



WEBINAR

Wiring for Canadian Homes – Part 3 of 3

Jun 20, 2023

By: Wissam Geahchan, Applications Engineer



Nexans
ELECTRIFY THE FUTURE

ATTENTION

AUDIENCE PARTICIPATION

- **Questions can be asked at any time using the chat function on the webinar screen**
- **Any unanswered questions will be followed up through email**
- **This presentation, a recording of the webinar and a brief survey will be emailed to all registrants**

Wissam Geahchan



Applications Engineer, Nexans Canada

- Active member on several industry standards committees
- Experience applying the Canadian Electrical Code in a variety of applications
- Licensed soccer coach

AGENDA

Introduction

Part 1 -

- Service Installations
- Panel and Service Size
- Branch Circuits

Part 2

- Receptacles
- Lighting

Part 3 - *Today*

- Smoke Alarms and CO Detectors
- Major Appliances & Electrical Equip.

Summary

Q&A



PREFACE: Nexans Products

Residential

For single and multi-family dwelling units, Nexans manufactures high quality, reliable and innovative solutions that provide ease of installation and increased durability and safety when installed in residential structures.

[Nexans - Residential](#)



RESIDENTIAL
SUPERVEX® NMWU



RESIDENTIAL
CANADEX® NMD90 Copper



RESIDENTIAL
CANADEX® NMD90
Aluminum

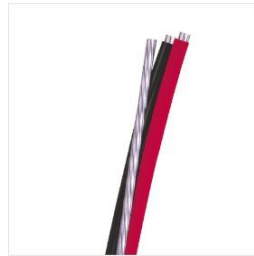


RESIDENTIAL
HEATEX® NMD90

Utility – Transmission & Distribution

Nexans manufactures a complete line of utility wire and cable for power transmission, distribution and service entrance from the generating station to the residential, commercial or industrial installation.

[Nexans - Utility – Transmission & Distribution](#)



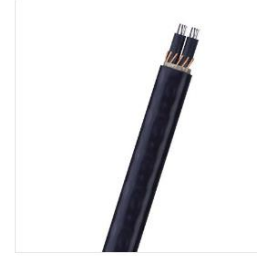
UTILITY – TRANSMISSION & DISTRIBUTION
NS75 & NS90



UTILITY – TRANSMISSION & DISTRIBUTION
USEI90

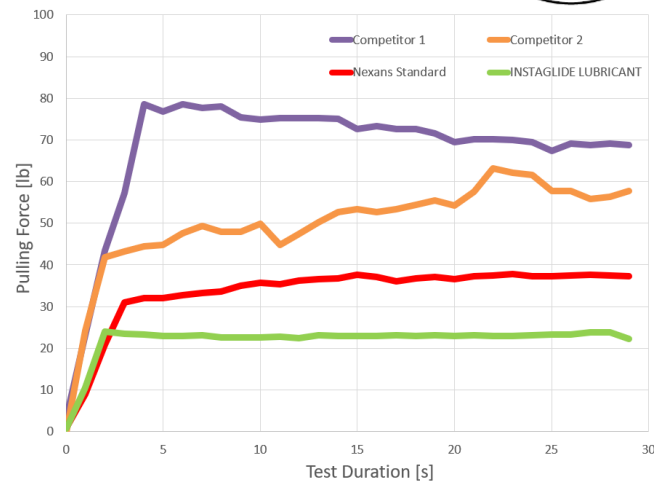


UTILITY – TRANSMISSION & DISTRIBUTION
USEI75



UTILITY – TRANSMISSION & DISTRIBUTION
USEB90

CANADEX® 2.0 NMD90



Instaglide lubricant



Easy-lifting handle



Metre markings



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SMOKE ALARMS

A device that detects the presence of smoke and sounds an alarm at a predetermined level of smoke concentration.

The National Building Code of Canada (NBC) provides the requirements for when and where a smoke alarm is required. The CE Code supplements and provides the wiring requirements.

ULC (Underwriters' Laboratories of Canada) Standard CAN/ULC-S521, *Smoke Alarms*.

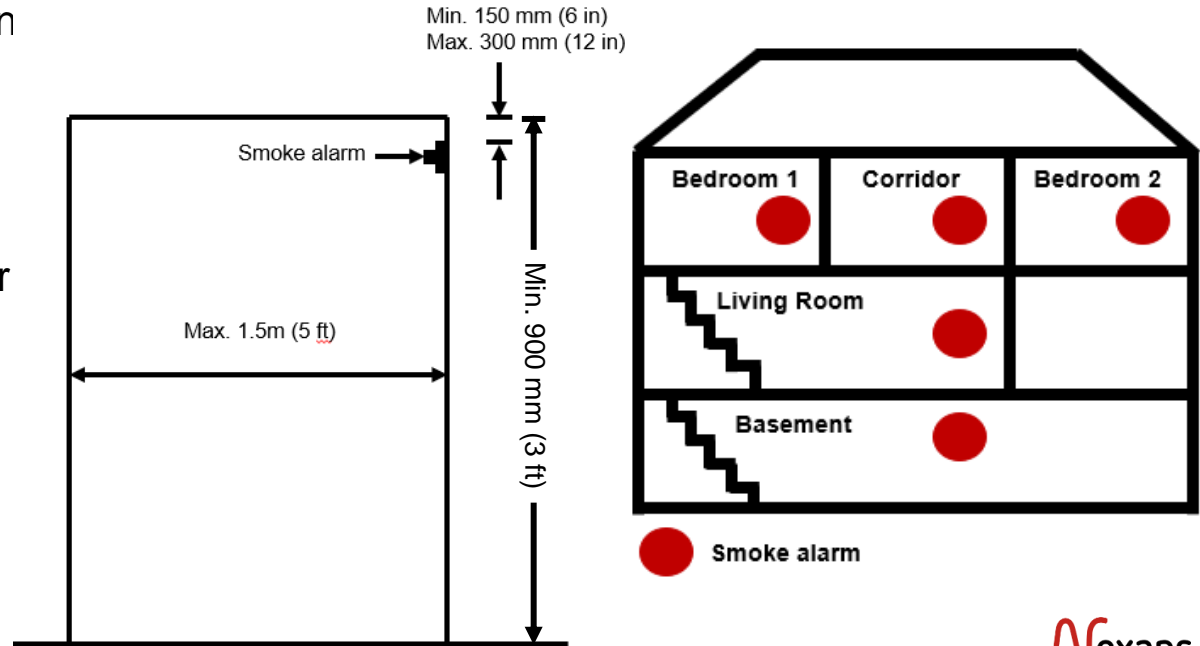


SMOKE ALARMS

The NBC requires that smoke alarms be installed on each floor level, including basemen

Smoke alarms must NOT be connected to any circuit that:

- is protected by an AFCI or GFCI; or
- has only receptacles connected to it.



CO DETECTORS

A device that detects the presence of carbon monoxide gas to prevent carbon monoxide poisoning.

CSA 6.19, *Residential Carbon Monoxide Alarming Devices*,

Installed in each room containing a solid-fuel burning appliance that does not incorporate doors that substantially close off the fire box when the appliance is in operation.

These appliances include open wood- or coal-burning fireplaces that do not have airtight doors across the hearth, Franklin stoves, and cast-iron pot-bellied stoves.



CO DETECTORS

CO detectors are typically installed in a circuit that supplies only lighting outlets or that has both lighting outlets and receptacles.

CO detectors must not be connected to branch circuits that supply kitchen counter and dining area receptacles, refrigerators, outlets in a garage, or outdoor receptacles, or to any general-use branch circuit that:

- Is protected by an arc fault circuit interrupter or a ground fault circuit interrupter; or
- Has only receptacles connected to it.

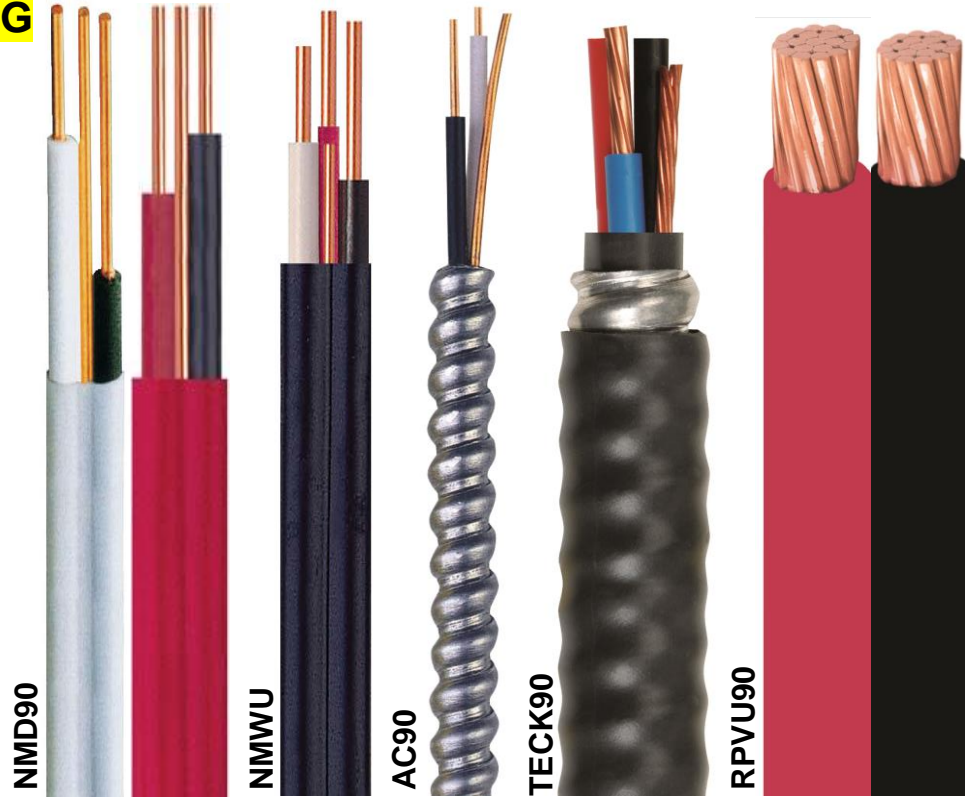


NMD90

MAJOR APPLIANCES & ELEC EQUIP

SPECIAL WIRING NEEDS IN A DWELLING

1. Direct-connected kitchen equipment
2. Water heaters
3. Space heaters and furnaces
4. Air conditioners
5. Pool and spa equipment
6. Central vacuum systems
7. Large appliance motors
8. Electric vehicle supply equipment
9. Solar photovoltaic systems



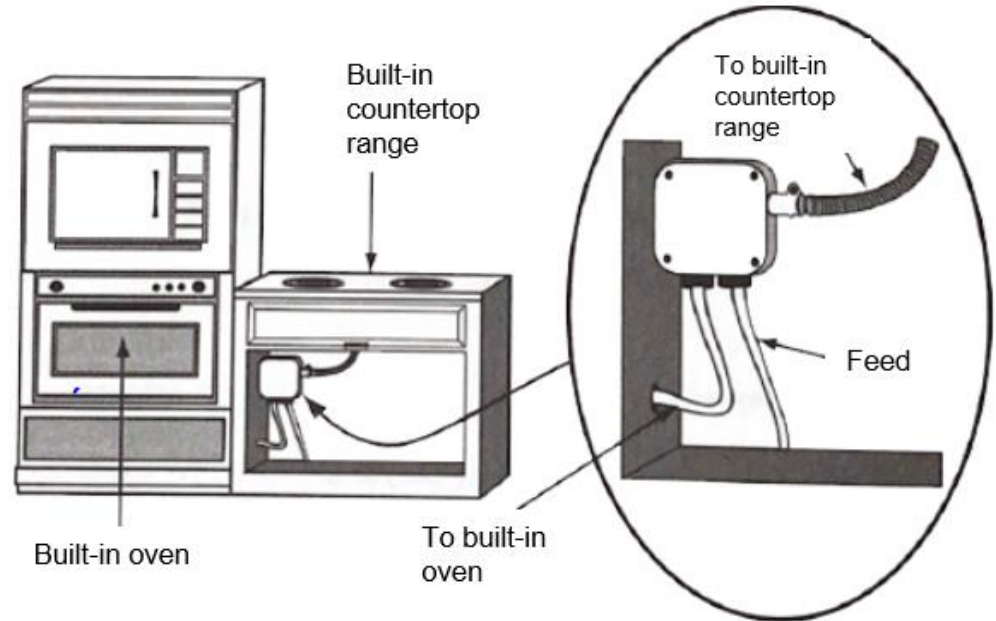
KITCHEN EQUIPMENT

BUILT-IN OVEN AND/OR COUNTERTOP RANGE

When a built-in oven or countertop range is installed in a kitchen, they are connected directly to a separate branch circuit. i.e., no receptacle.

Circuit requirements vary depending on the model of oven that is being installed.

Conductors and overcurrent protection are determined by the oven's wattage, voltage, and current ratings.

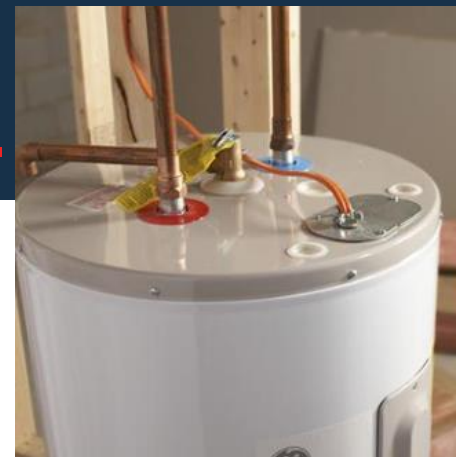
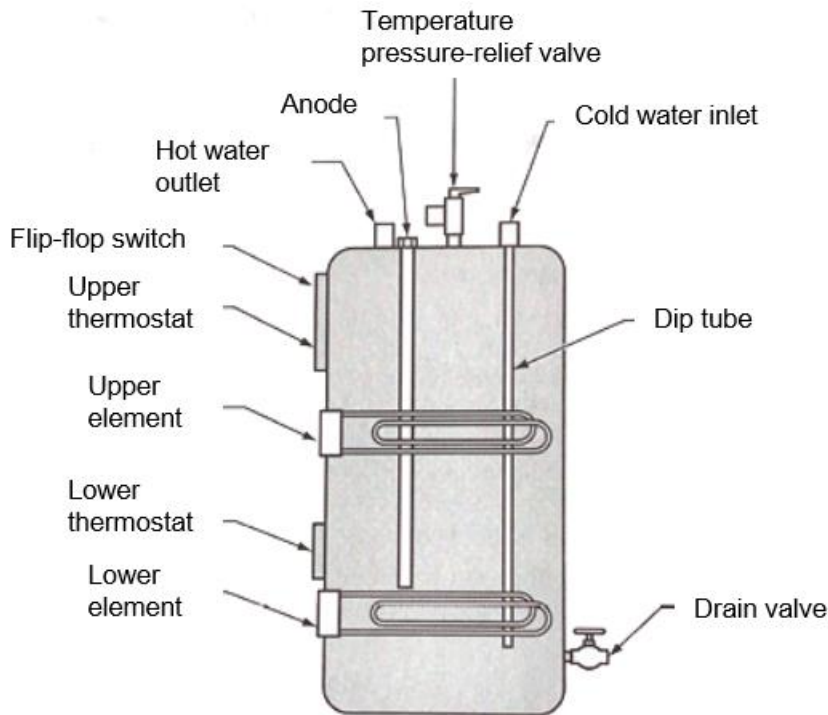


ELECTRIC WATER HEATERS

ELECTRIC STORAGE-TANK WATER HEATER

Element Ratings

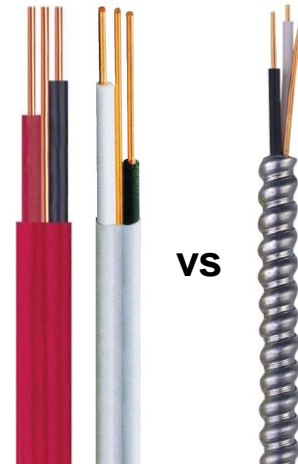
Capacity, gal	Top element, W	Bottom element, W
40	3000	3000
40	3000	1000
60	4500	4500
60	4500	1500



Wiring

NMD90

AC90



ELECTRIC WATER HEATERS

IN-LINE WATER HEATER

In-line water heaters heat the water on demand before it flows thru the hot water faucet.

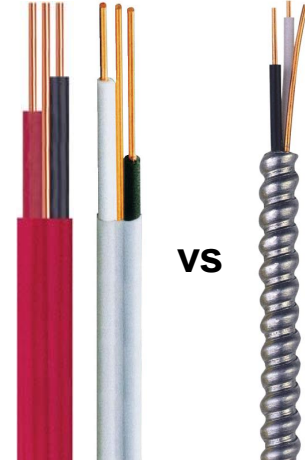
They are usually installed near the sink, inside a cupboard beneath the sink, or in a similar location.



Wiring

NMD90

AC90



SPACE HEATING EQUIPMENT

NATURAL GAS, PROPANE, AND OIL FURNACES

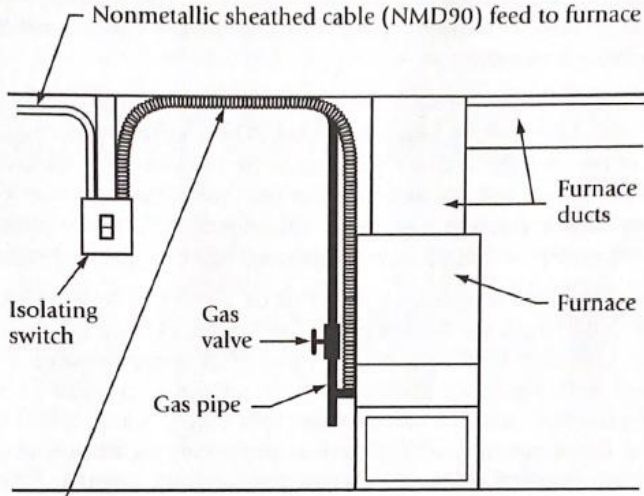
Residential furnaces typically have outputs of up to 400 000 BTU per hour (BTUh).

Must be connected directly to a single branch circuit that is used for no other purpose.

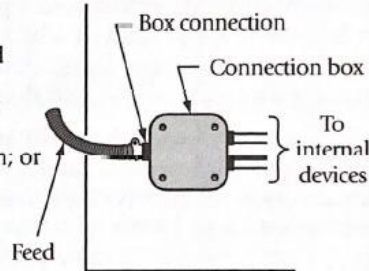
Each furnace must be supplied with a disconnecting means that cuts off the electrical supply to the furnace allowing maintenance and servicing which must be located b/w the furnace and the point of entry into the area in which the furnace is installed.



SPACE HEATING EQUIPMENT



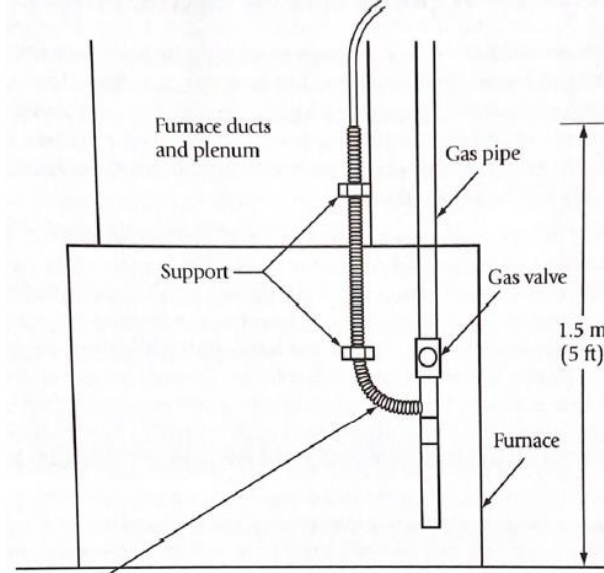
- (a) Nonmetallic sheathed cable (NMD90) run inside 16 mm (½ in) flexible conduit for mechanical protection; or
- (b) Armoured cable



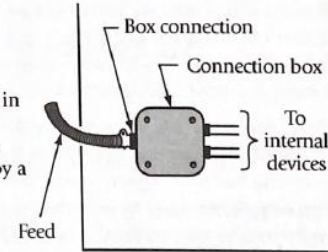
NMD90



NMD90



- (a) Nonmetallic sheathed cable (NMD90) installed in 16 mm (½ in) flexible conduit to connect to the furnace connection box by a box connector; or
- (b) Armoured cable



AC90



SPACE HEATING EQUIPMENT

ELECTRIC FURNACES

The first consideration in installing an electric furnace is to determine what size of furnace will be needed to heat the dwelling.

Electric furnaces consist of banks of 5 kW electric heaters. A 10-kW furnace has two banks of 5 kW heaters, a 15-kW furnace three banks and so on, up to a maximum of 30 kW.

When the thermostat requires the furnace to be switched on, not all banks of 5 kW heaters are turned on.



SPACE HEATING EQUIPMENT

Electric furnaces in dwellings must also be supplied with a disconnecting means.

The thermostat for an electric furnace usually switches a relay that, in turn, controls the operation of the furnace.

Electronic thermostats have many features that can help to save energy costs.



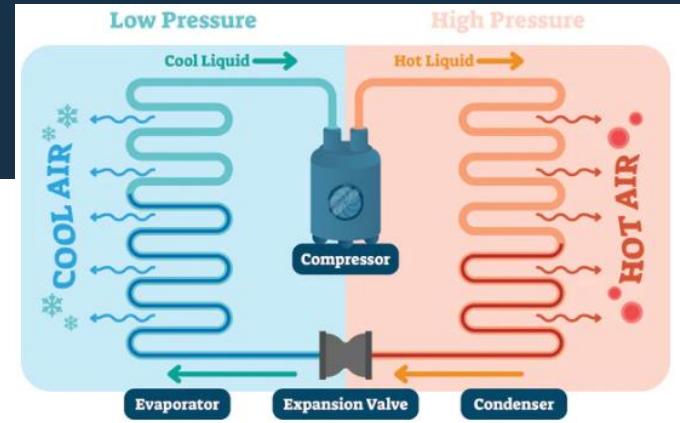
AIR CONDITIONERS

1. INDIVIDUAL AIR CONDITIONING UNITS

Individual units are usually connected to the electrical system by a power supply cord.

It is generally recommended, although not required by the Code, that an individual unit be placed on a separate branch circuit used only for the air-conditioning unit.

The sizing of the conductors and overcurrent protection for the AC circuit is based on the load characteristics of the AC, which vary from model to model.



AIR CONDITIONERS

2. CENTRAL AIR-CONDITIONING UNITS

Central air-conditioning units use the dwelling's forced-air furnace fan to circulate cooled air through the dwelling's ductwork.

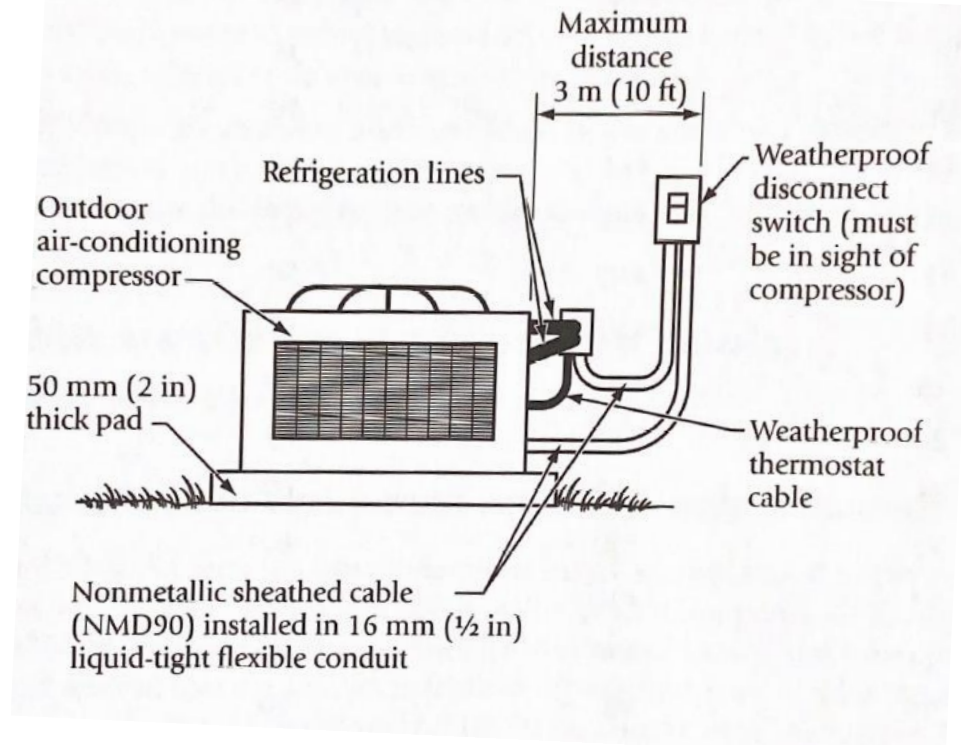
Central units for dwellings usually require a 240V, single-phase circuit, with current ratings varying from 8 A to 30 A.

The compressor unit is located outdoors in a well-ventilated area. It should be placed on a pad [usually 500mm (2 in) patio slabs], mounted on a bracket attached to an exterior wall, or otherwise kept out of direct contact with the earth.



AIR CONDITIONERS

Air-conditioning compressor connections and disconnect switch

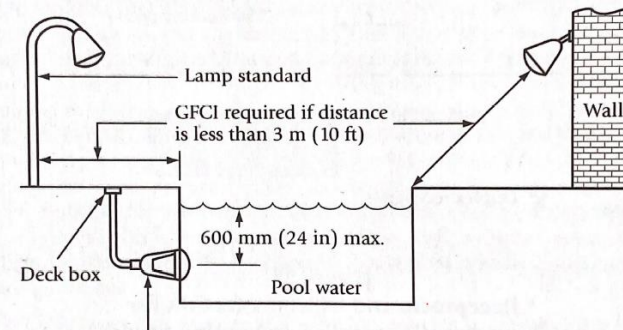
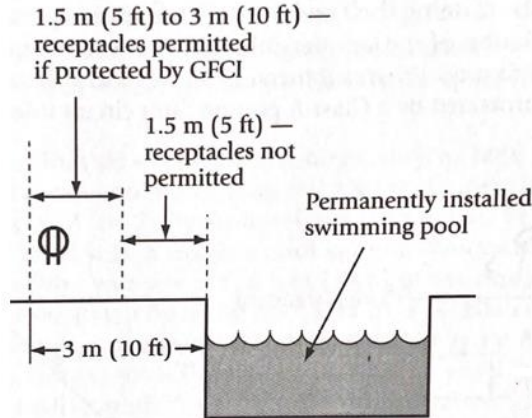


PERM-INSTALLED SWIMMING POOLS

Cannot be readily disassembled for storage.

When any electrical equipment, such as lights, receptacles, and pump motors, is installed within 3 m of the inside walls of the pool, the associated circuits be protected by a Class A GFCI.

When underwater or submersible lighting fixtures are required by the owner for decorative or safety purposes, a **wet-niche** fixture is commonly used.



Wet-niche fixture (150 V max.) — GFCI required.

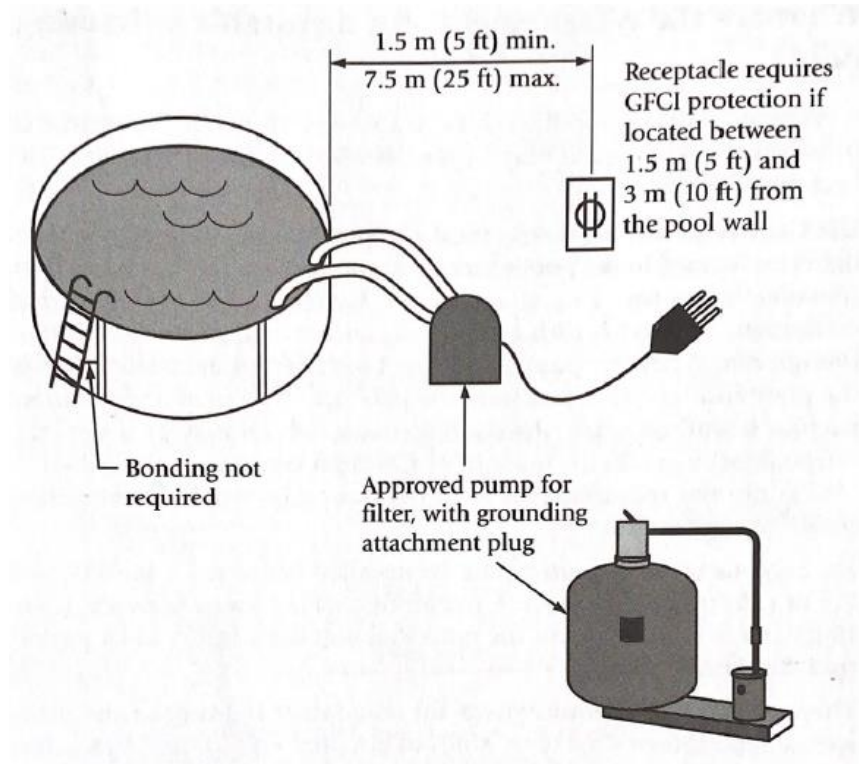
Forming shell usually has threaded connection to rigid conduit running to deck box.

STORABLE SWIMMING POOLS

May be readily disassembled for storage and later reassembled.

Generally, the only electrical equipment associated with a storable pool is a cord-connected electric filter pump.

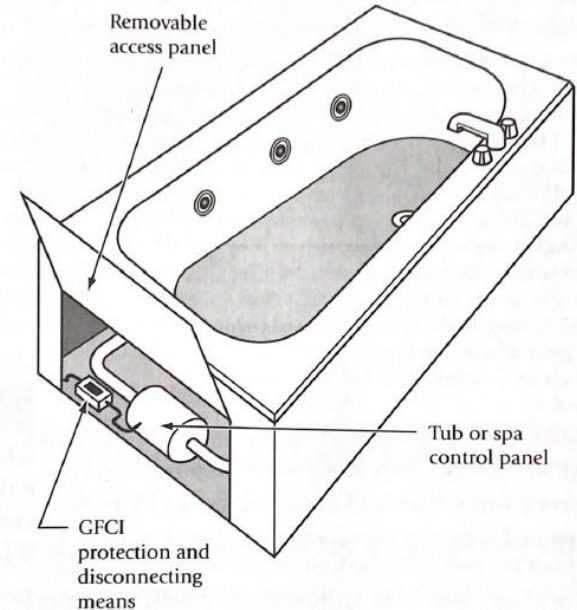
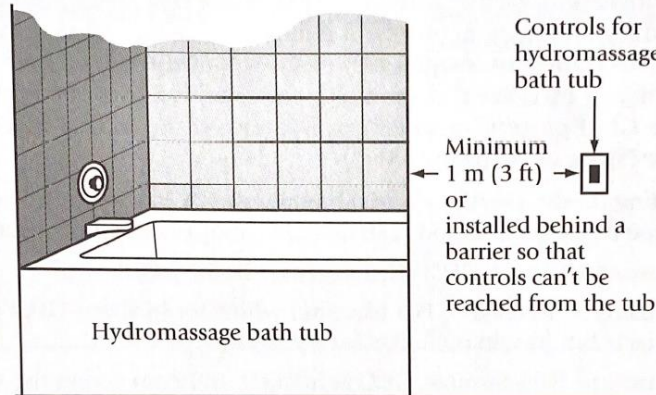
When the pump is within 3m of the inside walls of the pool and not separated from the pool by a permanent barrier, such as wall or fence, the supply circuit, which may be a general-purpose branch circuit, must have GFCI protection.



HYDROMASSAGE TUBS

The Code requires Class A GFCI protection for any electrical equipment associated with a hydromassage tub.

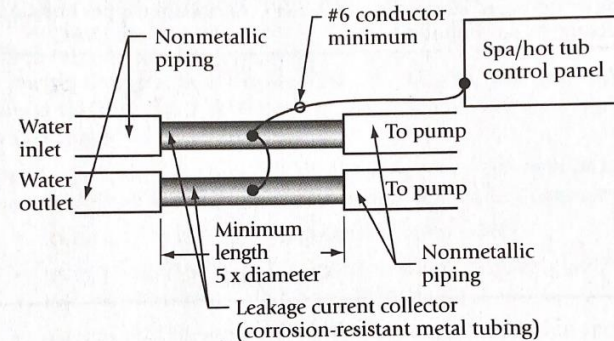
The controls of a hydromassage tub are often air switches on the tub that control the pump; these pose no shock hazard.



SPAS AND HOT TUBS

Spas and hot tubs are like hydromassage tubs but are usually larger, not intended to be filled and drained with each use, and often installed outdoors.

The Code also requires, with some exceptions, that field-assembled spas and hot tubs be protected by **leakage current collectors**.

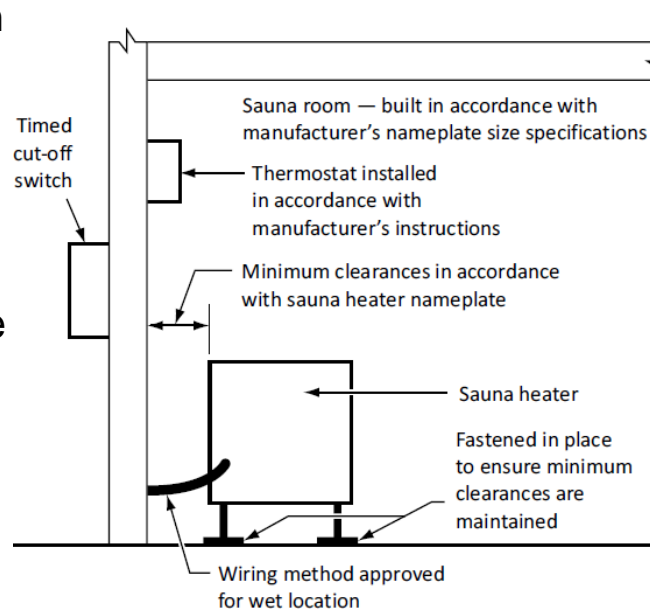


SAUNAS

The room in which a sauna is installed must be built according to the specs on the nameplate of the sauna heater.

Sauna heaters come in a wide variety of sizes to meet the different requirements posed by the size, shape, construction, and location of the sauna room.

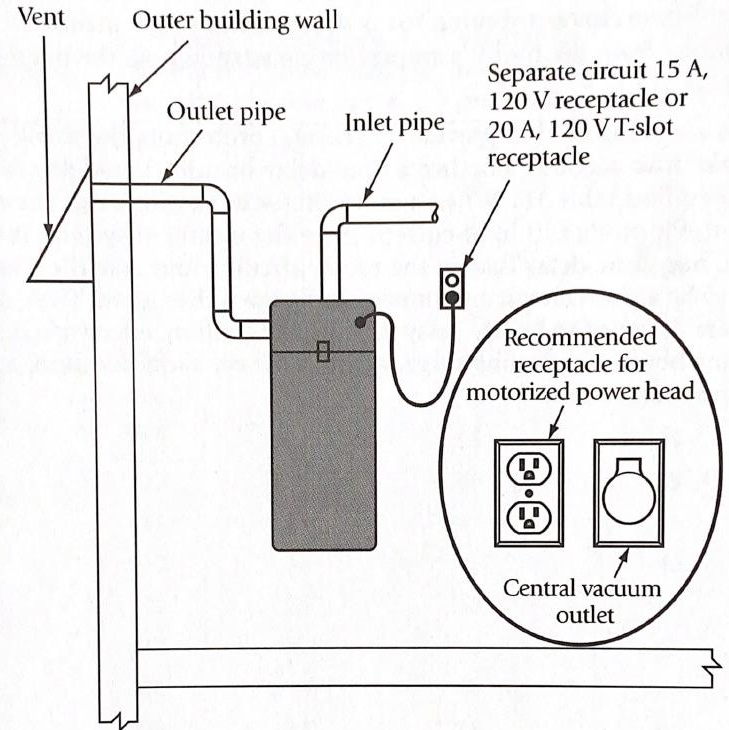
The sauna heater must be controlled by a timer, with a max time setting of 1 h and no override feature, that disconnects all live or ungrounded conductors in the circuit supplying it.



CENTRAL VACUUM SYSTEMS

The central vacuum, usually located in the basement or an attached garage, is a cord connected appliance that must be supplied by a separate circuit, with either a general-purpose duplex 15A, 120V receptacle or a 20A, 120V T-slot receptacle.

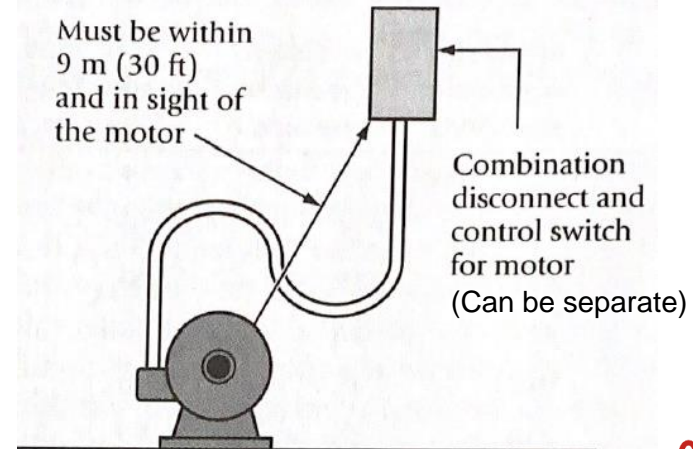
Some of these systems provide a motorized power head to supplement the central unit. In this case, receptacles should be installed adjacent to the central vacuum outlets to conveniently provide power to this equipment.



MOTORS

Motors may power pumps (sump pumps or pressure pumps), fans, or workshop equipment (table saws, planers, or lathes), and they can be either cord-connected or direct-connected to a branch circuit.

Wherever possible, it is best to have the motor supplied by a separate circuit. If there are other loads on the same circuit, starting the motor can cause nuisance tripping of the overcurrent protection due to **motor starting surges**.



ELECTRIC VEHICLE CHARGING

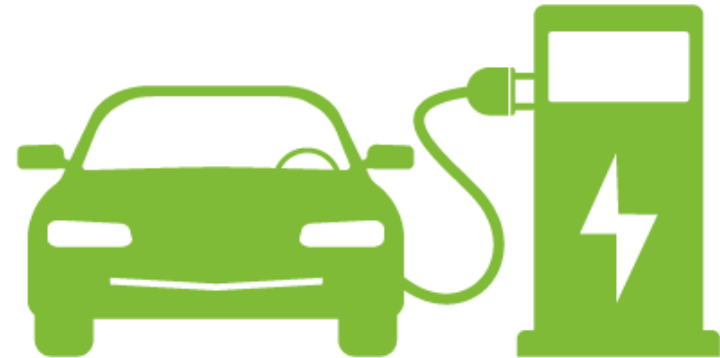
An electric vehicle includes:

- a. Vehicles powered by one or more electric motors that draw current from a fuel cell, PV array, rechargeable energy storage system, etc.

Does not include:

- a. Off-road EVs such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, and mobility scooters for persons with disabilities.

The nominal ac voltage used to supply **electric vehicle supply equipment (EVSE)** shall not exceed 1 kV.



ELECTRIC VEHICLE CHARGING

EVSE can be installed **indoors** in garages and **outdoors** in driveways or carports.

Supplied by a **separate branch circuit** that supplies no other loads except ventilation equipment intended for use with the EVSE.

Equipment rated > 60 A or > 150 V requires a separate **disconnecting means** on the supply side.

Can be direct-connected or plugged into a **receptacle**.

Adjustable EVSE



SOLAR PHOTOVOLTAIC SYSTEMS

A renewable energy system that converts solar energy into electrical energy.

Consist of PV modules which are assemblies of interconnected solar cells.

Class A – an unrestricted access module operating in > 50 V dc or > 240 W.

Class B – a restricted access module inaccessible to the public.

Class C – a limited voltage, unrestricted access module operating ≤ 50 V dc and ≤ 240 W.



SOLAR PHOTOVOLTAIC SYSTEMS

Insulated conductors and cables shall be adequately supported against mechanical damage and supported throughout the run.

Cables installed on or above a building shall meet the flame spread requirements for the National Building Code of Canada or local building legislation.

Insulated conductors or cables installed inside or on a building shall be contained in a raceway.

Plug-in connectors used to connect cables between PV modules must be of the locking type and be rated for the voltage and current of the circuit in which they are installed.



TECK90

RPVU90

2-wire circuit: **RED (+)** and **BLACK (-)**
3-wire circuit: **WHITE**, **RED (+)**, and **BLACK (-)**

KEY TAKEAWAYS

In Part 1, we learned about:

- requirements and considerations for **Service Installations** from both supply and consumer perspectives;
- components and purpose of a **Panel** and the **Service Size** considerations;
- different types of **Branch Circuits**; and

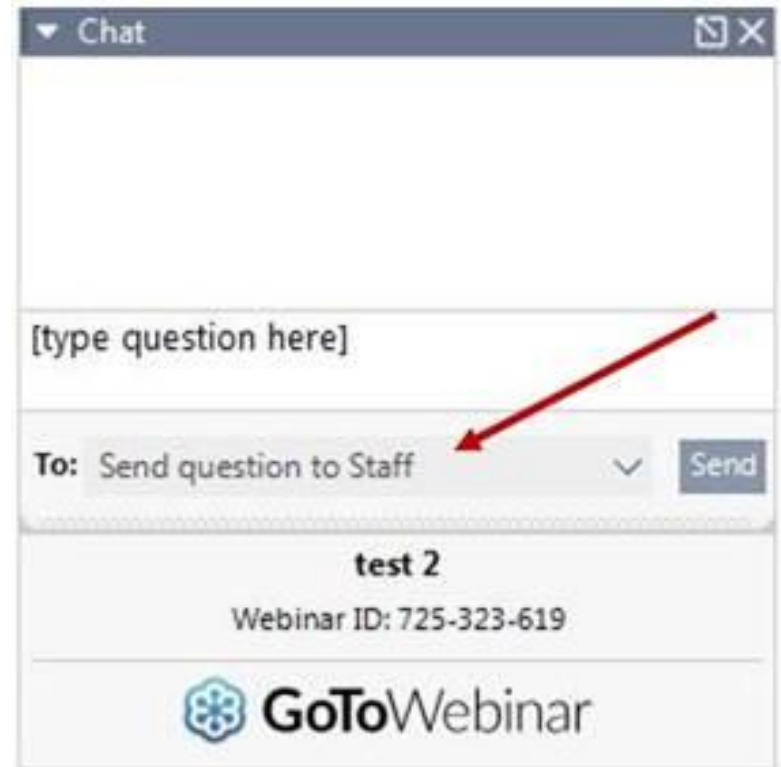
In Part 2, we discussed:

- requirements for **Receptacles** in various locations in a house
- requirements for **Lighting** in various locations in a house

Today, in **Part 3**, we finished with:

- requirements for **Smoke Alarms and Carbon Monoxide Detectors**
- more detailed wiring requirements for **Major Appliances and Electrical Equipment**

Q & A





Thank you for your attention!

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