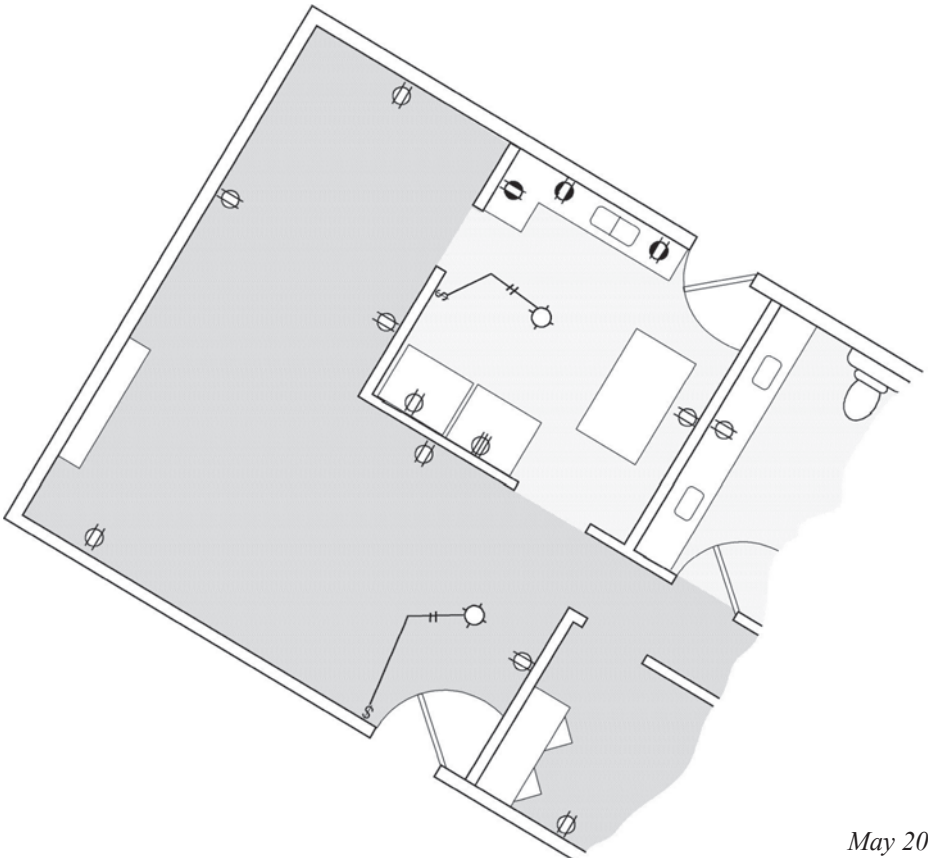


# Electrical Installations

***A homeowner guide to the Winnipeg  
Electrical By-law requirements for a  
Single Family Dwelling, Detached  
Garage or Shed.***



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## note

This booklet has been written to:

1. Provide an outline of some of the more common electrical regulations applicable to electrical installations done by the home owner; and
2. Provide information on the extent to which the electrical work must be completed prior to requesting an inspection.

The applicable sections of this booklet should be reviewed prior to commencing the project. Please note that this booklet is **not** intended to cover all of the electrical regulations for wiring. For complete electrical requirements please refer to the City of Winnipeg Electrical By-law.

*Every effort has been made to ensure the accuracy of information contained in this booklet. However, in the event of a discrepancy between this booklet and the governing City of Winnipeg By-law, the By-law will take precedence.*

***When is an electrical permit required?***

An electrical permit must be obtained from the City of Winnipeg Planning, Property and Development Department at 31 - 30 Fort Street, prior to the construction, alteration, repair, or extension of any electrical installation.

***Who may obtain an electrical permit?***

An electrical permit may be issued to:

- a) a person who holds an Electrical Contractor's License from the City of Winnipeg authorizing that person to carry out business or trade in the City of Winnipeg; **OR**
- b) the owner of a detached single family dwelling who is also the **occupant**. The owner **personally** must do the work. The permit would be issued to the owner provided the Manager of Development and Inspections is confident the work will be performed competently.

***What information is required to make an application for an electrical permit?***

To obtain an electrical permit, the applicant must present a wiring diagram for the proposed installation indicating the location of receptacles, lights, switches and all other electrical equipment to be installed. The wiring plan submitted should be comparable to the typical wiring plans shown on pages 8 and 9. It is not necessary to show any existing wiring that will not be altered.

***How long will this permit remain valid?***

The permit will expire if active work is not commenced and reasonably continued within six (6) months from the date of issuance. In addition, the Manager of Development & Inspections may cancel any electrical permit if, in his opinion, the privileges granted by that permit are being misused.

***Who is ultimately responsible for any electrical installation performed under this permit?***

The permit applicant assumes full responsibility for electrical work indicated on the permit and must ensure that the work conforms to all requirements of the Electrical By-Law.

***How many inspections are required for recreation rooms, additions, and other similar applications?***

The wiring in areas such as recreation rooms, room additions, and other similar installations, is normally allotted two inspections. The first inspection is made **prior to covering** any of the electrical installation with insulation or wall board.

The second inspection is made on completion of the work. Where additional inspections are found to be necessary an additional inspection fee may be levied.

***What must be ready for the first inspection?***

Before calling the electrical inspector for the first inspection, the following work is to be completed:

1. All the wiring for lights, switches, and receptacles are to be installed in the walls, secured to the structural members and terminated in the outlet boxes.
2. All connections, joints, and bonding in the outlet boxes must be completed, leaving unconnected only the conductors required for the connection of the light, receptacle or switch (see FIGURE 12 Typical Outlet Box Installation” on page 22).
3. At least one receptacle, light, and switch is to be connected to the wiring.
4. The wiring and connection of the 3-way switches required for the stairway lighting are to be completed.
5. If recessed lighting fixtures are to be installed, at least one fixture is to be completed.
6. The conductors are to be run into the electrical panel with the bonding (bare) conductor terminated under the ground screw and the neutral wire connected to the neutral terminal. The wires must **not** be connected to the circuit breaker or fuse until the wiring is complete.
7. On completion of this work, the electrical inspector, whose name and telephone number are indicated on your electrical permit, must be called for an inspection.

***What must be ready for the final inspection?***

For the final inspection, the electrical installation is to be fully completed in that all the light fixtures, receptacles, and switches are to be installed and connected to the normal power supply. The electrical circuits in the panel must be clearly identified on the panel directory and cover plates for receptacles, and switches are to be installed. Please contact the electrical inspector when you are ready for the final inspection.

***What are some of the specific electrical installation requirements for finished rooms, and additions?***

1. Receptacles must be located so that no point on the wall is more than 1.8 m horizontally from a receptacle measured along the floor line. This means that the distance between receptacles along a continuous wall must not exceed 3.6 m. Do not count wall space occupied by:
  - a) doorways and the area occupied by doors when fully opened;
  - b) windows which extend to the floor; and
  - c) other permanent installations that would limit the use of the wall space (e.g. fireplaces, clothes closets, etc.).These receptacles are normally installed 300 - 400 mm above the floor.
2. All 15 amp and 20 amp receptacles must be the tamper-resistant type unless they are dedicated for microwaves, refrigerators, freezers or kitchen counters or located in attics or crawlspaces.
3. A switch controlling a receptacle or lighting fixture must be installed for every room. If only one half of a duplex receptacle is switched, it will also qualify as one of the receptacles required in item 1.
4. The maximum over-current device permitted for lights and receptacles is 15 amperes (fuse or circuit breaker) and a maximum of 12 outlets (lights and receptacles) may be connected to each 15 ampere branch circuit.
5. The requirements pertaining to the number of conductors which are permitted in an outlet box are shown in TABLE 1.
6. Every stairway must be lighted. A light fixture which illuminates a stair having 4 or more risers must be controlled by “three-way” switches at the top and bottom of the stairs.
7. **Bathrooms and Washrooms:**
  - a) Ground fault circuit interrupter protection must be provided for any receptacle located within 1.5 m of a wash basin, bathtub or shower stall.
  - b) Bathrooms and washrooms must have a receptacle installed within 1 m of the wash basin.
  - c) Receptacles and switches installed in bathrooms must be located at least 1 m from the bathtub or shower stall.
  - d) Bathrooms & washrooms must have an electrically wired mechanical exhaust fan venting directly to the outdoors.
  - e) Electrical equipment associated with “jetted” bathtubs must be protected with a GFCI.

**TABLE 1 - Maximum Number of Conductors Allowed in Outlet Boxes**

Box Dimensions (inches)		Maximum Number of Conductors Permitted		
		#14	#12	#10
<b>Device</b>	3 x 2 x 1 1/2	5	4	3
	3 x 2 x 2	6	5	4
	3 x 2 x 2 1/4	6	5	4
	3 x 2 x 2 1/2	8	7	5
	3 x 2 x 3	10	8	6
<b>Octagonal</b>	4 x 1 1/2	10	8	6
	4 x 2 1/8	14	12	9

**Notes to TABLE 1**

- 1) The bare bonding conductors in cable assemblies are not counted.
- 2) 2 conductors must be deducted from the figure shown in the table for each switch or receptacle that is to be installed in the outlet box.
- 3) One conductor must be deducted for each pair of wire connectors in the outlet box.
- 4) A "device" box typically contains a receptacle or switch.












**EXAMPLE:** A 3x2x2 in. box allows six #14 conductors. If a receptacle is to be installed, 2 conductors must be deducted from the figure shown in the Table (6 – 2 = 4). Note that now only 4 conductors are allowed in a 3x2x2 in. outlet box with a receptacle. Therefore, in this example, one 2-conductor cable may enter the outlet box and one 2-conductor cable may leave the outlet box.

**8. Kitchens:**

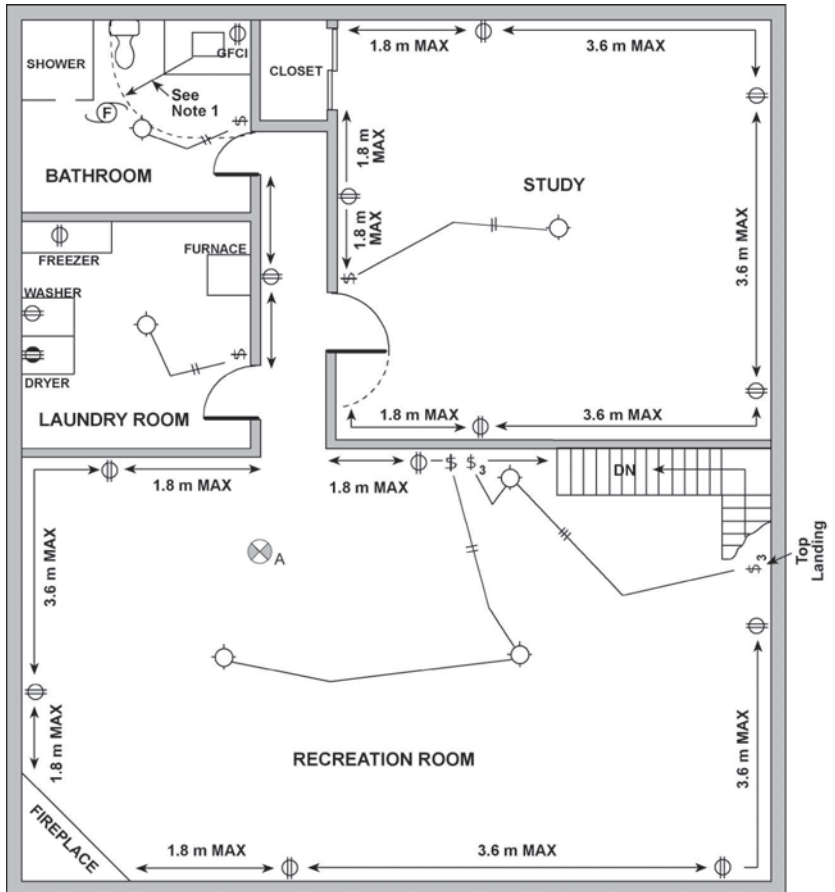
- a) Kitchen counter receptacles must be located on the wall behind the counter work surface so that no point along the wall is more than 900 mm from a receptacle. This generally requires that receptacles be spaced 1.8 m apart.
- b) Sinks, built-in equipment, and isolated work surfaces less than 300 mm long at the wall, need not be included when calculating the spacing of counter receptacles.
- c) At least one receptacle shall be provided at each permanently fixed island counter and at each peninsular counter space, that is 300 mm x 600 mm or larger.
- d) Kitchen counter receptacles must be of the "15A split" type, as illustrated in FIGURE 20 on page 26, or 20A T-slot.
- e) A receptacle must be installed for a refrigerator and must be supplied by a branch circuit that does not supply any other outlets except that of a recessed clock receptacle.
- f) Receptacles installed within 1.5 m of sinks shall be protected by a ground fault circuit interrupter (GFCI).

9. Circuits supplying receptacles in sleeping rooms must be protected by an arc-fault circuit interrupter (AFCI). An AFCI is a device intended to provide protection from the effects of arc-faults by de-energizing the circuit when an arc-fault is detected.
10. At least one branch circuit must be provided solely for each receptacle installed to supply power to a central vacuum system.
11. At least one branch circuit must be provided solely for each receptacle installed to supply power to a sump pump.
12. **Outdoor/Garage Receptacles:**
  - a) All receptacles located outdoors and within 2.5 m of ground or grade level must be protected by a ground fault circuit interrupter (GFCI) of the Class A type.
  - b) At least one receptacle, supplied by a separate branch circuit, must be provided outdoors for the use of electrical appliances.
  - c) At least one receptacle, supplied by a separate branch circuit, shall be provided for each driveway.
  - d) At least one receptacle, supplied by a separate branch circuit, must be provided for each car space in a garage or carport. Garage/carport light fixtures and a garage door opener may also be connected to this circuit.
13. Receptacles as per Item 1. must be installed in basement walls that are finished with drywall or wood panelling to within 450 mm of the floor.
14. Many of the above mentioned requirements are illustrated in the wiring plans for typical main floor and rec-room areas shown in FIGURES 1 and 2.

## SYMBOL LEGEND (for Figures 1 and 2)

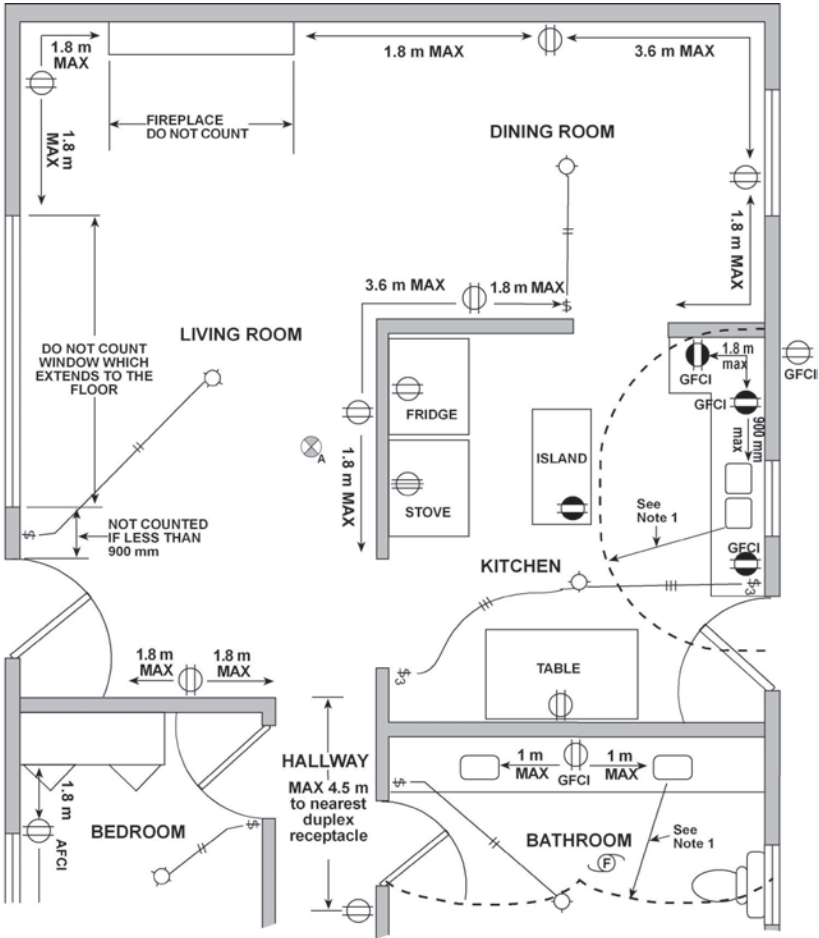
	Lighting Outlet		Single Pole Switch		Three Conductor
	Receptacle		3-Way Switch		Two Conductor
	15A split receptacle or 20A T-slot		Dryer Receptacle		Range Receptacle
	Exhaust Fan		120V Smoke Alarm		

### FIGURE 1 - Wiring Plan for Typical Rec-Room



Note 1: Receptacles within 1.5 m of sinks must be GFCI protected.

**FIGURE 2 - Wiring Plan For Typical Main Floor Living Area**



Note 1: Receptacles within 1.5 m of sinks must be GFCI protected.

## ***What are the requirements for smoke alarms?***

A smoke alarm detects smoke from a fire and warns the occupants with an audible alarm.

Smoke alarms conforming to CAN/ULC-S531, “Smoke Alarms” must be installed in each dwelling.

They must be installed on or near the ceiling. Sufficient smoke alarms must be installed so that:

1. There is at least one smoke alarm on each floor level, including basements, that is 900 mm or more above or below an adjacent floor level, and
2. Each bedroom is protected by a smoke alarm either inside the bedroom or, if outside, within 5 m of the bedroom door, measured following corridors and doorways, and
3. The distance, measured following corridors and doorways, from any point on a floor level to a smoke alarm on the same level does not exceed 15 m.

Installers should refer to the manufacturer’s installation guidelines included with the smoke alarm.

Smoke alarms must be permanently connected to a 120V electric lighting circuit and must have no disconnect switch between the overcurrent device (breaker or fuse) and the smoke alarm. The circuit must not be protected by a ground fault or an arc-fault circuit interrupter (GFCI or AFCI).

Where more than one smoke alarm is required in a dwelling, the smoke alarms must be wired so that the activation of one alarm will cause all alarms within the dwelling to sound.

## ***What are the requirements for carbon monoxide alarms?***

Where a dwelling contains a fuel burning appliance (eg.: furnace, fireplace, wood stove, gas appliance, etc.) or has an attached garage, a carbon monoxide alarm is required to be installed so that each bedroom is protected by a carbon monoxide alarm either inside the bedroom or, if outside, within 5 m of the bedroom door, measured following corridors and doorways.

Carbon monoxide alarms that are supplied by a 120V circuit must have no disconnect switch between the over current device (breaker or fuse) and the carbon monoxide alarm.

### **What are the minimum circuit, and receptacle requirements for detached garages and carports?**

A lighting outlet and fixture must be provided for a garage and at least one duplex receptacle, supplied by a separate 15 amp branch circuit, must be provided for **each** car space in a garage. Garage light fixtures and a garage door opener may also be connected to this circuit. Also, at least one duplex receptacle, supplied by a separate 15 amp branch circuit, must be provided for each driveway.

### **Is it a requirement to install a panelboard in the garage?**

No, a panelboard is not necessary. However, if one is to be installed, the ampacities (current rating) of the larger conductor sizes that may be required to supply this panelboard are listed in TABLE 2.

### **Are overhead power supply conductors a cause for concern?**

YES! If you plan to build a garage, carport or storage shed beneath overhead power supply conductors, you must first contact the Hydro utility to ensure that proper clearance can be maintained between the building roof and the overhead conductors

Contact your local Manitoba Hydro District Operating Centre at the phone number listed on your Manitoba Hydro bill.

**TABLE 2 - Typical Copper Conductor Ampacities & Over-Current Protection**

NMWU Conductor Type FOR DIRECT EARTH BURIAL.			NMD-90 Conductor Type FOR INDOOR USE ONLY.		
Wire Size	Ampacity (60°C)	Circuit Breaker or Fuse	Wire Size	Ampacity (90°C)	Circuit Breaker or Fuse
#14 AWG	15 Amp	15 Amp	#14 AWG	15 Amp	15 Amp
#12 AWG	20 Amp	20 Amp	#12 AWG	20 Amp	20 Amp
#10 AWG	30 Amp	30 Amp	#10 AWG	30 Amp	30 Amp
# 8 AWG	40 Amp	40 Amp	# 8 AWG	45 Amp	40 Amp
# 6 AWG	60 Amp	60 Amp	# 6 AWG	65 Amp	60 Amp
# 2 AWG	100 Amp	100 Amp	# 3 AWG	105 Amp	100 Amp

**Note to TABLE 2:** The ampacities shown in the table above are based on NMWU and NMD-90 conductor types. For ampacities of other types of conductors, reference should be made to the City of Winnipeg Electrical By-law.

***Are there any special requirements for outdoor receptacles?***

Receptacles located outdoors must be protected with an approved ground fault circuit interrupter (GFCI) of the class A type.

***What wiring must be ready before calling the inspector?***

**Underground wiring:** For wiring to buildings, such as detached garages, and sheds, the underground conductors between the house and the garage or shed must be installed in the trench. If mechanical protection is used it must be in position. The trench may be backfilled in the centre, provided the ends of the trench are left open for inspection purposes.

**Interior wiring:** Before the walls or ceiling of the garage or shed are insulated or covered with wallboard or other material, an inspection of the rough wiring is required. (The inspector's name and telephone number will be indicated on your electrical permit.)

***Are there required minimum installation depths for underground conductors?***

Yes! The required minimum installation depths for underground wiring are listed in TABLE 3. For a typical underground wiring plan please see FIGURE 3.

***Can the trench for my direct buried power conductors be used for any other purpose?***

Yes! However, a minimum horizontal separation of not less than 300 mm must be provided:

- a) between the direct buried power conductors and any gas line, water line or sewer line, and
- b) between the direct buried power conductors and any Cable TV or communication cable not having a metal sheath.

**TABLE 3 - Minimum Installation Depth for Underground Wiring**

WIRING METHOD	MINIMUM DEPTH NON-VEHICULAR AREAS		MINIMUM DEPTH VEHICULAR AREAS	
	No Mechanical Protection	With Mechanical Protection <sup>(1)</sup>	No Mechanical Protection	With Mechanical Protection <sup>(1)</sup>
Conductors or cable <b>NOT</b> having a metal sheath or armour. e.g. NMWU	600 mm	450 mm	900 mm	750 mm
Conductor or cables having a metal sheath or armour. e.g. TECK 90	450 mm	300 mm	600 mm	450 mm
Raceway <sup>(2)</sup> e.g. Rigid metal conduit or Rigid PVC conduit	450 mm	300 mm <sup>(3)</sup>	600 mm	450 mm <sup>(3)</sup>

**Notes to TABLE 3:**

- 1) *Mechanical protection must consist of one of the following:*
  - a) *planking e.g. 2 x 4s or 2 x 6s with a wood preservative other than creosote; or*
  - b) *polyethylene pipe.*
- 2) *Conductors or cables installed in underground conduits must be approved for wet locations, e.g. TW, RW, NMW, OR NMWU.*
- 3) *Raceways installed at a depth of 300 mm in non-vehicular areas and at 450 mm in vehicular areas must have mechanical protection such as treated planking described in note 1 above.*

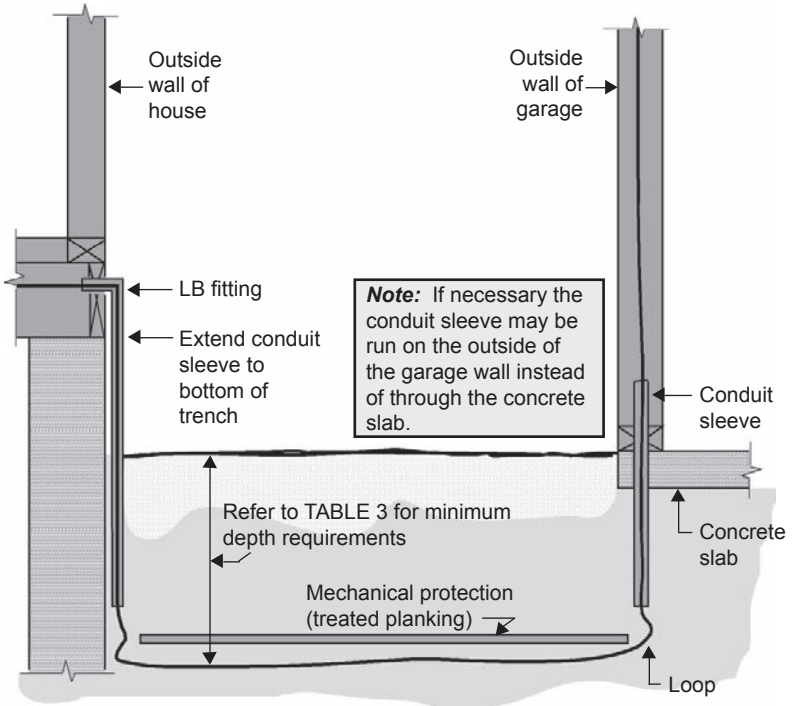
**NOTICE:**

Precautions should be taken to avoid gas service lines from being enclosed in or under buildings as per CSA Z184 Gas Pipelines Systems Standards. Additionally, care should be taken when excavating to avoid disturbing other underground service lines including telephone cables and electrical power cables.

**Please contact:**

- Manitoba Hydro at 480-1212 for gas and hydro lines,
  - MTS at 941-7267 for telephone lines, and
  - Shaw Cable at 480-7429,
- before proceeding with construction or any underground excavation.

**FIGURE 3 - Wiring Plan For Underground Cable to Detached Garage or Shed**



**Note to FIGURE 3:**

*This is a diagram of an acceptable installation of NMWU underground cable between the house and a detached garage or shed. Note that the cable, when installed at a depth of 450 mm, must be protected in the ground by planking at least 50 mm nominal thickness which is treated with a wood preservative other than creosote. As an alternative, the conductors may be protected by running it in a length of polyethylene water pipe from the house to the garage. Where the conductors emerge from the trench, they must be protected against mechanical damage by a piece of rigid metal conduit or rigid PVC conduit. The cable loops at each end of the trench are to prevent damage from ground movement. These loops should be installed whenever a cable emerges from a conduit into direct contact with the earth.*

***What is the first step to follow before proceeding with a service change?***

Before proceeding with any electrical service change, it is imperative that you check with Manitoba Hydro, to confirm the acceptability of your proposed meter location and to ensure that they will bring their conductors to the point where you wish to locate your service conduit. Having determined the “**Service Point**”, the installation of the service must comply with the applicable requirements of the Winnipeg Electrical By-law.

Manitoba Hydro will normally limit metering installations to one meter of the same voltage and service characteristic per residential customer/tenant area.

***How do you arrange for electrical power disconnect, inspections, and power reconnect for your service change?***

Prior to commencing any work, contact Manitoba Hydro to arrange to have the electrical power disconnected. It should, however, be noted that they will not reconnect the new service until it has been inspected by the City of Winnipeg electrical inspector. Therefore, it is imperative that you notify your electrical inspector of the time you expect to be finished the work so he can arrange to inspect your work on completion.

Please note that the inspector’s office hours are between 8:30 and 9:30am weekdays and this is the only time he can be contacted. Electrical services will not be reconnected after 3:30pm on weekdays, nor on holidays or weekends.

***What must be ready before you call the inspector?***

To be ready for an electrical inspection, the following work must be completed:

1. The service conduit must be completed, secured, and adequately braced.
2. All service conductors must be installed and properly terminated.
3. The ground conductor must ground all of the service entrance equipment, the neutral bar in the service and the service conduit (if metal), and continue to the street side of the water meter or other acceptable grounding electrode.
4. At least one branch circuit from the old service must be connected to the new panel so the inspector can determine if this is being done in a proper manner.

## **What are the minimum electrical installation requirements for electrical service changes and/or new installation?**

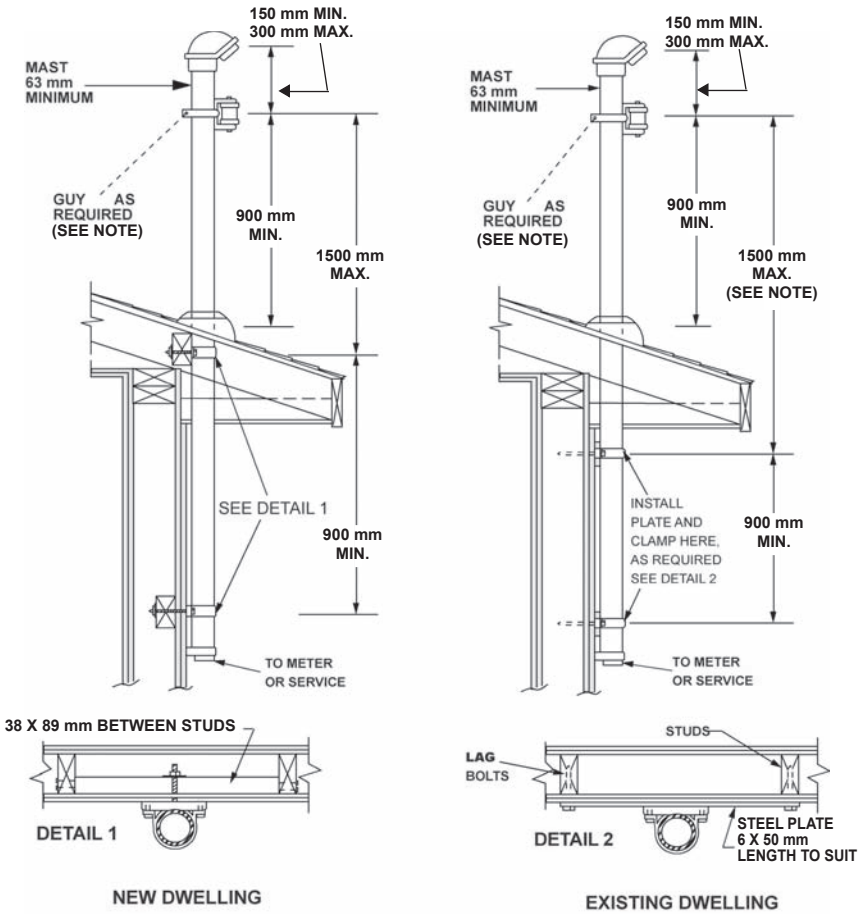
The typical requirements for a residential service are:

1. a) **100 amperes:**
  - A 27 mm conduit containing:
    - two #3 R-90 X-link copper conductors; and
    - one #6 bare copper neutral.
- b) **200 amperes:**
  - A 35 mm conduit containing:
    - two #00 R-90 X-link copper conductors; and
    - one #6 bare copper neutral.
2. Both 100A and 200A residential services require one #6 copper grounding conductor connected to a suitable grounding electrode, i.e. the street side of the water meter.
3. The service head height must not be less than 3.5 m nor more than 9 m above grade.
4. The meter base must be located not less than 1200 mm nor more than 1800 mm to centre above finished grade or deck.

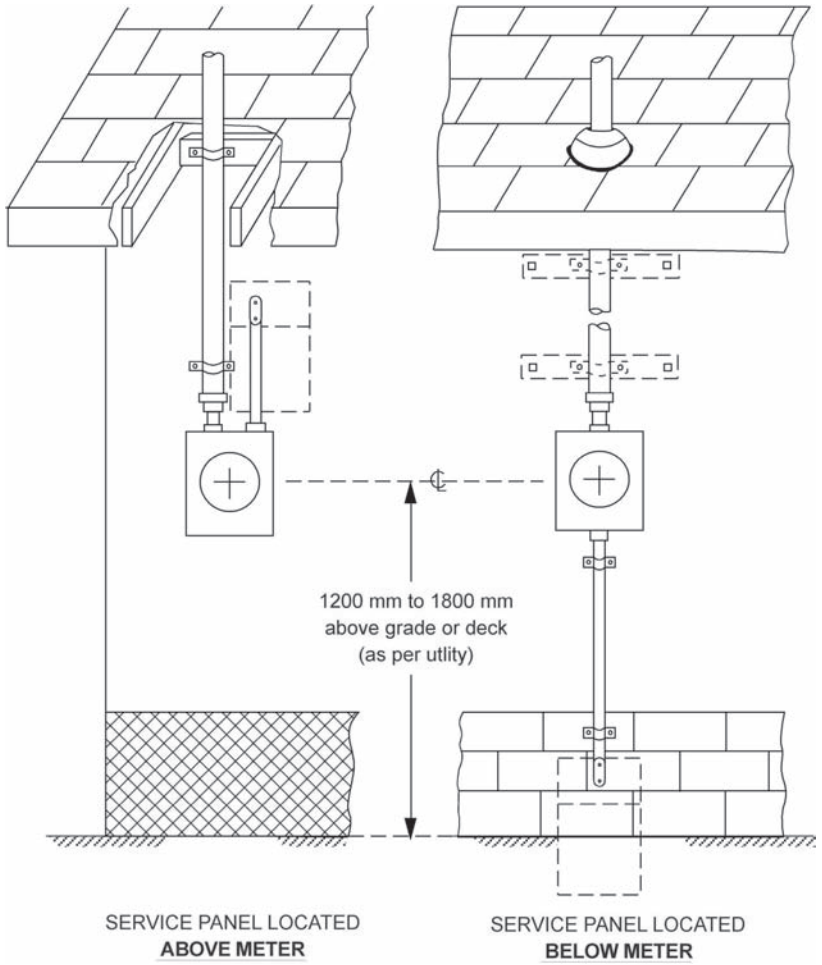
### **NOTE:**

- 1) *The service conduit must not enter the top of the service box unless drained outdoors.*
- 2) *Where the service conduit enters the building, the LB fitting must be filled with a compound that does not absorb moisture to prevent condensation.*
- 3) *To meet the minimum height requirements, a service mast may be required on single storey buildings.*
- 4) *See FIGURES 4 & 5 for typical service mast and meter installation methods.*

**FIGURE 4 - Typical Service Mast Installation**



**FIGURE 5 - Typical Service Meter Installation**



**NOTE:** The following information is provided to assist you in avoiding some of the more common errors which are made in interior wiring. Please recognize that this information is not intended to cover all of the applicable electrical regulations of the City. More detail regarding these regulations may be determined by referencing the City of Winnipeg Electrical By-law.

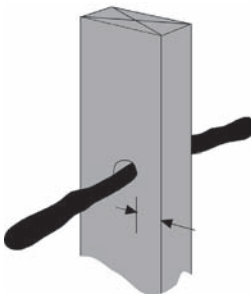
**Are there requirements for the installation of wiring in structural members such as studs in a wall?**

Yes! Cable running through stud members must be kept at least 32 mm from any face of the stud which can be nailed upon. If this distance cannot be maintained, a protection plate is required in the area where the wiring passes through the stud. This protection plate must be at least 16 gauge metal (See FIGURE 6).

**How must the cable be supported?**

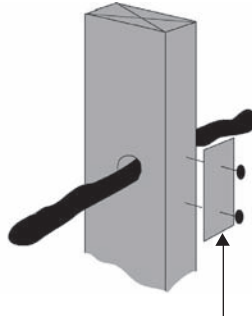
The cable must be secured within 300 mm of the outlet box and approximately every 1.5 m throughout the run (See FIGURE 7).

**FIGURE 6 - Cable Protection in Stud Walls**



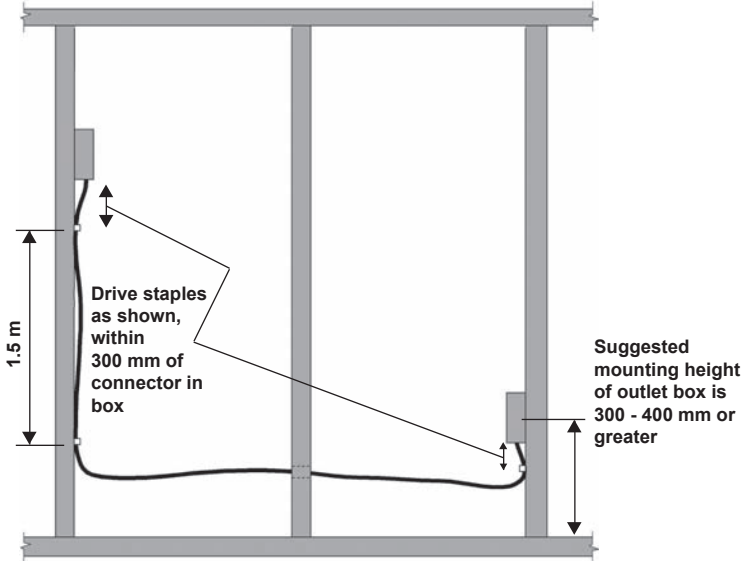
Provide at least 32 mm distance from each face.

OR



Use 16 gauge metal plate for cable protection.

**FIGURE 7 - Cable Support in Stud Walls**



***Are there any particular requirements for installing outlet boxes?***

Yes, mounting nails or screws can pass through or project into the interior of an outlet box only if the nails or screws are located within 6.4 mm of the back or ends of the box. In addition, the nails or screws must not interfere with conductors or connectors (see FIGURE 12).

Openings placed through vapour barriers for the installation of outlet boxes must be effectively sealed to maintain the integrity of the vapour barrier. This can be done through the use of an approved poly/vapour outlet box or with an ordinary outlet box as shown in the following section.

***What is the recommended practise for installing the vapour barrier behind outlet boxes on exterior walls?***

For a proper installation of outlet boxes with vapour barrier protection, the following steps should be followed.

**STEP 1:** Cut a 600 x 600 mm piece of 0.15 mm poly film and place against framing prior to attaching the outlet box as shown in FIGURE 8.

**STEP 2:** Attach the outlet box over the centre of the poly film square allowing approximately 200 mm of film to extend past the front of the framing.

**STEP 3:** Puncture the film below the box and install the electrical wire through the film and into the box.

**STEP 4:** Seal the puncture by taping the film to the wire (FIGURE 9).

**STEP 5:** Tuck the poly film into the box. This will completely enclose the box in a poly film bag (FIGURE 10).

**STEP 6:** Apply poly film vapour barrier on the warm side of the entire insulated area which will cover the outlet boxes.

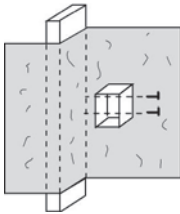
**STEP 7:** Make a small hole in the covering vapour barrier opposite the box and pull the poly film out of the box through the hole, leaving the front of the box accessible for installation of fittings, etc. Fold the film away from the box, on top of the vapour barrier, and tape in place (FIGURE 11). If a lap of at least 140 mm is not achieved on all sides, a vapour barrier tape should be used to seal the joint.

**STEP 8:** Install inside wall finish.

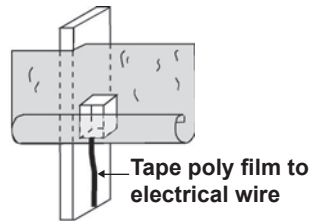
**CAUTION!** THIS METHOD IS NOT RECOMMENDED WHERE HIGH TEMPERATURE OR VENTILATED, RECESSED FIXTURES ARE TO BE USED.

## OUTLET BOX VAPOUR BARRIER INSTALLATION

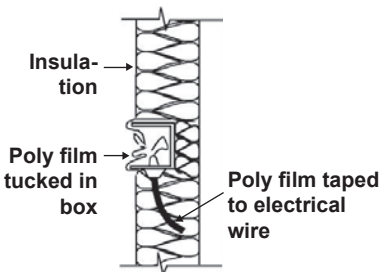
**FIGURE 8**



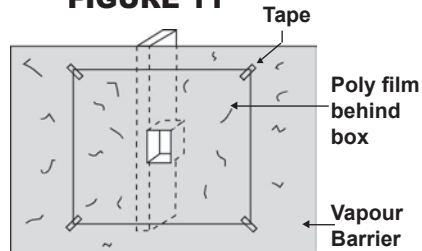
**FIGURE 9**



**FIGURE 10**

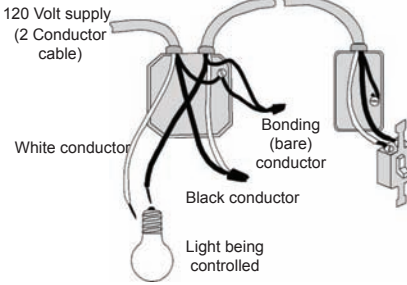


**FIGURE 11**

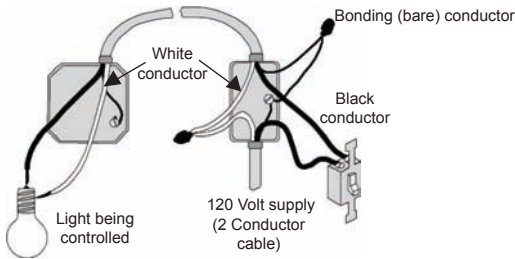




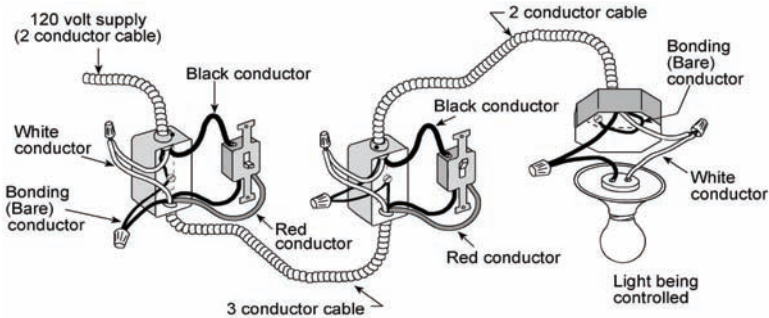
**FIGURE 13 - Light Switch Control Method.**  
(120 V supply to light first)



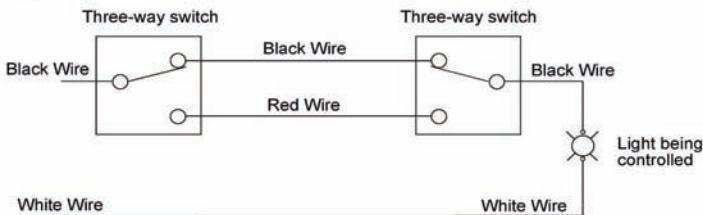
**FIGURE 14 - Light Switch Control Method.**  
(120 V supply to switch first)



**FIGURE 15 - "Three Way" Switch Wiring**



**Wiring Diagram**

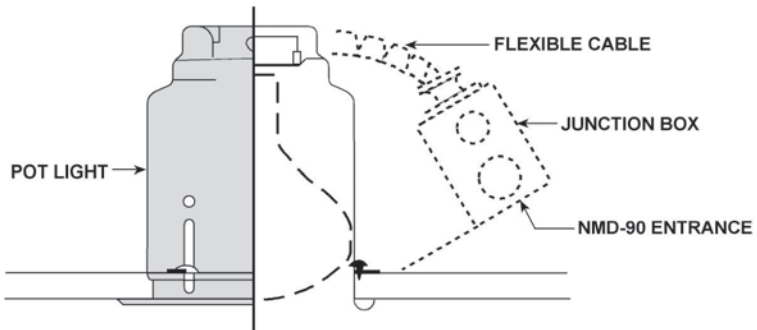


Recessed fixtures may also be required to be installed with approved vapour barriers

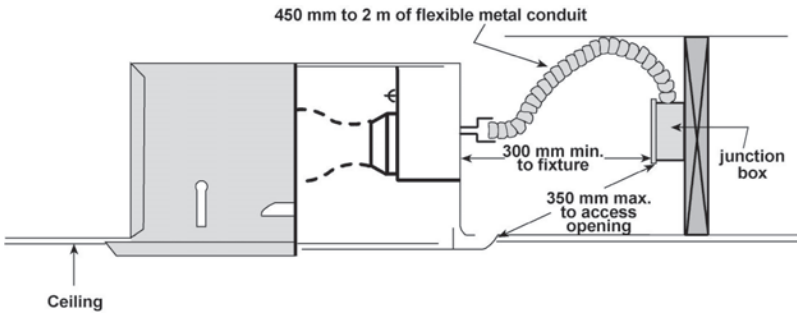
Recessed fixtures normally come in 2 different types: The **first** type is the pre-wired fixture which comes complete with the flexible cable from the fixture to a junction box mounted on the side of the fixture frame. This type of fixture is the most convenient fixture to use as it only requires the branch circuit conductors to be brought into and terminated in the side mounted junction box (See FIGURE 16).

The **second** type of recessed fixture is much less expensive yet requires more work by the installer. The fixture will come with high temperature conductors. These conductors must not be cut off but run through a flexible metal conduit (450 mm - 2 m in length) in their entirety and terminated in a junction box located not less than 300 mm from the lighting fixture. This junction box must be accessible for maintenance. If access is through the opening for mounting the fixture, then the opening must not be less than a circle of 180 cm<sup>2</sup>, with no dimension less than 15 cm, and the outlet box must be mounted within 350 mm of the opening. For fixtures having lesser dimensions than that listed here, the junction box must be made accessible through a ceiling opening not less than a square or rectangle of 400 cm<sup>2</sup>, with no dimension less than 20 cm (see FIGURES 17 and 18).

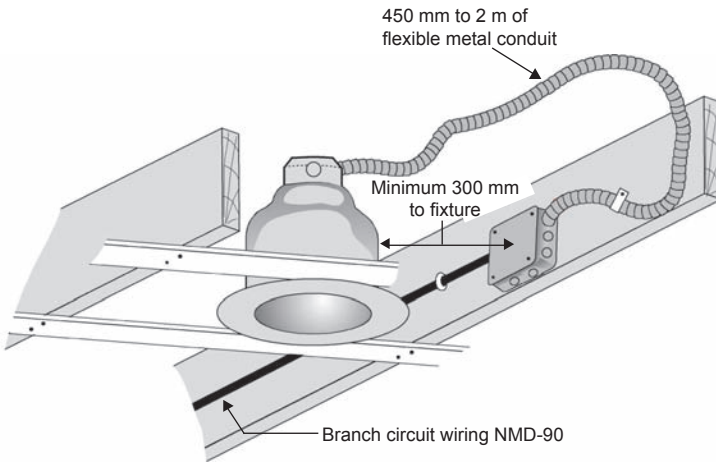
**FIGURE 16 - Pre-Wired Fixture**



**FIGURE 17 - Recessed Square Fixture**



**FIGURE 18 - Potlight Fixture**



**Note:** Flexible metal conduit should not be confused with armoured cable (BX). Armoured cable is not acceptable for wiring between the fixture and the junction box.

**How should duplex receptacles be connected?**

When connecting duplex receptacles please note that all receptacles are polarized (see FIGURE 19). That is, the black or “hot wire” must be connected to the brass coloured screw terminal. The white or neutral conductor must be connected to the nickel plated screw terminal. The bonding conductor for the circuit must terminate under the bonding screw in the outlet box and then must be carried out and be terminated under the green bonding screw on the receptacle.

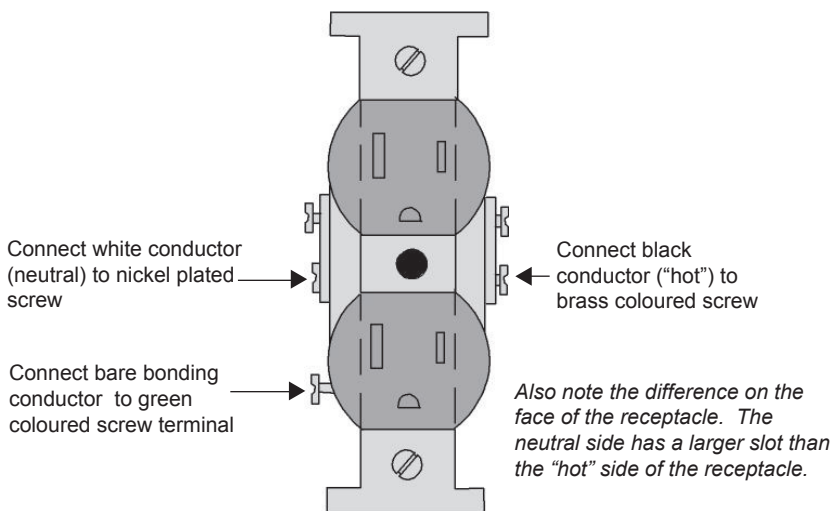
Where existing receptacles in dwellings do not have a bonding means, a bonding conductor must be provided or the circuit must be protected by a GFCI.

**What are split receptacles, and where and how are they to be installed?**

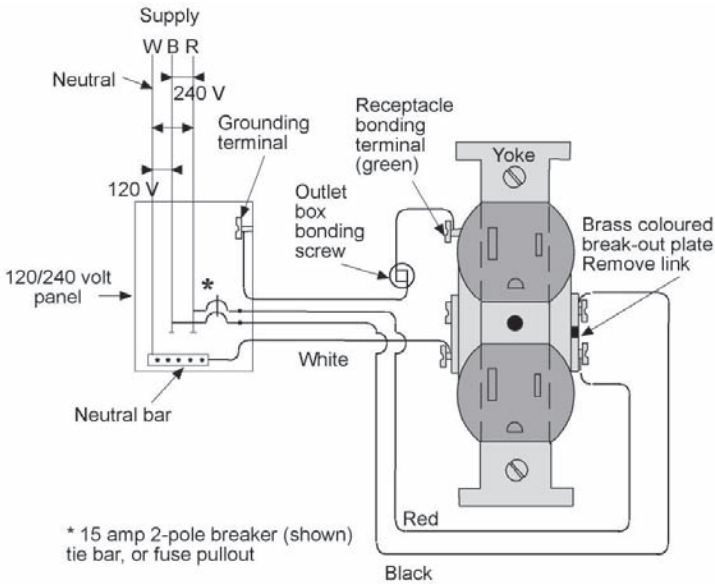
A split receptacle is a duplex receptacle which is supplied by a multi-wire branch circuit (See FIGURE 20). Split receptacles are typically installed along the wall of kitchen counter work surfaces, island counters, and peninsular counters where ground fault protection is not required (ie. not within 1.5m of sinks).

For a kitchen counter, not more than two split receptacles may be connected to a multi-(three) wire circuit.

**FIGURE 19 - Duplex Receptacle Connections**



**FIGURE 20 - Split Receptacle Wiring Diagram**



*How can I determine what size wire and overcurrent rating are required for 240 volt electric baseboard heaters?*

TABLE 4 illustrates the maximum permitted electric heating load that may be connected to a single 240 volt circuit.

**TABLE 4 - Maximum Permitted 240 Volt Electric Baseboard Heating Load**

Maximum Connected Heating Load, not more than:	Minimum Wire Size NMD-90 Copper Cable	Fuse or Breaker Size
2,880 Watts	#14 AWG	15 Amp, 2 pole
3,600 Watts	#14 AWG	20 Amp, 2 pole
3,840 Watts	#12 AWG	20 Amp, 2 pole
4,800 Watts	#12 AWG	30 Amp, 2 pole
5,760 Watts	#10 AWG	30 Amp, 2 pole

**Are there any special requirements for fuses or breakers supplying 240 volt electric heat?**

Yes! The maximum rating permitted for a fuse or breaker is 30 Amps. Where a breaker is used it must be of the two pole type. The use of two single pole breakers with interlocked handles is not permitted in this case. Where fuses are used, they must be contained in a “dead front fused pull-out”. This device consists of a removable block which holds both fuses of the 240 Volt circuit.

**Are there any other requirements I should be aware of?**

Yes! Thermostats must be installed to control the baseboard heater(s) in each heated area or room. Thermostats may either be wall mounted or built into the baseboard heater.

**FIGURE 21 - Typical 240 Volt Electric Heating Wiring Diagrams**

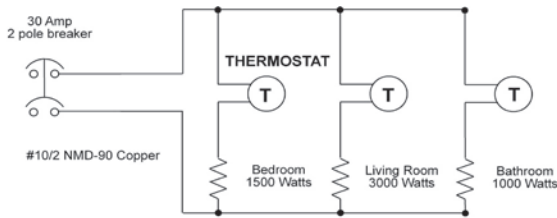


Diagram 1

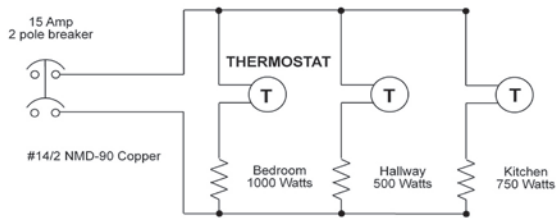


Diagram 2

**EXAMPLE:** In diagram 1 of FIGURE 21, the connected heating load is 5,500 Watts. Referring to TABLE 4, a 30 Amp, 2 pole breaker and #10 AWG conductors would be required. In diagram 2 of FIGURE 21, the load is 2,250 Watts therefore, the minimum wire size is #14 AWG connected to a 15 Amp, 2 pole breaker.

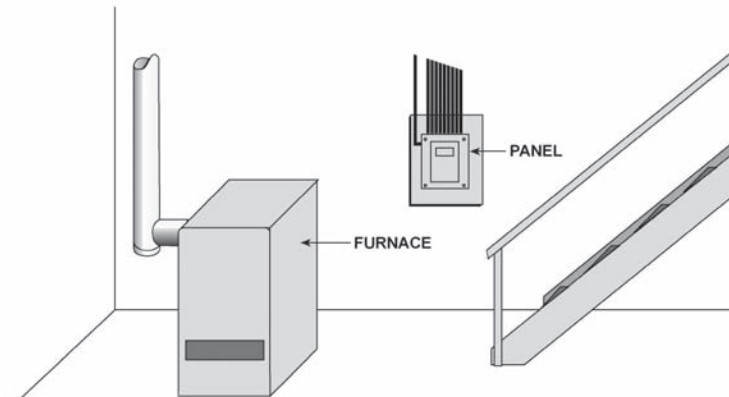
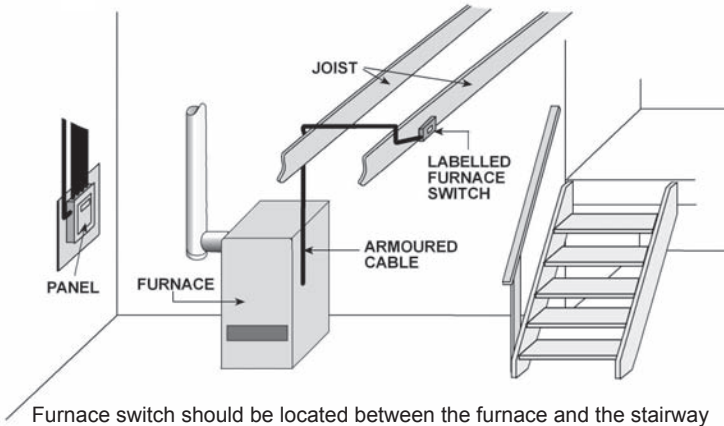
**Note to FIGURE 21:** Diagrams 1 and 2 above are examples only and should not be used to determine heating requirements for any particular room.

The circuit supplying electric baseboard heating must not be used for any other purpose. This guide does not cover the installation of other types of electric heat such as electric furnaces, radiant heat panels, etc.

***Are there special requirements with respect to the location/relocation of a furnace switch?***

The furnace switch must be labelled to indicate the equipment it controls. The furnace switch **must** be located in such a place so that a person does not have to pass the furnace to gain access to the switch, as indicated in FIGURE 22.

**FIGURE 22 - Furnace Switch Location**



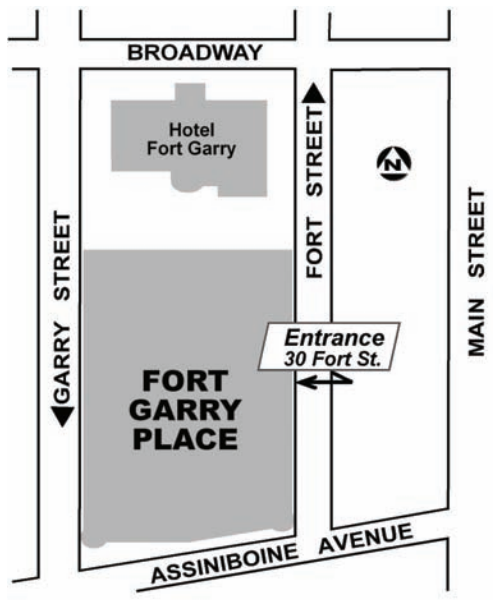
Where the panel board is located between the stairway and furnace, the furnace circuit breaker or fuse can serve as the furnace disconnect



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