NIAGARA-ON-THE-LAKE HYDRO'S

GUIDE TO HOME ELECTRICAL SAFETY

IMPORTANT

Niagara on-the-Lake HYDRO

BETTER A THOUSAND TIMES CAREFUL THAN ONCE DEAD

Proverb

This is intended as a guide with useful information about electricity. It is not an instruction manual and all electrical work should be completed by qualified and/or Licensed Electrical Contractors. Licensed Electrical Contractors are the only people in Ontario legally allowed to do electrical work in your home, and failing to hire one could result in injury, death, loss of property, or denied insurance claims*. If you don't obtain the proper permits or have it installed by a professional, your insurance company has grounds to deny your claim in the chance of a house fire– and faulty wiring is one of the leading causes of residential fires.

Obtain all necessary permits and approvals and be careful when selecting a good contractor to ensure the safety of your work.

NOTL Hydro officers and employees shall not be liable from any claims, losses, damages (including indirect or consequential damages), expenses and proceedings for personal injury (including death) or property damage of any person relating to, in connection with, resulting from, or arising out of information in this publication.

BE SAFE, WORK SAFE AND PLAY SAFE

*https://www.esasafe.com/consumers/hiring-an-electrician/overview

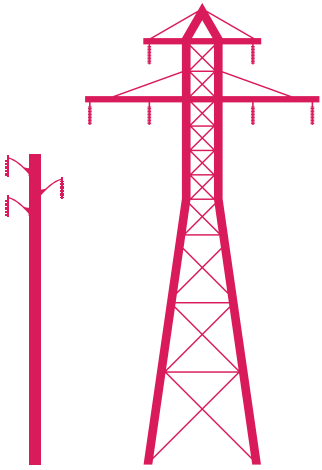
FUNDAMENTALS

Electricity is everywhere. It powers our lights, computers, smart phones, microwaves, cars and furnaces. It also flows through our bodies. Call it a necessity of life! Here are some commonly used terms:

TERM	DEFINITION
AMPERE (A)	The FLOW of electricity. A unit of electric current equal to a flow of one coulomb per second. An ampere is equal to 1,000 milliamperes.
VOLT (V)	Is the electric equivalent to pressure. It is how hard electronics flow in a material such as copper wire.
WATT (W)	Is a unit of power. It can be derived by multiplying Amperes x Volts. 1A x 110V = 110W. A kilowatt (kW) is equal to 1,000 watts. It is similar to referencing your speed in a car (km/hr).
KILOWATT HOUR (kWh)	Similar to total distance traveled, it's the total kilowatts used in one hour.
GFCI	The ground-fault circuit interrupter is a fast-acting circuit breaker designed to shut off electric power in the event of a fault that reached ground before it does damage.
KELVIN	Kelvin is used when describing the colour emitted from a light bulb. As it is also referred to in climate terminology, the colour is also known as temperature.
LED	Standing for light-emitting diode, this is the term used for the technology being LED lighting.
LUMENS	Lumen is a standard measurement of light. Where many people equate the wattage of a light bulb as an indicator of the amount of light it produces, a Lumen is the term that will be used in the future. Historically a 60W incandescent bulb would produce 800 lumens of light.
TRANSFORMER	A device that transfers electricity from one voltage to another. Homes typically use 110V or 220-240V while electricity flows through most of NOTL wires at 27,600V.

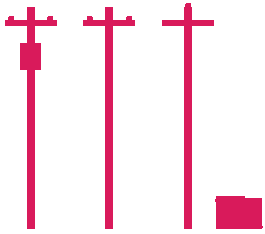
KNOW YOUR POLES

Niagara on-the-Lake HYDRO



!!!IMPORTANT!!!

NEVER CLIMB AN ELECTRIC POLE OR TOWER



TRANSMISSION

Transmission lines carry high voltage electricity from generators like the Hydroelectric Adam Beck plant to local distributors like NOTL Hydro. There are two types of transmission lines in Niagara-on-the-Lake, each carrying 115kV lines (above images). The left image shows local transmission lines carrying electricity within NOTL. The right image are towers sending power to other areas of the Province. Other grids in Ontario carry 230kW and 500kV lines.

DISTRIBUTION

Transmission lines carry electricity to large NOTL Hydro transformer stations that reduce the voltage to 27.6kV. It is then distributed around the NOTL grid before undergoing another step-down. These lines are known as primary lines. The electricity then goes through a small local transformer (greenbox for underground, grey canister for overhead) before going to your home at 120/240V. The line from the local transformer to your home is called a secondary line.

IS BIGGER BETTER?

Energy is lost as electricity is transmitted through Ontario. When traveling over transmission lines, higher voltages are used, which allows the current to be lower. Line losses are reduced at higher voltages. When the voltage is reduced, the current increases which increases line loss. Another benefit to higher voltages is that high voltage wires can be thinner, poles/towers then require less engineering to carry the weight loads.

CONDUCTORS

Be aware of water, metal and Bach when encountering any electrical situation. These are examples of conductors, materials that allow the movement of electricity through it. Yes, humans *(being primarily made of water)* are conductors of electricity.

There are many situations where a conductor is present that could pose a danger to you or your loved ones:

- **Water Related.** Whether it's an in-ground, above ground, kiddie pool or hot tub, water is a conductor. Be aware of any electrical hazard near water.
    - Do not work on any electrical while standing in water.
    - **Flooded Basement.** If your basement is flooded and you have electricity present, do not enter the basement. If your breaker panel is in a different part of the house, turn off the power before heading down, otherwise call NOTL Hydro.
- **Trees on Power-lines.** Branches can conduct electricity and by attempting to remove it, you would complete a circuit and be severely injured. Call NOTL Hydro.
- To reduce risk of shock, always use insulated tools.
- Unplug electrical equipment when cleaning or repairing them.

GROUNDED OR NOT?

Electricity can flow through the ground. Known as ***Step Potential***, a live wire is still dangerous up to 33ft away from the contact point. If you're within that distance, **do not walk** away from the wire. Shuffle your feet closely, maintaining contact with the ground at all times.

CURRENT IN HUMANS

Niagara on-the-Lake HYDRO

Electricity is very lazy but values its' freedom. It follows the path of least resistance and it has many safety consequences. It doesn't take much to affect your body.

A milliampere is one thousandth of an ampere, a measure for small electric currents. A hair dryer uses 15 amperes, or 15,000 milliamperes. A laptop uses under 500 milliamperes. A Playstation 4 uses between 1,000 and 3,000 milliamperes. **Amperes, not volts, kill.**

The following chart goes over various electrical current ranges and how it can affect your body. Be respectful of the power of electricity.

CURRENT *(milliampere)*	REACTION
<1	Generally not perceptible.
1	Faint tingle.
5	Slight shock felt; not painful but disturbing. Average individual can let go. Strong involuntary reactions can lead to other injuries.
6-25 (Women) **9-30** (Men)	Painful shock, loss of muscular control where you can not let go. The electricity is contracting your muscles.
50-150	Extreme pain, respiratory arrest, severe muscular contractions. Death is possible.
1,000-4,300	Rhythmic pumping action of the heart ceases. Muscular contraction and nerve damage occur; death likely.
>10,000	Cardiac arrest, severe burns; death probable.

THE 3 SAFETY TENORS

It is generally considered better to be alive than to be dead. Whether you're changing a power outlet at home or working on 27,600V power-lines, safety should be your #1 priority.

There are three basic principles for safety to go by before starting any project:

1. **Have the Right Tools.** Make sure you have all the tools, items, accessories, and other materials needed for the job.
2. **Have a Job Plan.** It's your opportunity to go over what is needed for the job, identify safety hazards and mitigate/remove the risks.
3. **De-Energize & Double-check.** Turn off the power to the area you're working on and test to make sure it's off.

THE RIGHT TOOLS

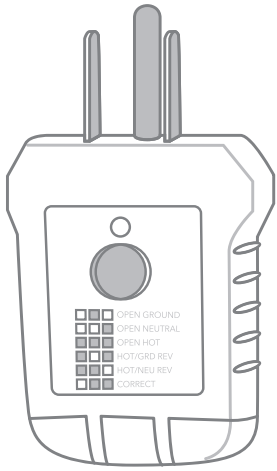
Niagara on-the-Lake HYDRO

You likely have all the screwdrivers and pliers that you need for common home repairs but there are a few tools that we recommend you use to lower your chance of injury and/or future property damage.

When purchasing, read all instructions that come with the tool for proper usage.

Wire Stripper

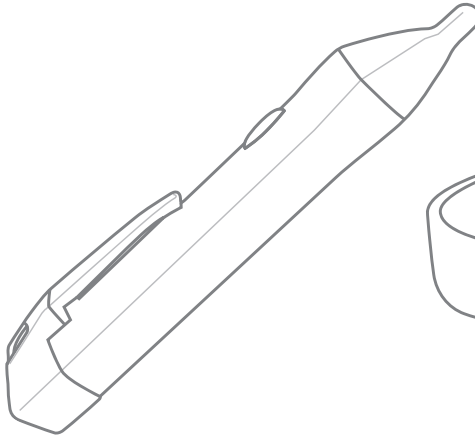
Using a wire stripper (over a utility knife or pliers) lowers your chance of damaging the conducting wire. A damaged wire can cause short circuits and fires, which is generally considered a bad thing. They can be found in hardware stores for under $20.

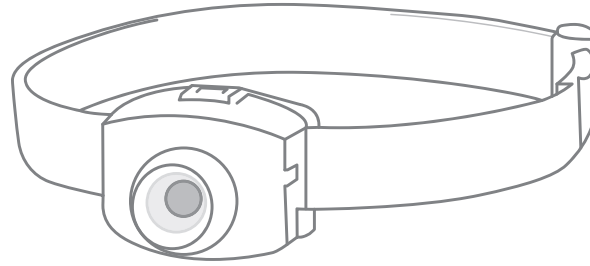


Outlet & GFCI Tester

Receptacle testers cost less than $20 and will let you know if you've wired a power outlet correctly. If it's not done right, it'll tell you what's wrong using the built-in LED lights. Spend a few extra dollars for a GFCI version so you can test GFCI outlets.

If you require specialized equipment you should seriously consider hiring an expert. It is illegal to work on certain household items unless you have the training to do so. Insist on appliances and tools that have been certified by the Canadian Standards Association (CSA) seal or another accredited Standards Council of Canada association.





Non-Contact Voltage Tester

You're about to cut a wire that you think is de-energized, but is it? This tool will tell you if it's on or off. Just place the detection end on to a wire or near an outlet. If the wire/outlet is hot (energized), it will beep.

Head Lamp

After de-energizing a room, you'll often have to deal with lower light levels. Flashlights are nice but you'll probably be safer using both of your hands. Head lamps help focus light on where you need it the most.

For something a little more advanced, consider a **multi-meter**. It indicates power as well as specific voltage, current and resistance.

HAVE A JOB PLAN

Niagara on-the-Lake HYDRO

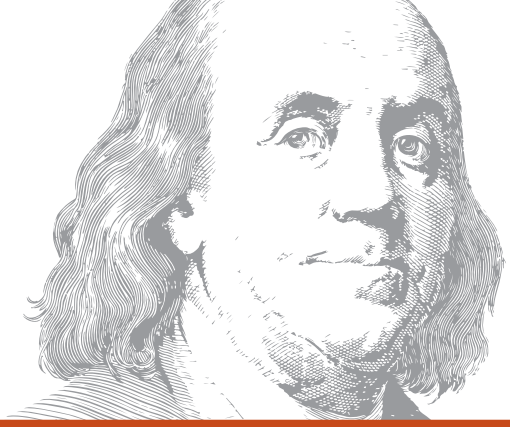
Your product's instruction manual will provide you with the information needed to perform installation *(available on the manufacturer's website)*. It will provide you with specific tools needed and safety items to be aware of for your particular job. **Get familiar with what you need to do.**

Our linemen use a 5-step approach for safety. We've simplified it for home use.

1. **REMOVE.** There are many things to consider when looking for hazards. Remove them to the best of your abilities.
   - Look for climbing, slipping or tripping hazards and remove them. If you're working at a height, ensure that your ladder or similar device is set-up properly and secured.
   - If you're working outside, consider the weather at the time. Never work with electricity in the rain.

2. **REPLACE.** Ensure the item or attached/other equipment is in good condition. If not, replace it. The same goes for any tools, protective equipment and anything else needed for the job. Replace also stands for substitution but may not be applicable.

3. **ISOLATE.** Is there a hazard that can not be removed or replaced but can be isolated? This might include a noise hazard or your nosy neighbour.



"If you fail to plan, you are planning to fail"

Benjamin Franklin, Safety Specialist

4. **REDUCE.** In your case, supplemental lighting might be needed. If you're turning off power to a room, do you have appropriate lighting to move around, identify tools and install/repair your intended item. If you're working in a garage and want to use natural lighting, the doors might need to be opened prior to turning off the breaker. Plug a lamp into an extension cord connected to another area of the home that will not be affected when the breaker is turned off. Use a head lamp for added light to keep your hands-free.

5. **PERSONAL PROTECTIVE EQUIPMENT (PPE).** Protect yourself with the proper gear whether it be glasses, gloves or whatever else is recommended for your project. Included instructions should list any PPE needed.

BONUS POINT - YOU

Mistakes are made when people are tired or rushed.

Ensure you're alert before starting. Make sure that you have enough time to get the job done. If you think it'll take 15 minutes then make sure you have 30 minutes available. You'll likely use it all.

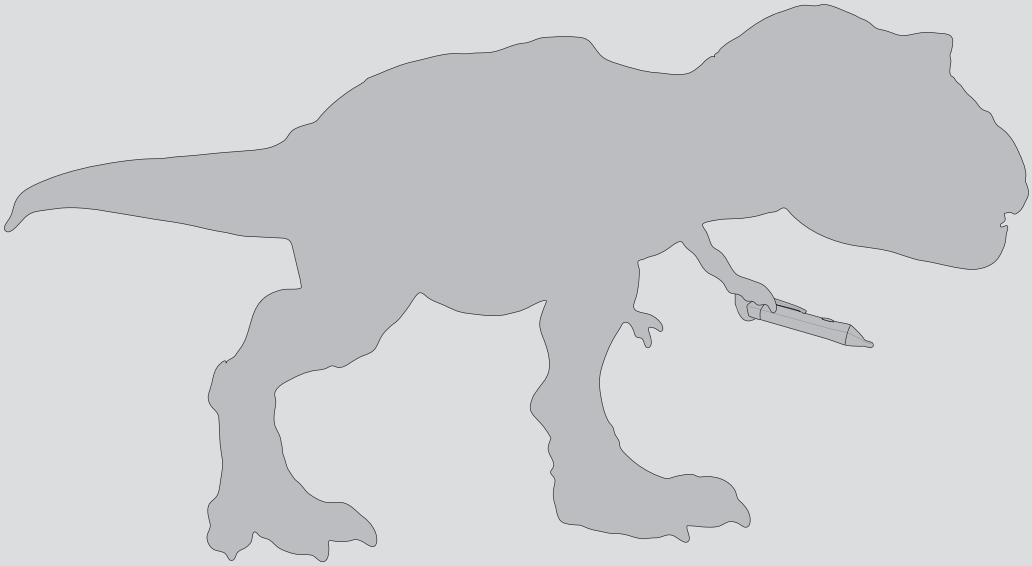
DE-ENERGIZE

Niagara on-the-Lake HYDRO

If you try to take apart an energized power outlet, you might have one thing in common with dinosaurs; extinction.

Remove any potential for electrocuting yourself by turning off the power to the area you're working on. At this point you will have already prepared your project and cleared up any potential hazards. This is the last step before starting your job.

Use your breaker panel to cut the energy to the entire area and ensure you won't get zapped. Breaker panel labels are not always labeled or maintained properly. Individual receptacles or fixtures can be on a different breaker. **Use your outlet/GFCI tester, multi-meter or non-contact voltage tester to ensure that the power is absent.**



Once you confirm that there is no power, you should be ready to begin your project.

INDOOR SAFETY

POT LIGHT REPLACEMENT

When purchasing new pot lights, check to make sure they are safe around insulation to prevent fires.

SWITCH IT OUT

If your switch buzzes or gets hot when turned on, replace it. Dimmer switches get warm by design, not hot.

EXTENSIONS

Extension cords are rated for different loads. Use them with the right load requirement. Extension cords should only be used temporarily and should not be overloaded. If your cord is fraying, has black burn marks on it or talks back to you, replace it immediately.

THINK OF THE KIDS

Tamper resistant outlets protect infants from electrocution.

If you feel the need to jam a fork in a toaster, unplug the toaster first.

JUNCTION BOXES

When extending a line enclose the connection in a junction box to prevent a fire.

COVER PLATES

If you have a broken or missing cover plate, replace it to prevent an electric shock.

SLACK WELCOMED

Leave 6 inches or more of wire slack for new outlets to allow for future updates. Install electrical spacers to tighten loose outlets.

FREQUENT ISSUES?

Fuses that regularly blow or circuit breakers that regularly trip should be checked by a licensed electrical contractor or electrician.

GFCI - Ground Fault Circuit Interrupters

GFCIs are designed to almost instantly sense an electrical ground fault and interrupt the protected circuit to stop the flow of electrical current before someone is hurt. Any outlet within 1.5m of a sink or water source should be GFCI *(all outdoor outlets should be GFCI)*. Test them once a month.

OUTDOOR SAFETY

Niagara on-the-Lake HYDRO

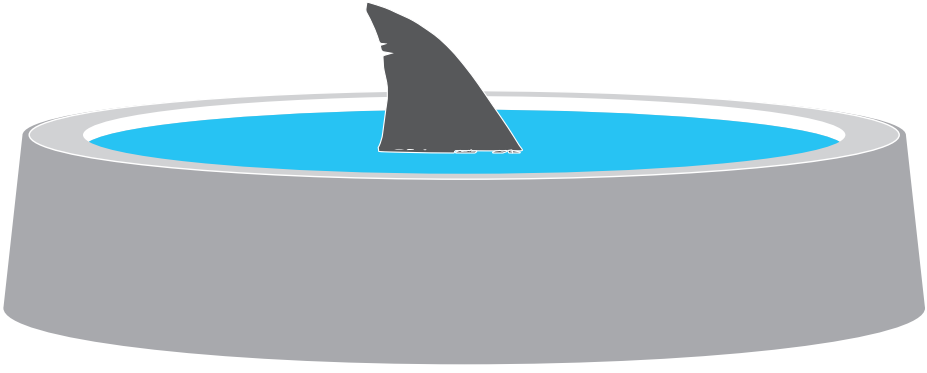
CALL BEFORE YOU DIG

It's getting pretty crowded underground. There could be gas pipelines, electrical services, telephone and cable TV as well as water and sewer connections. In addition to these types of buried services going to your home, there could be distribution networks for utilities that serve your neighborhood and community. **Do not put yourself or community at risk. Don't take the risk.**

Get a free locate! Call 1-800-400-2255 (Ontario One Call)

OTHER TIPS:

- Don't operate electric tools near a pool or pond.
- Don't mow wet lawns with an electric lawn mower.
- All outdoor outlets should be GFCI and have weatherproof covers to prevent water damage.
- All outdoor devices should be connected to a junction box, not a loose wire.
- If a tree on your property is near a power-line use a professional to trim it (not yourself) and ensure we're aware of the work.
- If a tree branch snaps and lands on a hydro line, do not approach it. **Call 905-468-4235, we will safely remove it.**
- If you have a power generator, ensure you run it outdoors *(never indoors)* to prevent carbon monoxide poisoning.
- Never use an indoor extension cord outdoors.
- Ensure outdoor light fixtures have outdoor rated bulbs in them.



HOLIDAY SAFETY

Holidays are a time of joy so make it a habit to double-check your holiday decor and practices to ensure it will be a safe holiday.

Grammy's old handcrafted tree may be nostalgic but could cause a fire in your home. Here are a few tips for holiday safety:

- **Check older electronic decorations for wire damage or burn marks that might indicate an issue.** If there is concern that it might be dangerous but you still want it for decoration, remove/cut the power cord so others don't unknowingly plug it in.
- Lights are not created equal. Use indoor lighting indoors. Use outdoor lights outdoors.
- Replace damaged light strings and never staple them in place to avoid wire damage.
- Don't use seasonal outdoor lighting year-round. Year-round lighting is made differently.
- Ensure empty sockets on light strings are replaced with bulbs, especially for pet-owners and those with children.
- If you have a natural tree, keep it watered everyday to avoid a fire.
- Never leave your tree lights on unattended.
- Watch for pets and young children putting wires and other holiday decor in their mouths.
- Avoid overloading your outlets.
- Be aware of overhead lines when putting up outdoor lights, especially with ladders and if you're on your roof.
- Test your smoke and carbon monoxide alarms and if you haven't changed the batteries recently, change them now.
- Stay alert and take extra precautions when working under mistletoe.

POWERLINE SAFETY

Niagara on-the-Lake HYDRO

Power lines are often misidentified as communications lines which can be deadly.

Most of the overhead wires in Niagara-on-the-Lake carry 27,600 volts which is then stepped down to a lower voltage at the transformer feeding your home. Here are some tips when dealing with overhead power lines:

- **Never touch** *(directly or indirectly)* an overhead power line. Even if it has fallen to the ground, consider it live. All powerlines are lethal.
- Maintain a distance of **at least 10ft** *(3 metres)* from your home's overhead power line when using a ladder, putting Christmas lights up, cleaning windows/eaves or tree trimming.
- Stay **at least 33ft** *(10 metres)* away from a downed power line, approximately the length of a full-sized school bus. Electricity still flows a distance through the ground.
- When planting a tree, do not plant them directly under a power-line to prevent future expenses when trimming. Do not trim trees near power-lines, use a professional.
- If you're driving by working linemen, slow down and pass with extra space like you would do for a police officer.
- If you see a damaged pole or downed power-line, ***call NOTL Hydro at 905-468-4235 so we can safely repair it***.

IF YOU CRASH INTO A POWER LINE

This happens more than you think (I've seen it happen). If you are the driver or passenger of a vehicle that hits an electric pole **STAY IN THE VEHICLE**. Turn off the vehicle, call 911, and wait for emergency responders to arrive and confirm it's safe to leave. If a live wire is touching your vehicle, the car becomes energized. **STAY IN THE VEHICLE**...

In the event that your vehicle catches on fire and you must leave then it's not as simple as opening the door and running out. When a wire is touching the vehicle it is imperative that when leaving that you **JUMP** from the vehicle *(feet together)* ensuring that you are not touching any part of it when you touch the ground. If you're touching ground and the vehicle at the same time you're closing a circuit which leads to electrocution.

BONUS TIP

If you ever have the opportunity to touch a live power-line, politely decline the opportunity.

BONUS BONUS TIP

Pad-mounted transformers (green metal boxes) carry high-voltage electricity. If they are ever accidentally shifted or damaged by a car or lawnmower, call us at 905-468-4235 to make sure they are still safe.

ELECTRICAL FIRST AID

Niagara on-the-Lake HYDRO

The majority of Ontarians have indicated that they have been shocked. More than 110 children under the age of 15 go to the hospital each year due to shocks and electrical burns. What should you do if you or a loved one injures themselves with electricity?

1. **If the victim is unconscious, call 911 immediately.**
2. If it can be done safely, turn off the source of electricity. This will prevent further injury to the victim and others.
3. Cardiac issues can arise from electrical shocks, even small shocks. It is advised to seek medical attention immediately to determine if the victim's heart is experiencing any irregularities.
4. Dress any wounds with gauze *(not clothing)* to keep the wound clean.
5. Seek first-aid.

TRAINING

First Aid courses are available in Niagara through a number of sources including St John's Ambulance **(www.sja.ca)** and the Heart & Stroke Foundation **(https://resuscitation.heartandstroke.ca)**. Niagara-on-the-Lake Hydro trains with the Heart & Stroke Foundation.

IMPORTANT LOCAL NUMBERS

NOTL Hydro	905-468-4235
NOTL Town Offices	905-468-3266
NOTL Fire & Emergency Services	911, 905-468-3266
Police *(non-emergencies)*	905-688-4111
Mental Health Emergencies	911, 1-866-550-5205 *ext1*
NOTL Community Centre	905-468-4386
NOTL Public Library	905-468-2023
NOTL Chamber of Commerce	905-468-1950
Niagara Region Offices	905-685-1571
Waste Info-Line	905-356-4141
Large Item Pick-up	905-227-7771
Enbridge Gas	1-877-362-7434
Enbridge Emergencies	1-866-763-5427
Locates *(Ontario One Call)*	1-800-400-2255

Electrical Safety Authority

If your project involves new electrical wiring or devices, or repairing/replacing old ones, you need to know your obligations under Ontario law.

All electrical work in Ontario needs to be done in compliance with the Ontario Electrical Safety Code. Almost all electrical work requires a permit, which triggers a review process by ESA. To confirm whether the Code applies to the work you're planning, you can call ESA's Customer Service Centre at:

1-877-ESA-SAFE (372-7233)
www.esasafe.com

Niagara on-the-Lake HYDRO

www.notlhydro.com