



STRATHCONA COUNTY

Residential Wiring and Electrical Best Practices



This guide describes methods of installation that have been tried and tested. Other methods of wiring a home may be used, but must meet the Canadian Electrical Code.

The following guide includes the Canadian Electrical Code in effect as of February 1, 2019. This guide is meant to assist users and every effort has been made to ensure it reflects the current code, however, where discrepancies between this and the Canadian Electrical Code are found, the code prevails.

Who can do electrical installations?

- The owner of a single-family dwelling who lives in the home (you may not do wiring in a home that you do not reside in)
 - It is strongly recommended that homeowners without a basic knowledge of electrical wiring hire a qualified electrical contractor (who is responsible for obtaining the permit).
 - Due to the hazard involved, the Electrical Inspection Section recommends an electrical contractor do the following work:
 - The installation of pool grounding and connection of electrical equipment for pool; OR
 - Installation or making changes to main electrical services.
- A master electrician for all other installations types including:
 - Work exceeding 100 amps
 - Work in a commercial/industrial property (including a tenant space);
 - Work conducted in a residence where the owner is not eligible to apply as they do not reside there or plan to reside there
 - Work conducted in a residence where there are party walls (duplex, apartment, etc.)

Requirements for underground installation are on our website at:

<https://www.strathcona.ca/your-property-utilities/residential-permits/dwellings-and-additions/>

Permit Information

PERMIT REQUIREMENTS

Permits can be obtained by the master electrician doing the work or by the homeowner, provided, the homeowner is doing the work themselves, the work is being done in a single-family dwelling (with no common walls with other properties) and the homeowner resides on the premises.

A homeowner may submit (and pay for) an application, in person, on behalf of the master electrician, provided the master has completed the form as applicant and provided their ticket information.

Forms and method of submission (in person, email, ePermits) can be found here:

<https://www.strathcona.ca/business-and-development/development/commercial-and-industrial-permitting/permit-application-forms/>

WHEN PERMITS CANNOT BE ISSUED TO A HOMEOWNER

Homeowner electrical permits cannot be issued in the instance of any of the following:

- The property is within an apartment or duplex (sharing a common wall with another landowner)
- The homeowner does not reside on the premises
- Proof of ownership of the property is not presented
- The property is used for rental purposes
- The property is purchased for the purpose of flipping
- The wiring has been concealed (walls dry-walled)
- If the voltage is over 240 volts and/or the amperage exceeds 100 amps

Please note, homeowner electrical permits can be cancelled if, at the discretion of the Safety Codes Officer (electrical inspector), the installation could be hazardous to life or property. The homeowner will be responsible to hire a qualified licensed electrical contractor and the electrical contractor will obtain a separate electrical permit to do the work.

Inspection process/requirements

UNDERGROUND

Call for inspection once the underground installation is complete. Refer to the Strathcona County website on the requirements of new main service undergrounds.

- Do not backfill until the Safety Codes Officer (electrical inspector) has accepted the installation.
- For garages, please coordinate the underground and rough-in wiring inspection if possible.
- Electrical wiring in trench is required to be buried to a minimum depth of 600mm (24 inches) for non-vehicular areas and 900 mm (36 inches) for vehicular areas, all with ribbon (12 inches) below grade.
- Ensure slack in wire is provided in the ground (S-Loop) for frost purposes.

ROUGH WIRING

Prior to scheduling your rough-in inspection, please ensure:

- All electrical boxes are secured in place, flush with the finished wall or ceiling.
- All wiring is installed in the electrical boxes and secured to the building structure (staples).
- All grounding conductors are terminated in electrical boxes and splices completed.
- Vapour barrier (poly hats) installed on exterior walls and exterior ceilings electrical boxes and including pot lights.
- Roofing (shingles) and windows are finished

Please note, do not secure plugs, switches or lights to outlet boxes on first inspection.

FINAL INSPECTION

You are ready for a final inspection when:

- All devices, including the smoke alarm(s) and carbon monoxide detector(s), are connected to outlet boxes.

- All branch circuits are installed in panel and terminated on the circuit breaker.
- The panel schedule is updated and complete.

REQUESTING INSPECTIONS

To request an inspection, please call the inspection line at 780-464-8169. You will be asked to provide your permit number (or civic address of the property), the type of inspection being requested (underground, rough-in, final) and the inspection date. Bearing in mind, inspections can be booked for as early as the next working day if called in before 3:00 p.m. on the previous business day.

Electrical Information

CAUTIONARY NOTES

- When developing the basement or renovating existing areas, do not design the development so that panelboards are placed in clothes closets, bathrooms, stairways or any other area where moisture or location may present a hazard. These areas are not acceptable and may result in the electrical contractor relocating the panelboard under a separate permit.
- Ensure that a minimum 1 metre (39 inches) clearance is maintained from the face of the panelboard.
- Ensure that circuits are not left in an energized state during construction when children or persons requiring constant care are present, unless all light fixtures, devices and cover plates have been installed.

Please note: The method shown on the following page is no longer an acceptable wiring method. Please see examples 2, 3 and 4 on page 16 for examples of approved methods.

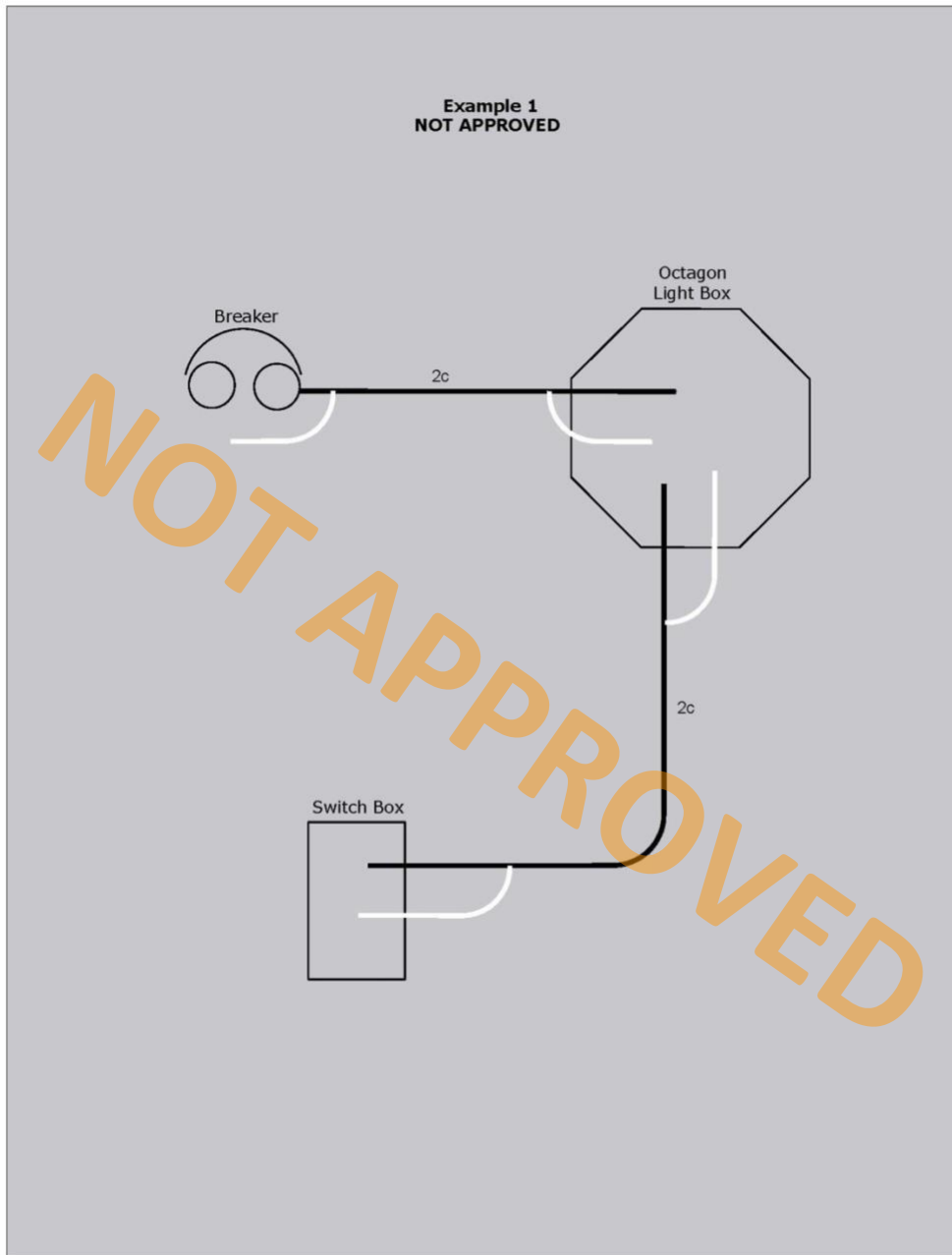


Figure 1: This common installation practice of using the identified conductor (white) as a switch leg is no longer approved.

General rules for non-metallic sheathed cables

1. Use only copper conductors.
2. Use 14 AWG copper wire for general purpose wiring (lights and receptacles).
3. Provide over-current protection of 15 amperes for general purpose wiring (lights and receptacles).
4. Install a maximum of 12 outlets on a general purpose circuit (lights and receptacles).
5. Run cable as a loop system in continuous lengths between outlet boxes, junction boxes and panel boxes. Make joints, splices and taps in the outlet boxes.
6. Where cables pass through a hole in a joist or a stud, bore the hole 32 mm (1.25 inches) back from the face of the stud or joist, or protect the wires from driven nails by using approved protection plates.
7. Secure wires every 1.5 m (5 feet) when run on the sides of joists or studs and 300 mm (12 inches) from each outlet box.
8. Protect wires that are exposed within 1.5 m (5 feet) of the floor.
9. Keep cables a minimum of 25 mm (one inch) from heating ducts or use insulation installed between the conductors and heat ducts.
10. Where cables run through or along metallic studs, joists, sheathing or cladding, ensure that the cables are:
 - a. Protected from mechanical damage both during and after installation
 - b. Protected by an insulation insert secured to the opening in the stud
11. The term 'neutral' (white) has been changed to 'identified conductor' (white).

- 12. Protect cables from mechanical damage and from driven nails and screws when they are installed behind baseboards or horizontally behind cupboards.
- 13. Where communication cables are to be installed in joists or studs, maintain a minimum separation of 50 mm (2 inches) from any power (non-metallic sheathed cable is recommended).

Outlet Boxes

- 14. Set outlet boxes flush with the finished wall or ceiling and secure them to studs or joists.
- 15. Ground all outlet boxes.
- 16. Ensure all junction boxes are accessible after installation.
- 17. Leave at least 150 mm (6 inches) of wire out of each outlet box for joints and connection of equipment.
- 18. Surround the outlet boxes with a moisture resistant barrier when the wall or ceiling requires a vapour barrier.

The maximum number of conductors permitted in outlet boxes are:

| Common Types | Dimensions | Capacity ml (cu-in) | Number of Conductors #14 | General Usage |
|--------------|-------------|---------------------|--------------------------|-------------------|
| Octagon | 4 x 1 ½ | 245 (15) | 8 | Light or junction |
| Square | 4 x 1 ½ | 244 (21) | 12 | Junction |
| Rectangular | 3 x 2 x 1 ½ | 131 (8) | 3 | Switch or plug |
| Rectangular | 3 x 2 x 2 | 163 (10) | 4 | Switch or plug |
| Rectangular | 3 x 2 x 2 ½ | 2047 | | Switch or plug |

Note: When a dimmer switch, a timer or a GFCI receptacle is used in an outlet box, reduce the number of permitted conductors by three.

LIGHTING FIXTURE

- Install 3-way on stairs
- Light fixtures that are installed in clothes closets shall be totally enclosed (no exposed bulbs)
- Bulbs located below 2.5 m (7 feet) require mechanical protection
- Garages having more than one man door require lighting controlled by each door (3-way switch)

LIGHTING

- 3-way switching is required on stairway lighting when a stairway has four or more risers AND is leading to a finished area or to an outside entrance.
- Switches cannot be located within 500 mm from a bathtub or shower. Switches located within 1 m of a bathtub or shower shall be protected by a ground fault current interrupter of a class A type.
- An identified conductor must be installed at each location of a manual or automatic control device for the control of permanently installed luminaries at a branch circuit outlet.
- All switches need to be bonded to ground. The #6 screws are not an approved method.

SMOKE ALARMS AND CARBON MONOXIDE ALARMS

- Install smoke alarms on each floor level, including basements.
- Install smoke alarms within 5 m (16 feet) of bedrooms.
- Smoke alarms and carbon monoxide alarms are not to be installed on a circuit protected by a ground fault circuit interrupter or arc fault circuit interrupter.
- When more than one smoke detector is being installed, interconnect the smoke detectors with 14/3 NMD-90 cable and connect according to manufacturer's instructions.
- A smoke detector needs to be installed in every bedroom and interconnected together.
- Wi-fi smoke detectors hard wired for power with battery back-up are acceptable allowing for wireless inter-connectivity between devices.

Please note, the Alberta Building Code permits only wired-in smoke and carbon monoxide alarms. (Alberta Building Code – Article 9.10.18.3)

GARAGES

- Provide at least one separate circuit to the garage and one duplex receptacle for each car space. The lighting may come off this circuit.
- One receptacle shall be provided for each garage door opener and be located within 1 m (39 inches) of the opener.
- Using the same trench for gas sub-service lines and electrical power conductors is permitted as long as they are separated by 12 inches of well tamped earth.
- Attached garage receptacles need to be tamper resistant and have arc-fault protection.
- Detached garage receptacles **do not** need to be tamper resistant or be arc-fault protected.

ELECTRIC DRYER

- Provide a 30 amp circuit breaker with a 2-pole common trip
- Use #10 copper wire (NMD-90)

ELECTRIC RANGE

- Provide a 40 amp circuit breaker with a 2 pole common trip
- Use #8 copper wire (NMD-90)
- Use a 50 amp receptacle rated 125/250 volt (14-50 R)
- Use a 30 amp receptacle rated 125/250 volt (14-30 R)

RECEPTACLES (GENERAL)

- Install duplex receptacles in the walls of every finished room or area so that no point along the floor line of any usable wall space is more than 1.8 m (6 feet) horizontally from a receptacle. The usable wall space includes a wall space of 900 mm (3 feet) or more in width, but does not include doorways, windows that extend to the floor, fireplaces or other permanent installations that would limit the use of the wall space.

- Ground all receptacles.
- Connect the receptacles so that the silver terminal screw (or the screw identified as 'white') on the receptacle is connected to the white circuit wire; the brass terminal screw (or the screw identified as 'black' or 'hot') on the receptacle is connected to the black (or red) circuit wire.
- Connect only one wire under each terminal screw. Do not use the terminal screws and the 'quick-connect'.
- Receptacles shall be of the tamper resistant type (except receptacles dedicated to stationary appliances e.g. microwaves, washing machines or receptacles located above 2 m from the floor).
- Each branch circuit supplying 125V receptacles rated 20A or less shall be protected by a combination-type arc-fault circuit interrupter, except for:
 - Washrooms or bathrooms
 - Sump pumps
 - Refrigerators, gas range, counter tops, permanently fixed island and a peninsular counter space greater than 600 mm in kitchens.
- The entire branch circuit need not be provided with arc-fault protection if an arc-fault receptacle is installed at the first outlet and the wiring method consists of armoured cable between the outlet and the breaker.

BATHROOMS AND WASHROOMS

- Install one duplex receptacle, protected by a Class A ground fault circuit interrupter (GFCI) within 1 m (39 inches) of the wash basin.
- Receptacles cannot be located within 500 mm of a bathtub or shower. Receptacles located 500 mm to 1 m from a bathtub or shower must be of a Class A type.

OUTDOOR

- Provide at least one receptacle on a separate circuit. Receptacles located on the dwelling including attached carports and attached garages are to be protected by a GFCI.
- All receptacles (except for automobile heater receptacles) installed outdoors and within 2.5 m of a finished grade shall be protected by a ground fault circuit.

- Receptacles exposed to weather shall be provided with wet location cover plates (in use extra duty) whether or not a plug is inserted into the receptacle.

SOLAR/PHOTOVOLTAIC

Must be completed by a master electrician. Please refer to the website for installation information and application process.

<https://www.strathcona.ca/your-property-utilities/residential-permits/residential-improvement/solar-panels/>

IN-FLOOR HEATING

- A heating device installed less than 1.8 m above the floor shall not be installed less than 1 m horizontally from a sink (wash basin complete with drainpipe), tub or shower stall, this distance being measured horizontally between the heating device and the sink, tub or shower stall unless it is protected by a GFCI.

HOT TUBS

- A GFCI shall be installed no closer than 3 m from the water's edge.
- If using teck cable, ensure the armour of the cable is bonded through an approved ground bushing.
- Receptacles shall not be located within 1.5 m of the pool or hot tub exterior.
- Receptacles located between 1.5 m and 3 m shall be GFCI protected.

KITCHEN RECEPTACLES

- Provide a sufficient number of receptacles (15A split or 20A T-slot) along the wall behind counter work surfaces (excluding sinks, built-in equipment and isolated work surfaces less than 300 mm long at the wall line) so that no point along the wall line is more than 900 mm from a receptacle measured horizontally along the wall line.

- Receptacles within 1.5 m of sinks (wash basins complete with drain pipe) shall be protected by a ground fault protected by a GFCI.
- Provide at least one receptacle (15A split or 20A T-slot) installed at each permanently fixed island counter space with a dimension of 600 mm or greater and a short dimension of 300 mm or greater.
- Provide at least one receptacle (15A split or 20A T-slot) installed at each peninsula counter space with a long dimension of 600 mm or greater and a short dimension of 300 mm or greater.
- Refrigerators and microwave ovens require separate circuits.
- A separate circuit is recommended for dishwashers, but not required.
- #14 wire for 15 amp receptacles and #12 wire for 20 amp receptacles

LAUNDRY ROOM OR AREA

- Install a separate circuit and include at least one receptacle for the washing machine and another one in a convenient location.

UTILITY ROOM OR AREA

- Install at least one receptacle on a separate circuit for the utility room.
- Install one receptacle in each undeveloped area.
- Each utility room shall have a light controlled by a wall switch.
- Furnace switch must be located between point of entry to the room and furnace.
- A single receptacle on its own circuit is required for a sump pump, but it does not require AFCI protection.

Note: *Built-in vacuum motors require a receptacle on a separate circuit located adjacent to the unit.*

REASON FOR TAMPER RESISTANT RECEPTACLES

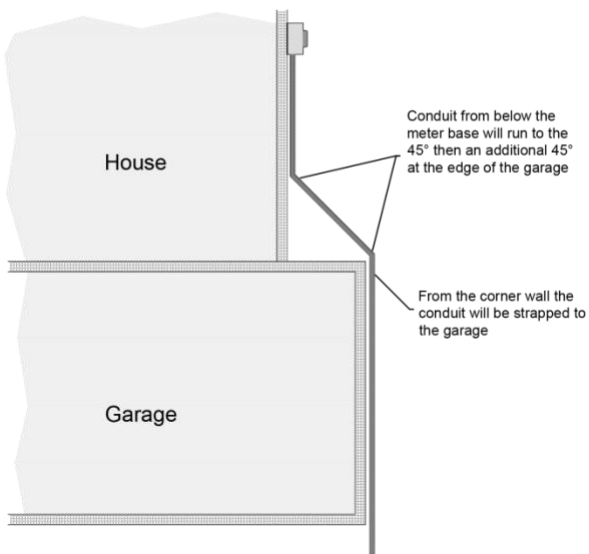
There are a significant number of electrical shock incidents that occur when children insert conductive objects into electrical receptacles. Most of these incidents take place in living areas of the home. Tamper resistant receptacles are designed to prevent contact with live electrical contacts when an object, other than a plug, is inserted into one of the receptacle slots.

OVERHEAD SERVICES

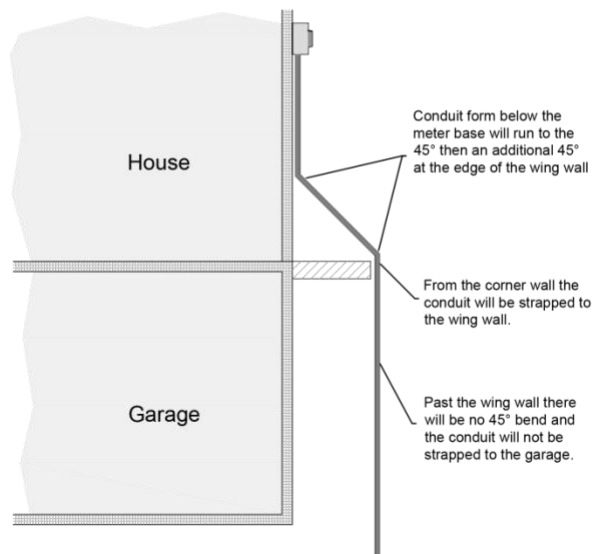
- A means of attachment shall be provided for all supply or consumer's service conductors.
- The point of attachment shall be on the same side of the building as the consumer's service head:
 - Solidly anchored to the structure or service mast
 - In compliance with the requirements of the supply authority
- Where service masts are used, they shall be of metal and assembled from components suitable for service mast use.

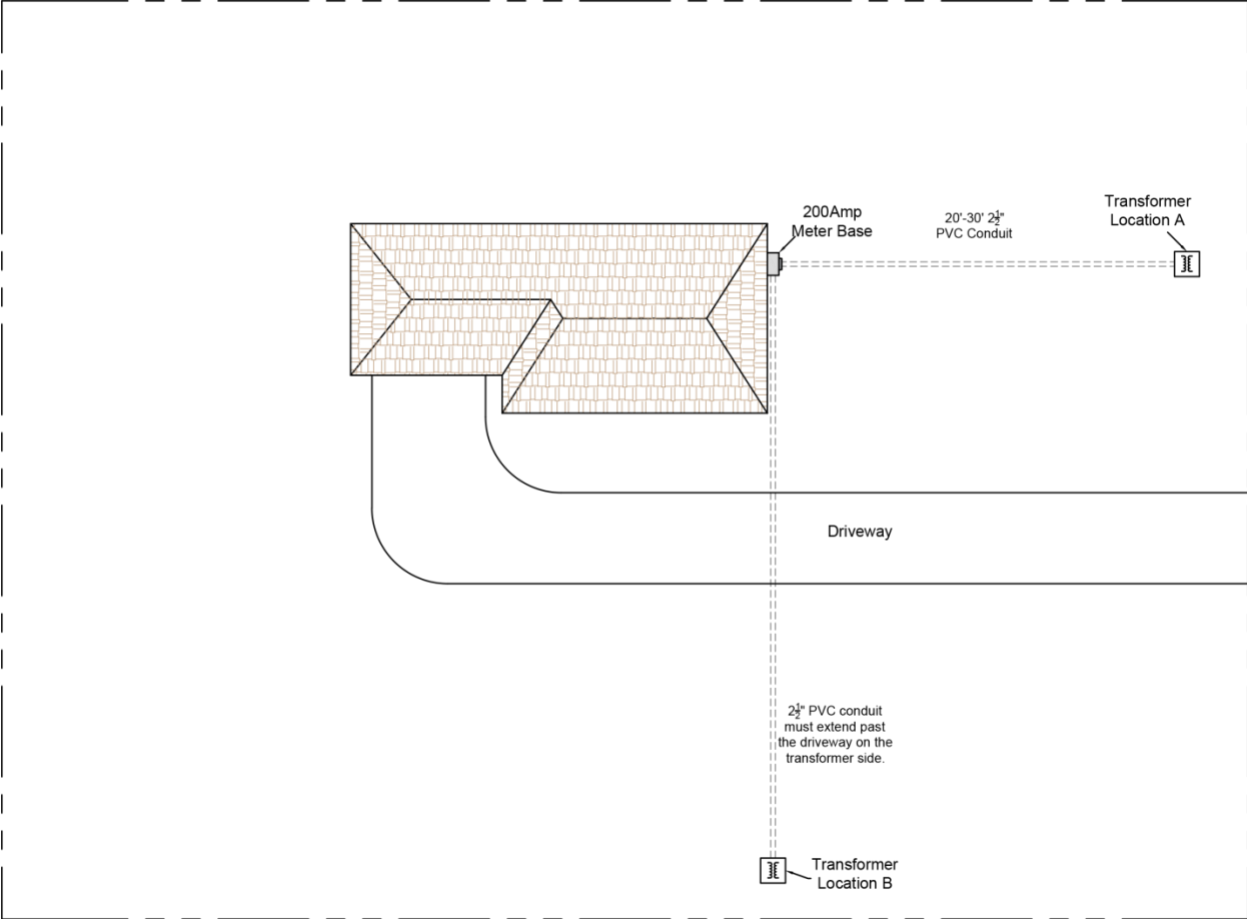
Residential Electrical Service Installation

Installation With Garage Grade Beam



Installation With Wing Wall





Wiring for lighting as per the 2018 Canadian Electrical Code:

These are typical wiring methods and are only a few examples. The purpose of these methods is to have an identified conductor (white) at each switching device box.

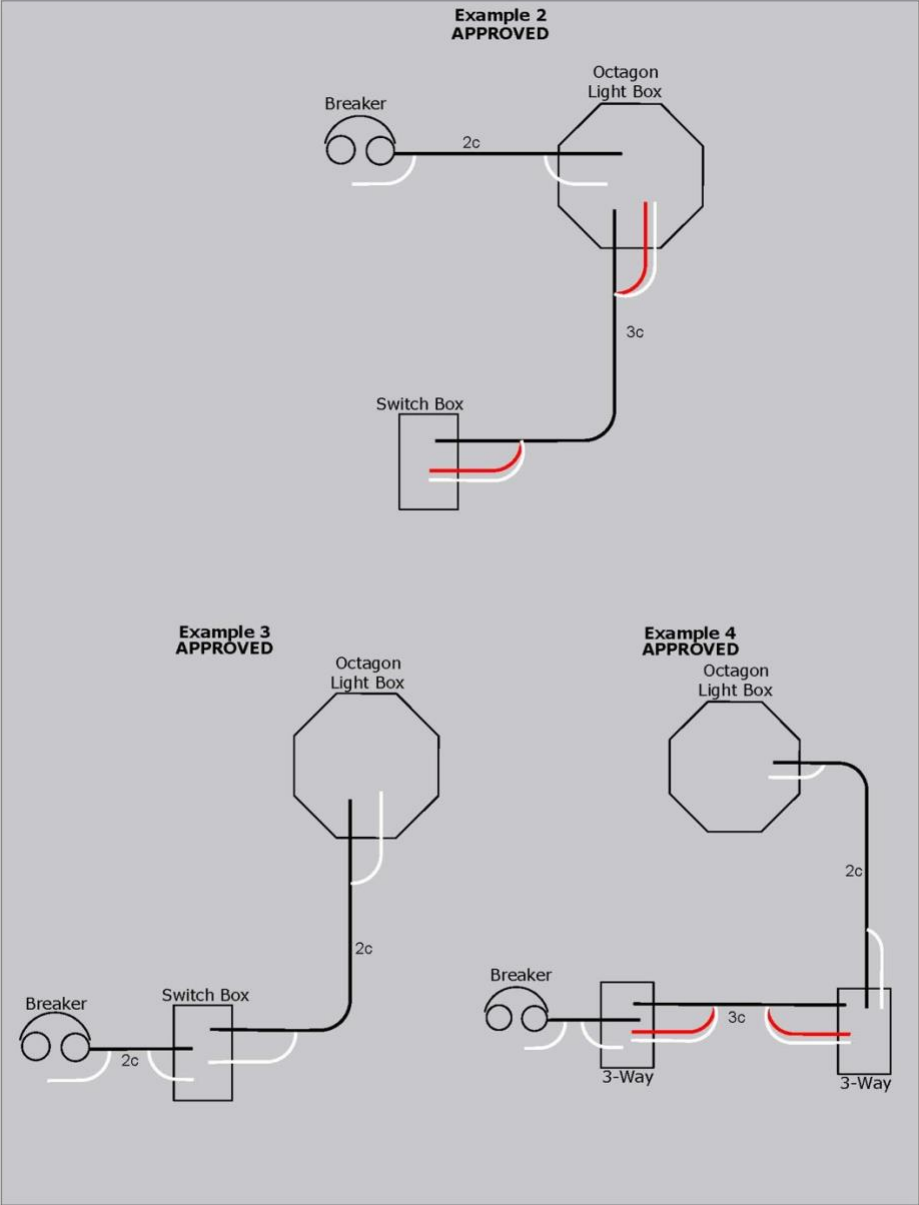


Figure 2: This installation using a 3 conductor is an approved wiring method. The black and red conductors are the travelers and the identified conductor (white) can be capped for future use.

Figure 3: This wiring method is approved.

Figure 4: This wiring method for a typical 3-way switch is approved.

