ELECTRICAL MATERIALS

DEVICE BOXES

A steel device box with adjustable ears, or a plastic / phenolic device box with an offset bracket is needed. While most steel boxes are designed to be gangable, pre-ganged plastic boxes are available. Depending on the thickness of the wall covering intended, device box adjustable ears or offset brackets must insure that the box installation meets the code regarding being installed flush with the finished surface. **NOTE: the following device and ceiling boxes are merely recommendations. They have been used and do work, however, this does not limit the installer from selecting other boxes.**

The following single gang device boxes are standard stock items for most electrical wholesalers and retailers. We have cross matched an 18 cubic inch single gang box with clamps and ears to the following:

Steel Boxes: (18 Cu. In.) = 3" x 2" x 3 1/2" depth.

***STEEL CITY # CXWOW RACO # 601 BOWERS # 54-LC APPLETON # 384D**

Plastic / Phenolic Boxes: (18 - 20 Cu. In.) = 3.75" x 2.25" x 2.75" depth

*** PASS & SEYMOUR # S1-18-S50U STEEL CITY Nu-Tek # FWSW BOWERS # 118-LB**

CEILING FIXTURE BOXES

Again, because of the need for adjustable ears, we recommend a steel box with adjustable ears and steel cable clamps. For light fixtures weighing 35 to 50 pounds or ceiling fans, we recommend using a heavy light / ceiling fan box such as the ***Steel City # 54151-CFB** or similar box type. Fixtures over 50 pounds need special device boxes and support. *see example on page 15.

The steel box industry manufactures a 3-1/4" and 4" steel octagon box. We found that a 3-1/4" octagon box with ears works best when it is being cut into a sheet rock or finished surface, because of its diameter, and it can be covered by a typical fixture canopy cover. On other installations where the fixture box will be installed and then dry wall or other finish material will be used, a 4" octagon box works best because the ears of the box are located on the panel, thus concealed by the finish surface. We found two 3-1/4" steel octagon boxes with ears and clamps available from electrical wholesalers.

APPLETON # 560LXE

BOWERS # 3-O-LCE

We have cross matched 4" octagon steel box with clamps and ears to the following:

***STEEL CITY # 54151-NE RACO # 150 BOWERS # 4-OW-LC-E**

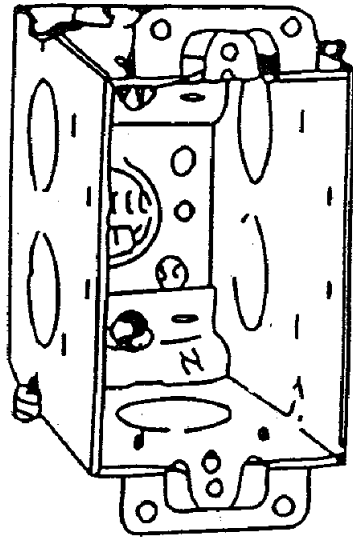
APPLETON #561LXE

*see example on page 15.

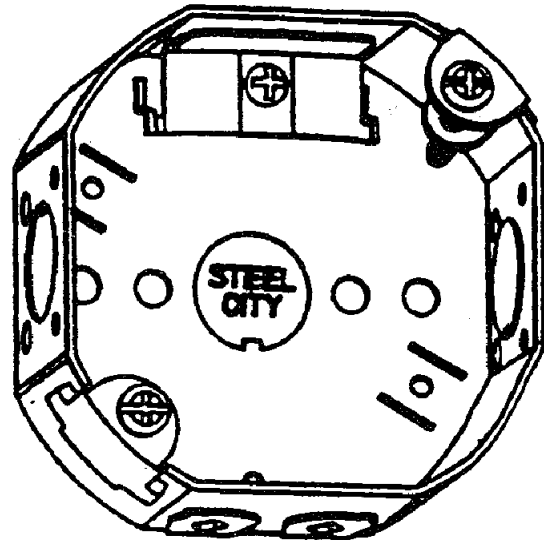
WIRE

The electrical industry has developed a nonmetallic cable (type NM cable) that has a low profile jacket making pulling much easier. This cable is identified as NM Cable "type B". Either cable will work, but NM-B pulls easier by virtue of its size.

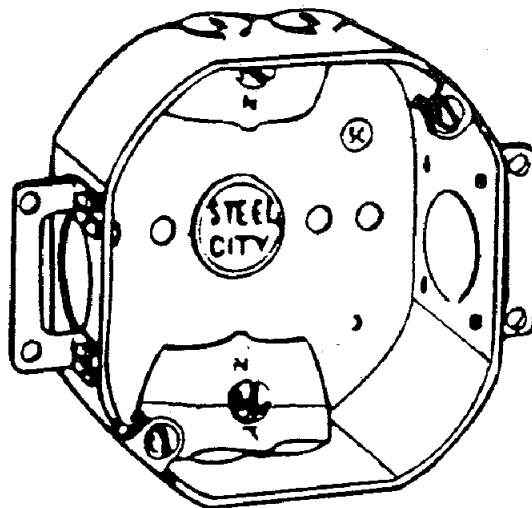
SUGGESTED ELECTRICAL MATERIALS



Steel City # CXWOW
Square Corner Switch Box
Gangable, adjustable ears
3" x 2" x 3 1/2" 18 cubic inch



Steel City # 54151-CFB
4" Octagonal Ceiling Fan Box
1/2" knockouts and clamps
15.8 cubic inch



Steel City # 54151-NE
4" Octagonal Box
1 1/2" deep, adjustable ears
15.8 cubic inch

NATIONAL ELECTRICAL CODE REFERENCES

ELECTRICAL CHASE / BOX CAPACITY

When wiring the Enercept panel it is recommended that you run no more that two (2)- # 12-2 NMB Cables in the provided 1 ¼" chases, three (3)- # 12-2 NMB Cables can be run in the chases, but will pull harder.

one (1)- # 12-2 and one (1)- #12-3 can be in a 1 ¼" chase.

one (1)- # 10-2 or one (1)- #10-3 can be in a 1 ¼" chase.

In an 18 cubic inch electrical box with duplex receptacle, two (2)- #12-2 cables can be in the box, or one (1)- #12-2 and one (1)- #12-3 or two (2) # 12-3.

Three (3)- #12-2 cables can be put into a box if no device is used.

In a 21 cubic inch electrical box with duplex receptacle, three (3)- #12-2 cables can be in the box.

NATIONAL ELECTRICAL CODE REFERENCES (N.E.C)

The following references to electrical wiring were taken from the National Electrical Code of 2008. These specific references are included in this guide because they are pertinent to wiring methods employed in the wiring of an Enercept building.

NOTE: Though these code references are included as information for wiring techniques, the electrician or wireman doing the work is ultimately responsible for satisfying the authority having jurisdiction regarding satisfaction of any and all codes that may be in effect at the time of this building construction.

Box fill	*	*	*	*	*	*	*	Article 314.16b
Box supports		*	*	*	*	*	*	Article 392.6J
Building system / components			*	*	*	*		Article 545
Cable strapping		*	*	*	*	*	*	Article 334
Ceiling fans	*	*	*	*	*	*	*	Article 422.18
Lighting fixture support		*	*	*	*	*	*	Article 410.30
NM cable uses permitted			*	*	*	*		Article 334.10
NM cable uses not permitted			*	*	*	*		Article 334.12
Wiring planning	*	*	*	*	*	*	*	Article 90-8

WALL/ROOF OPENING CHECKLIST

The following list is provided to help prevent overlooking an electrical device that may need to be planned for. This is not necessarily a complete list.

RECEPTACLES / SWITCHES / FAN CONTROLS

LIGHT OPENINGS

TELEPHONE JACKS

CABLE TV JACKS

DOOR BELL PUSH-BUTTON/ DOORBELL CHIME

THERMOSTAT

ELECTRIC HEAT OPENINGS

COMPUTER - MODEM / INTERNET TRANSMISSION WIRES

VOLUME CONTROLS

AUDIO / SPEAKER EQUIPMENT

PILOT LIGHT SWITCHES

ELECTRIC DOOR LATCH

SECURITY DEVICES i.e. burglar alarms, cameras, motion sensors etc...

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GLOSSARY

ADDITIONALLY REQUIRED We use this term to indicate wire chases in panels which we will install that are not part of our normal 16" horizontal or "door / window opening" vertical wire chases.

DEVICE An electrical product to which a conductor is connected which either transfers or uses electricity. Typically this term refers to switches, receptacles, or energy using equipment. (I.e. light bulb)

FACTORY INSTALLED ELECTRICAL BOX KNOCKOUTS 2 ½" X 3 ⅜" Pre-cut openings for electrical boxes (typically in 4' panels, and lower window panels at intersection of vertical and 16" horizontal chase only).

GANGABLE A term that refers to a device box making it capable of having additional sections added to it by mechanically attaching them. Then additional devices can be added to the same opening box.

N.E.C. National Electrical Code. A book published by the National Fire Prevention Association (N.A.P.A.) which establishes safety standards for the installation of electrical equipment and wiring in and on various structures. This book is published every three years.

OPENING Term used to describe a point on a wall, ceiling, or floor where some form of electrical device is located or planned to be located. Openings can be multiple in nature - two switches side by side may be referred to as a "two gang opening".

SOURCE Refers to a point in a circuit from which energy is derived, typically from service meter or circuit breaker panel.

TERMINATE The process of connecting electrical wiring or, wires to a specific device(s). (i.e. installing a duplex receptacle in a steel box)

WIRING (noun) Electrical material that makes up a complete wiring system that consists of, but is not limited to wire, wire chase, boxes, devices, outlets, fixtures, and overcurrent protective devices.

WIRING (verb) The process of installing cabling, wire chase, boxes, devices, outlets, fixtures, or overcurrent protective devices to make up a completed electrical system.

WIRE CHASE * Enercept Patent #4852310 A groove or, channel that has been formed or, cut into the EPS Core for the purpose of routing of wiring.

*Never cut through or across panel connection points

*No horizontal/vertical cuts longer than 6" on the wall or roof panels. - CALL BEFORE YOU CUT

*Recessed Light Fixtures are not allowed in the panels