

The right tree in the right place

The underground distribution system



Clearance requirements

Practical advice and design ideas for landscaping
near pad-mounted transformers

People are more conscious than ever of their living environment and put increasing emphasis on the quality of that environment. In response, most municipalities in the United States, Ontario and Western Canada now require new residential developments to put power lines underground. You are fortunate to live in a neighborhood that is part of the trend toward a wirefree environment.

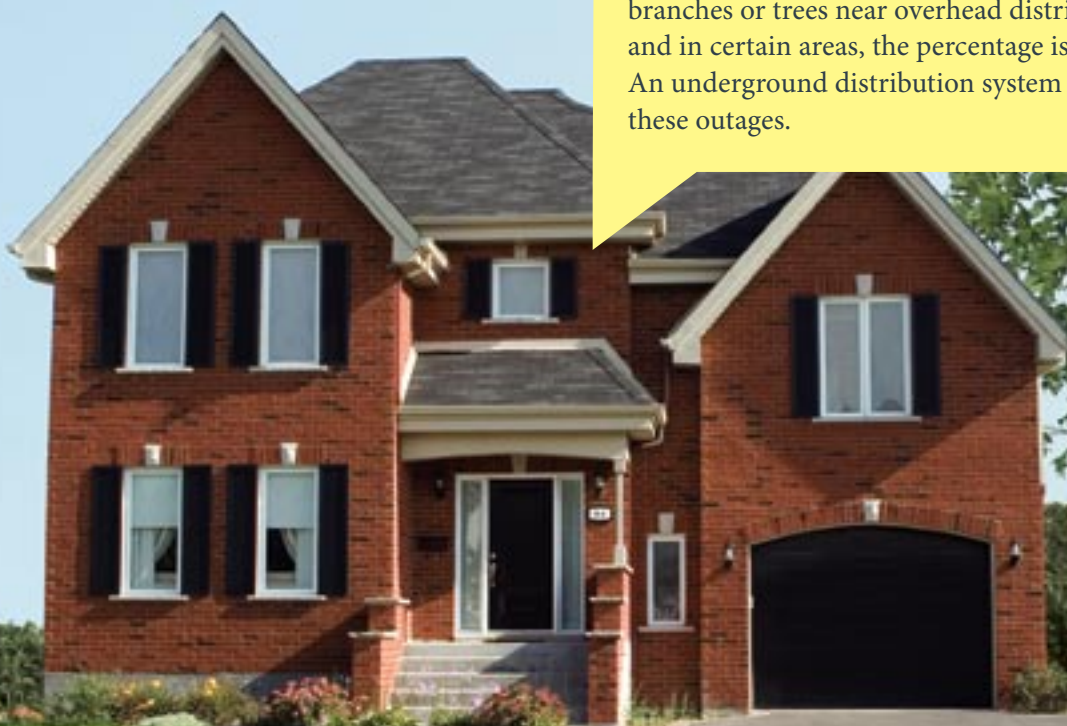
Hydro-Québec has designed this brochure to provide you with some useful information on clearance requirements around utility equipment installed above ground, along with landscaping principles which can help ensure that a pad-mounted transformer is successfully integrated with your property.

There are many benefits to living in a neighborhood with an underground distribution system ...

- unobstructed views
- more space for landscaping
- fewer limitations on locating your patio, pool or garden shed
- lower risk of power outages due to high winds, or fallen branches or trees
- possible increase in the resale value of your home

Did you know?

More than 40% of power outages are caused by fallen branches or trees near overhead distribution lines—and in certain areas, the percentage is much higher. An underground distribution system can help prevent these outages.



... but clearances must be respected

In neighborhoods with an underground distribution system, cables are buried in underground conduits, while the equipment needed to operate the system is located above ground. The location of this equipment is governed by strict criteria. Some equipment is installed in public areas (parks, community land, etc.) and other types—particularly pad-mounted transformers—are located on private property.

Homeowners with a pad-mounted transformer on their lot must respect clearance requirements that give Hydro-Québec easy access to the devices.

It is absolutely essential that these clearances be respected so that power system operations can be conducted safely, helping to reduce delays during outages.

These requirements are shown on page 3.

Don't forget—trees and shrubs grow! You must leave them enough space to do so without interfering with the distribution system.

Be careful! If you do not respect **clearance requirements** and recommended **planting distances**, your landscaping could be damaged during routine system maintenance or when repairs are made following an outage.

Did you know?

Very strict technical and regulatory requirements, as well as safety standards, must be met in siting pad-mounted transformers. Since 1995, an environmental assessment has been carried out for each project to extend the underground distribution system. This allows equipment to be located in the best possible place. Pad-mounted transformers must be located so they are accessible at all times, enabling Hydro-Québec crews to maintain the system and take action as quickly as possible when required.

To successfully integrate a pad-mounted transformer with your property, landscaping is key

Everyone can integrate a pad-mounted transformer with their property in a harmonious way, while respecting clearance requirements. See pages 9 and 10 of this brochure for some inspiration—landscaping tips, design concepts and examples.

Planting a tree or shrub or building a fence, deck or patio must be carefully planned to take clearance requirements into account.



Underground distribution system architecture and prescribed clearances

The underground distribution system contains equipment sited above ground and equipment buried underneath. The former includes pad-mounted transformers, disconnect cabinets, joint-use enclosures and pedestals, while manholes, cables and conduits are located underground.

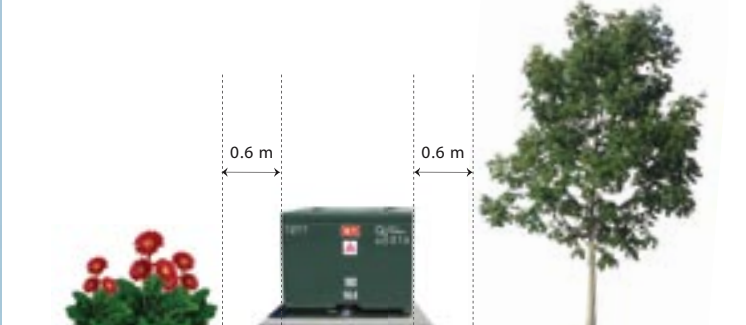
In the case of both buried and aboveground equipment, the **required clearances** must always be respected. To prevent your trees and shrubs from becoming too invasive as they grow, make sure you also comply with **planting distances** and maintain your vegetation.



Required clearances

For pad-mounted transformers, **nothing must be placed in front of the doors** and a **completely unobstructed space of 0.6 metres** must be left around the sides and back.

For buried equipment, a **completely unobstructed space of 2 metres** must be left around equipment.



Planting distances

All plants must be located so that, when they reach **maturity**, there will be a space of 0.6 metres around pad-mounted transformers completely unobstructed by branches and foliage and so that plants do not hinder access to the doors in any way.

Recommended planting distances for some of the trees and shrubs used most commonly in landscaping in Québec are provided on pages 11, 12 and 13 of this brochure.



Aboveground equipment



Pad-mounted transformer

A device that lowers voltage so it can be used for household purposes. The transformer is usually placed on a concrete slab and enclosed in a metal box, generally green in color. This is the type of equipment found most often on people's lots.



Disconnect cabinet

This enclosure looks like a pad-mounted transformer, only bigger, and is usually located in public areas or parks.



Telecommunications and cable distribution pedestals

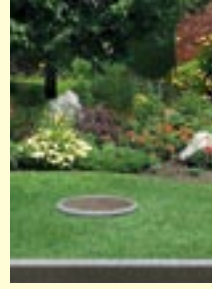
This is not Hydro-Québec equipment, but is linked to the telephone and cable networks. However, the landscaping principles recommended in this brochure can be used to successfully integrate the pedestals with your property.



Joint-use enclosures

In some residential neighborhoods, joint-use enclosures are used instead of pedestals and manholes, and also serve as streetlamps.

Buried equipment



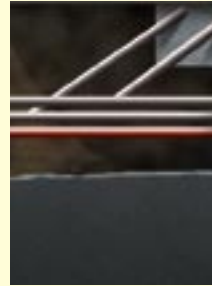
Manhole

This roughly one-metre-deep trench is used to supply electricity to houses by linking them to the distribution system. It is usually located under a circular steel manhole cover.



Underground conduits

Generally encased in concrete, they hold several electrical cables.



Cables

The underground cables that carry electricity are insulated and placed in conduits.

Pad-mounted transformer: a very safe device

These devices have a metal enclosure that is designed to provide adequate protection with regard to the live electrical equipment inside. A bolted and padlocked door prevents access to this equipment. The enclosure is also equipped with a grounding set that protects the public and Hydro-Québec employees who maintain or repair the equipment.





Essential teamwork

Electric utilities, telecom and cable companies are joining forces to bury their service conduits in joint-use distribution trenches, which not only lowers costs but limits inconvenience to customers. They are also partnering with municipalities to create integrated underground systems that benefit the community as a whole.

Five important steps to follow

In recent years, gardening has become one of the most popular pastimes in Québec. For some people, it's a true passion on which they spend significant time and energy, and sometimes substantial amounts of money. However, like any other site improvement effort on your property, gardening must be compatible with public service infrastructures.

Creating a landscape design that allows harmonious integration of a pad-mounted transformer is within everyone's reach. However, to do so, you must follow several steps to ensure your safety and to allow your trees and shrubs to flourish happily in the presence of the underground distribution system.

Step 1

Always find out before you dig

Regardless of why you are digging—whether it is to plant a tree or shrub, build a fence or put in a swimming pool—you must always call Info-Excavation, a free information service on underground infrastructures. The call center is able to answer location requests for places all over Québec. By finding out before you start, you can factor in this information when planning your landscape design.

Info-Excavation is an independent organization created by a group of municipalities and public utility companies, including sectors such as energy, telephone and cable television. The call center provides **free** service throughout Québec. Telephone: 514 286-9228 or 1 800 663-9228. Web site: www.info-ex.com.

Step 3

Plan your landscaping carefully

Successful landscaping requires careful long-term planning and planting the right tree in the right place. This is true both for clearance requirements and for taking account of your horticultural tastes and the specific features of your lot. Pages 9 and 10 of this brochure provide practical tips and design principles for integrating pad-mounted transformers.

Step 2

Respect clearance requirements

Always keep in mind that **equipment must be accessible at all times** to ensure adequate customer service and allow servicing and repairs to be done as quickly as possible. This applies to pad-mounted transformers and other aboveground equipment as well as buried equipment. **Don't forget to leave 0.6 metres of clearance around the sides and back of pad-mounted transformers and make sure there is nothing in front of the doors.**





Step 4

Select your plants carefully and respect the recommended planting distances

Before you succumb to a plant's irresistible fragrance or beauty, make sure that it can grow where you intend to plant it without hindering the smooth operation of the distribution system.

Consult your municipality to find out if it prohibits the planting of particular tree species and to determine what clearances are required around joint-use enclosures and streetlamps.

Don't forget: small saplings can grow into huge trees. The *Quick Reference Guide to Harmonizing Your Trees and Shrubs with the Underground Distribution System* on pages 11, 12 and 13 shows the planting distances required for some popular species in Québec.

Step 5

Look after your plantings regularly

It's your responsibility to make sure that the pad-mounted transformer on your property is always accessible. When necessary, you must prune or remove any foliage, branches or plants that encroach on required clearances.

If employees responsible for maintaining and repairing the distribution system cannot access the equipment, Hydro-Québec will have no choice but to prune your shrubs and trees itself or sometimes even remove plantings that do not comply with the rules, **at your expense**.

A lot adorned with mature trees and shrubs increases the value of your home. However, to ensure that your plantings flourish and reach full maturity, please look after them regularly and respect clearance requirements.

Landscaping principles to be applied in the vicinity of pad-mounted transformers

A certain amount of planning is needed to successfully integrate a pad-mounted transformer into a landscape design. Two important landscaping principles can be used to achieve this goal.

A **filter** will partially conceal the transformer by blending it in with your landscaping, while a **screen** will hide it completely from one or more sight lines. These two options can also be combined for maximum results.

The purpose of a **filter** is to integrate the transformer with your landscaping so that it blends in. The equipment will be partially but uniformly concealed with a design consisting of plants or objects (sculptures, park benches, birdbaths, etc.). The elements in the design are arranged so that attention is drawn away from the transformer.

A **screen** will completely hide the transformer from a particular sight line, or angle. For example, you can design your landscaping in such a way that the transformer cannot be seen from the house, deck or patio.



Did you know?

Most successful landscape designs involving pad-mounted transformers consist of shrubs of various sizes against a lawn background.

Filter effect

The purpose of a filter is to draw attention away from the transformer, but not hide it completely. The choice of plantings and other design elements, their characteristics and placement, and the arrangement of these elements in relation to one another serve to enhance the overall environment, allowing the transformer to be glimpsed rather than making it disappear entirely.

The composition can make use of **camouflage** by creating similarities between the color, height and form of the various design elements and those of the transformer. It can also rely on **contrasts**, by using striking or particularly attractive elements to create a design that attracts the eye and diverts attention away from the transformer, helping it to blend into the background.



Some helpful tips

- **Choose a wide variety of plants to achieve a filter effect in all seasons.**
- **Plantings should be fairly massive so as to compete with the pad-mounted transformer.**
- **The use of filters is best suited to properties that are large enough to allow a well-spaced design. If the space is too small or if all your effort is concentrated around the transformer, you will not obtain the desired effect. Instead, the transformer will appear to take up more space than it actually does!**





Screen effect

The goal of this effect is to completely hide the pad-mounted transformer so that it cannot be seen from certain angles. For example, if you spend a lot of time on your patio, you can create a screen so the transformer cannot be viewed from that area. Since the space in front of the transformer's doors (which generally face the street) must never be obstructed, screens can only be used to conceal the transformer from the house or the sides of the property.

A screen can consist of a hedge, fence, massed plantings or change in ground contour that hides the transformer. You can combine these solutions for maximum effect.



Some helpful tips

- **Have you thought about a hedge or fence? "Breaks" can be created in the alignment of a hedge or fence and the transformer inserted into one of them so it is less visible from the street. However, this solution is only useful if the property is large enough to create a kind of rhythm in the breaks.**
- **For small properties, the key to success is simplicity: less is more. Make use of screens, with restraint.**

Good ideas

In your design, vary the height of plants at maturity to give a feeling of perspective, or receding space, which will serve to enlarge the space visually.

To help the pad-mounted transformer blend into your landscaping, use plants with foliage or flowers in the same tones as the transformer, planting them on its periphery or in the background.

Avoid

A design consisting of a single, horseshoe-shaped bed around the transformer, which will attract the eye to the device rather than diverting attention.

Quick reference to harmonizing your trees and shrubs with the underground distribution system

This Quick Reference Guide provides information on how to harmonize some of the most popular trees and shrubs in Québec with equipment that is part of the underground distribution system. The guide contains the **plant name** (common and scientific), **height at maturity** and the **planting distances to be respected** in relation to buried and aboveground equipment. The last column shows the **hardiness zone** for each species, which provides an indication of how well it will stand up to the climate in your region.

The map of Québec below shows the plant hardiness zones in the province's various regions, based on annual average minimum temperatures. Hardiness zones allow plants to be classified according to their resistance to cold winter weather. The lower the zone (the smaller the zone number), the harder the plant is to cold. To ensure that your plants grow healthily and survive winter successfully, identify the hardiness zone in your region and choose plants with the same hardiness zone or lower.

How to read the tables

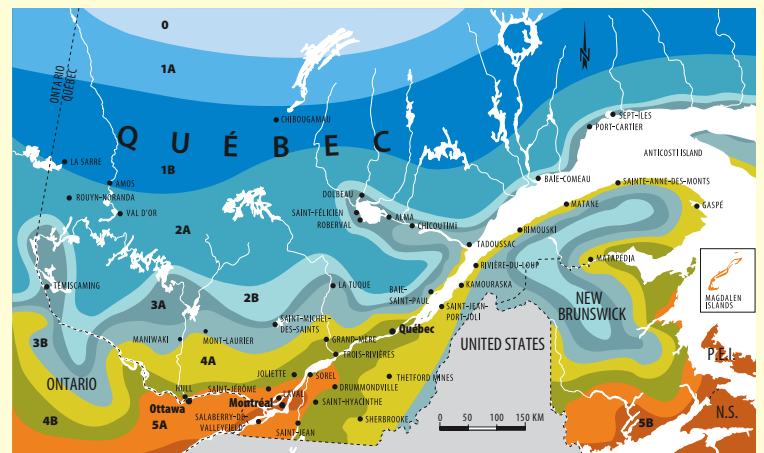
	PAD-MOUNTED TRANSFORMER (METRE)			HARDINESS ZONE
	BURIED EQUIPMENT (METRE)			
	DECIDUOUS (HEIGHT - METRE)			
<i>Acer negundo</i> Boxelder	15	3	1.5	2B
<i>Acer rubrum</i> Norway Maple	20	3	1.5	3A
<i>Acer saccharum</i> Red Maple	20	3	1.5	4A
<i>Amelanchier alnifolia</i> Saskatoon Serviceberry	4	1.5	1.5	2B

HEIGHT AT MATURITY

REQUIRED PLANTING DISTANCE

HARDINESS ZONE

Plant hardiness zones



LEGEND

	ZONE 0		ZONE 3A
	ZONE 1A		ZONE 3B
	ZONE 1B		ZONE 4A
	ZONE 2A		ZONE 4B
	ZONE 2B		ZONE 5A
			ZONE 5B

To find out more about plants available in Québec, consult Hydro-Québec's *Guide to Ornamental Trees and Shrubs*. To order this publication, dial 1 800 ÉNERGIE (1 800 363-7443) or visit the Online Store at www.hydroquebec.com.

Deciduous

PAD-MOUNTED TRANSFORMER (METRE)				HARDINESS ZONE
BURIED EQUIPMENT (METRE)				
DECIDUOUS (HEIGHT – METRE)				
<i>Acer negundo</i> Boxelder	15	3	1.5	2B
<i>Acer platanoides</i> Norway Maple	10 to 15	3	1.5	4B
<i>Acer rubrum</i> Red Maple	20	3	1.5	3A
<i>Acer saccharum</i> Sugar Maple	20	3	1.5	4A
<i>Amelanchier alnifolia</i> Saskatoon Serviceberry	4	1.5	1.5	2B
<i>Aronia melanocarpa</i> Black Chokeberry	1	1.5	1.5	4A
<i>Betula lenta</i> Sweet Birch	15	3	1.5	4B
<i>Betula papyrifera</i> Paper Birch	20	3	1.5	2A
<i>Betula pumila</i> Swamp Birch	1 to 3	1.5	1.5	2A
<i>Buddleia davidii</i> 'Royal Red' Royal Red Butterfly-bush	2	1.5	1.5	5B
<i>Chaenomeles japonica</i> 'Sargentii' Japanese Flowering Quince	0.5	1.5	1.5	3A
<i>Chamaedaphne calyculata</i> Leatherleaf	0.75	1.5	1.5	2A
<i>Cornus alba</i> Tatarian Dogwood	2	1.5	1.5	2A
<i>Cornus alternifolia</i> Pagoda Dogwood	3	1.5	1.5	3B
<i>Cornus racemosa</i> Gray Dogwood	3	1.5	1.5	2B
<i>Cornus stolonifera</i> Redosier Dogwood	2	1.5	1.5	2A
<i>Cotinus coggygria</i> Common Smoketree	3	1.5	1.5	5B
<i>Cotoneaster apiculatus</i> Cranberry Cotoneaster	1	1.5	1.5	4B
<i>Crataegus crusgalli</i> Cockspur Hawthorn	6	3	1.5	2B
<i>Daphne x burkwoodii</i> Burkwood Daphne	0.8	1.5	1.5	5A
<i>Daphne mezereum</i> February Daphne	0.8	1.5	1.5	3A
<i>Daphne mezereum</i> 'Alba' Alba February Daphne	0.6	1.5	1.5	3A
<i>Deutzia x lemoinei</i> 'Compacta' Compact Deutzia	1	1.5	1.5	5B
<i>Diervilla lonicera</i> Dwarf Bush-honeysuckle	1	1.5	1.5	3A
<i>Euonymus fortunei</i> Wintercreeper Euonymus	0.3	1.5	1.5	5A

PAD-MOUNTED TRANSFORMER (METRE)				HARDINESS ZONE
BURIED EQUIPMENT (METRE)				
DECIDUOUS (HEIGHT – METRE)				
<i>Forsythia x intermedia</i> Forsythia Border	1.3	1.5	1.5	4A
<i>Forsythia mandshurica</i> Manchuria Forsythia	1.75	1.5	1.5	4A
<i>Fraxinus nigra</i> Black Ash	15	3	1.5	2B
<i>Fraxinus pennsylvanica</i> Red Ash	18	3	1.5	2B
<i>Hamamelis virginiana</i> Common Witch-Hazel	5	1.5	1.5	4B
<i>Hydrangea arborescens</i> Smooth Hydrangea	1.2	1.5	1.5	3A
<i>Hydrangea paniculata</i> 'Grandiflora' Pee Wee Hydrangea	2.5	1.5	1.5	4B
<i>Ilex verticillata</i> Common Winterberry	2	1.5	1.5	3B
<i>Juglans cinerea</i> Butternut	18	3	1.5	3B
<i>Lonicera canadensis</i> Fly Honeysuckle	1.5	1.5	1.5	3A
<i>Magnolia stellata</i> 'Royal Star' Royal Star Magnolia	3	1.5	1.5	4B
<i>Malus 'Radiant'</i> Radiant Crabapple	6	3	1.5	3B
<i>Malus 'Red Jade'</i> Red Jade Crabapple	4	1.5	1.5	4A
<i>Myrica gale</i> Sweet Gale	1.2	1.5	1.5	2A
<i>Populus balsamifera</i> Balsam Poplar	20	3	1.5	1A
<i>Potentilla fruticosa</i> Bush Cinquefoil	1.3	1.5	1.5	2A
<i>Prunus tomentosa</i> Nanking Cherry	2.5	1.5	1.5	2B
<i>Prunus virginiana</i> 'Schubert' Chokecherry	7	3	1.5	2B
<i>Quercus alba</i> White Oak	25	3	1.5	4A
<i>Quercus rubra</i> Red Oak	24	3	1.5	3A
<i>Rhus glabra</i> Smooth Sumac	3.5	1.5	1.5	3A
<i>Rhus typhina</i> Staghorn Sumac	6	3	1.5	3A
<i>Sambucus canadensis</i> American Elder	3	1.5	1.5	3A
<i>Sambucus nigra</i> European Elder	4	1.5	1.5	3A
<i>Sambucus pubens</i> Scarlet Elder	4	1.5	1.5	3A



Evergreen

PAD-MOUNTED TRANSFORMER (METRE)				HARDINESS ZONE
BURIED EQUIPMENT (METRE)				
DECIDUOUS (HEIGHT - METRE)				
<i>Shepherdia canadensis</i>				
Russet Buffalo-Berry	1.5	1.5	1.5	2A
<i>Sorbus aucuparia</i>				
European Mountain Ash	10	3	1.5	3A
<i>Sorbus decora</i>				
Showy Mountain Ash	8	3	1.5	2A
<i>Spiraea japonica</i>				
Japanese Spirea	0.7	1.5	1.5	4A
<i>Spiraea latifolia</i>				
Broad-leaved Meadowsweet	1.5	1.5	1.5	4A
<i>Symphoricarpos albus 'laevigatus'</i>				
Snowberry Laevigatus	2	1.5	1.5	5A
<i>Syringa x prestoniae 'Donald Wyman'</i>				
Donald Wyman Prestons Lilac	2.5	1.5	1.5	2A
<i>Syringa x prestoniae 'Isabella'</i>				
Isabella Prestons Lilac	3	1.5	1.5	4A
<i>Syringa x prestoniae 'James MacFarlane'</i>				
James MacFarlane Prestons Lilac	2.5	1.5	1.5	2A
<i>Syringa x prestoniae 'Minuet'</i>				
Minuet Prestons Lilac	2	1.5	1.5	2A
<i>Syringa x prestoniae 'Miss Canada'</i>				
Miss Canada Prestons Lilac	2.5	1.5	1.5	2A
<i>Syringa villosa</i>				
Late Lilac	3	1.5	1.5	2B
<i>Tamarix ramosissima 'Pink Cascade'</i>				
Pink Cascade Tamarix	2	1.5	1.5	5A
<i>Tilia americana</i>				
American Linden	23	3	1.5	3A
<i>Tilia cordata</i>				
Littleleaf Linden	15	3	1.5	3A
<i>Ulmus pumila</i>				
Siberian Elm	18	3	1.5	3B
<i>Viburnum acerifolium</i>				
Mapleleaf Viburnum	2	1.5	1.5	3A
<i>Viburnum dentatum</i>				
Arrowwood	2	1.5	1.5	3A
<i>Weigela</i>				
Weigela	Varies	1.5	1.5	5B
<i>Yucca glauca</i>				
Small Soapweed	0.8	1.5	1.5	4B

PAD-MOUNTED TRANSFORMER (METRE)				HARDINESS ZONE
BURIED EQUIPMENT (METRE)				
EVERGREEN (HEIGHT - METRE)				
<i>Abies balsamea</i>				
Balsam Fir	20	3	4	1A
<i>Abies concolor</i>				
White Colorado Fir	15	3	4	4A
<i>Chamaecyparis pisifera 'Filifera'</i>				
Threadleaf Sawara Falsecypress	2.5	1.5	1.5	4B
<i>Chamaecyparis pisifera 'Filifera Aurea'</i>				
Golden Threadleaf Falsecypress	3	1.5	1.5	4B
<i>Ginkgo biloba</i>				
Maidenhair Tree	20	3	4	4B
<i>Juniperus communis 'Depressa'</i>				
Prostrated Common Juniper	0.6	1.5	1.5	2B
<i>Juniperus horizontalis</i>				
Creeping Juniper	0.6	1.5	1.5	2A
<i>Juniperus sabina</i>				
Sabin Juniper	1.5	1.5	1.5	2A
<i>Juniperus sabina 'Blue Danube'</i>				
Blue Danube Sabina Juniper	2	1.5	1.5	2B
<i>Juniperus virginiana 'Burkii'</i>				
Burk Red Cedar	5	1.5	4	3A
<i>Larix laricina</i>				
Eastern Larch	20	3	4	3A
<i>Picea abies 'Pumila'</i>				
Pumila Norway Spruce	1.2	1.5	1.5	3A
<i>Picea glauca</i>				
White Spruce	22	3	4	1A
<i>Picea glauca 'Conica'</i>				
Dwarf Alberta Spruce	2	1.5	1.5	4A
<i>Picea omorika 'Nana'</i>				
Dwarf Serbian Spruce	1.5	1.5	1.5	4A
<i>Picea pungens</i>				
Colorado Spruce	20	3	4	2A
<i>Pinus banksiana</i>				
Jack Pine	16	3	4	1A
<i>Pinus mugo 'Gnom'</i>				
Gnom Swiss Mountain Pine	0.6	1.5	1.5	2
<i>Pinus resinosa</i>				
Red Pine	24	3	4	2B
<i>Pinus strobus</i>				
White Pine	20	3	4	2B
<i>Taxus canadensis</i>				
Canadian Yew	2	1.5	1.5	3A
<i>Thuja occidentalis</i>				
Eastern Arborvitae	12	3	4	3
<i>Thuja occidentalis 'Golden Globe'</i>				
Golden Globe Arborvitae	1	1.5	1.5	4B
<i>Thuja occidentalis 'Pyramidalis'</i>				
Pyramidal Arborvitae	15	3	4	3A
<i>Tsuga canadensis 'Pendula'</i>				
Pendula Hemlock	2 and more if staked	1.5	1.5	4B



www.hydroquebec.com/livingwirefree

Hydro-Québec

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