St. Thomas energy inc.

We're Your Local Power Distributor

INDUSTRIAL AND COMMERCIAL SERVICE

TRANSFORMER & METERING

INSTALLATION SPECIFICATION

February 2013

NOTE: If conflict exists between St. Thomas Energy's Conditions of Service and this document, the Conditions of Service will be considered correct.

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1.0 Transformer Installation

For service sizes requiring transformers up to 300 KVA, pole mounted utility owned transformers are used. For larger services requiring transformers sizes over 300 KVA, either utility owned or privately owned pad mounted transformers are used. For pad mounted transformer installations, the customer has the option to have a utility owned transformer or a privately owned transformer.

For a utility owned pad mounted transformer, the customer would still be responsible for the complete cost of the transformer installation, however, the utility would own and maintain the transformer for the life of the installation. If the transformer is damaged or hit by lightning, the utility would replace it at no cost to the customer typically within 6 to 8 hours. If an existing utility pole can be used as a cable riser pole, a cable riser pole will not be required on the customer's property.

For a privately owned pad mounted transformer, a privately owned cable riser pole on the customers property will be required with a primary switch either in a cabinet at the transformer primary side or on the cable riser pole supplying the transformer. Fusing and lighting arrestors are also required on the cable riser pole for the underground cable, which will also be owned by the customer. The complete private transformer installation must be inspected by Electrical Safety Authority (ESA). If the private transformer or cable is damaged or hit by lighting, the customer is responsible to repair or replace it. The utility may be able to assist, however, the customer would be charged for all emergency work the utility is requested to perform.

2.0 Utility Owned Transformers

2.1 Pole Mounted Transformer Installation

For a utility owned pole mounted transformer, the customer would still be responsible for the complete cost of the transformer installation which includes all material and labor for the transformer, transformer pole, transformer pole hardware, secondary wires and utility metering. The utility would own and maintain the transformer for the life of the installation. If the transformer is damaged or hit by lightning, the utility would replace it at no cost to the customer typically within 6 hours to 8 hours.

It may be possible to mount the transformers on an existing utility pole. If the transformers cannot be mounted on an existing utility pole, a new pole will have to be installed on the customer's property. The transformer must have 6 meters of clearance (line of site) from any windows, doors or vents. The secondary service wire from the overhead transformer can be either overhead or underground. If the customer decides to go with an overhead service wire, the utility will install overhead services wire. For underground service wire, the customer's contractor is responsible for all the trenching and the installation of the underground cable along with all the hardware required for the cable to rise on the utility pole. This includes cable guards and the compression lugs for the secondary cable terminations at the transformer Burndy type YJA-(size#)2N. Transformer delivery is typically 12 to 14 weeks. If work has to be done outside normal working hours, overtime is charged at double time for labor and regular time for truck and equipment.

Utility Service & Transformer Size Standards for 1 Ph 3 Wire 120/240 Volt Supply

Service Size	Pole Mount Transformer Size
100 Amp	1 - 25KVA Transformer
200 Amp	1 - 50KVA Transformer
400 Amp	1 - 75KVA Transformer

Utility Service & Transformer Size Standards for 3 Ph 4 Wire Wye Grounded 208 Volt Supply

Service Size	Pole Mount Transformer Size
200 Amp	3 – 25 KVA Transformers
400 Amp	3 – 50 KVA Transformers

Utility Service and Transformer Size Standards for 3 Ph 4 Wire Wye Grounded 600 Volt Supply

Service Size	Pole Mount Transformer Size
100 Amp	3 – 25 KVA Transformers
200 Amp	3 – 50 KVA Transformers
400 Amp	3 -100 KVA Transformers

2.2 Pad Mounted Transformer Installation

For a Utility owned pad mounted transformer, the owner is responsible for the total electrical service installation cost which includes all material and labor for the riser pole hardware, transformer, transformer base, transformer base grounding, primary cable, primary cable duct, all trenching, secondary cable, revenue metering and all associated hardware.

The Utility will supply and install the transformer and the primary 28 KV cable, the owner's contractor is responsible for all the civil work to Utility's specifications. This includes installing the transformer base, transformer base grounding, primary cable duct (100mm rigid PVC Conduit) with 10mm polypropylene rope in the ducts, all trenching completed to utility specifications. Secondary cable is also supplied and installed by the owner's contractor. The contractor must also leave 5 meters of secondary cable coiled up inside the transformer base. The transformer must have 6 meters of clearance (line of site) from any windows, doors or vents. If there are no windows, doors or vents within 6 meters of the transformer and the outside wall of the building is fire proof, the transformer can have 1 meter clearance from the fire proof outside wall of the building. The owner's contractor must also install 150mm steel bollards filled with concrete at each corner of the transformer. The bollards must not interfere with the transformer cabinet doors. The transformer must be located in an area where it can be easily accessed by the Utility normally within 6 to 8 feet from a road or parking lot. If the transformer cannot be located within 6 to 8 feet of a road or parking lot, a road base must be installed to within 6 to 8 feet of the transformer. The final transformer location must be approved by the Utility. The owner is responsible to purchase the concrete transformer base to St. Thomas Energy Specifications:
3 Phase Transformer Sizes 150 to 500 KVA Specification 11-120-R0
3 Phase Transformer Sizes 750 to 1000 KVA Specification 11-125-R0

The bases can be purchased from C.J. Pink in London, Reid's Precast Cement Products Ltd. or other suitable suppliers. The owner or the owner's representative is also responsible to supply the compression lugs for the secondary cable terminations at the transformer Burndy type YJA-(size#)2N. The Utility will install the compression lugs and make final connection to the transformer. Transformer delivery can be up to 14 weeks. The Utility cost does not include primary and secondary cable trenching, does not include the primary duct for the primary cable and does not include the transformer base and transformer base grounding. These items are to be supplied and installed by the owner's contractor to Utility specifications. If work has to be done outside normal working hours, overtime is charged at double time for labor and regular time for truck and equipment.

Utility Service & Pad Mounted Transformer Size Standards for 3 Phase 600/347 Volt Services

Service Size	Pad Mounted Transformer Size
400 Amp	300 KVA
600 Amp	500 KVA
800 Amp	500 KVA
1000 Amp	750 KVA
1200 Amp	1000 KVA

Utility Service & Pad Mounted Transformer Size Standards 3 Phase 208/120 Volt Services

Service Size	Pad Mounted Transformer Size
400 Amp	150 KVA
800 Amp	225 KVA
1000 Amp	300 KVA
1200 Amp	300 KVA
1600 Amp	500 KVA
1800 Amp	500 KVA
2000 Amp	500 KVA

2.3 Revenue Metering

All three phase metering and metering equipment is installed indoors, inside an electrical room. For service sizes that require metering PTs and CTs, the PT specification is Itron type ME7. If PTs and CTs are being installed inside the metering cabinet, the CTs specification is Itron type MV7. For larger type services, were PTs and CTs are installed in the switchgear, the CT specification is Itron type R6L.

If PTs and CTs are installed in the metering cabinet, the metering cabinet size required is (48"x48"x12") with removable back place and lockable door to be supplied by the owner's contractor. For a single phase 400 Amp service, the CTs will be in the metering cabinet and the metering cabinet size required is (30"x30"x12") with removable back plate and lockable door. If the metering PTs and CTs are installed in the switchgear, the metering cabinet size required will be (30"x30"x12") with removable back plate and lockable door and 1-1/4" conduit connecting the cabinet to the switchgear to be supplied and installed by the owner's contractor. The metering cabinets or metering centers with multiple meters if there is more than one service, are to be installed in the electrical room on the ground floor and the electrical room must have a door to the outside and a key supplied to the Utility.

The contractor must drop off the metering cabinet back plate at St. Thomas Energy's Meter Shop at 135 Edward Street in St. Thomas. If PT's and CT's are being installed in the switchgear, the contractor must arrange to pick them up from St. Thomas Energy's Meter Shop and send them to the Switchgear Manufacture for installation. All services with loading higher than 500 KW require a telephone line be installed in the meter cabinet. The customer/contractor must provide a dedicated phone line and supply the phone number to St. Thomas Energy.

Any transformation required inside building electrical rooms must be down stream of any revenue meter (load side of the revenue meter). For example, If the main building supply is 600/347V and 208/120V is required, any loads or services that have to be metered must be metered at the 600/347V level. If the main building supply is 208/120Vand 600/347V is required, any loads or services that have to be metered must be metered at the 208/120V level.

For commercial and industrial buildings with multiple meters, a meter center must be installed indoors inside an electrical room with door access to the outside and a key supplied to the Utility.

For commercial and industrial buildings supplied with a single phase 120/240 Volt 200 Amps main service, up to 3 meters including a common services meter (maximum 2 metered units) can be located outdoors without a main service entrance disconnect switch using a gang meter base and supplied by a single stack.

Where the number of metered units supplied by a single phase 120/240 Volt 200 Amp main service exceed 2 metered units, a 200 Amp main service entrance disconnect switch shall be installed ahead of the splitter trough and meters. Furthermore, an electrical room on the main floor with door access to the outside will also be required.

Where multiple meters are supplied by a single phase 120/240V 400Amp service, a main service entrance disconnect switch shall be installed ahead of the splitter trough and meters. Furthermore, an electrical room on the main floor with door access to the outside will also be required

2.4 Available Short Circuit Current (Fault Current) at Customer Service Entrance

It is the customer or customer's electrical contractor responsibility to ensure that equipment being installed has the appropriate short circuit ratings. Available short circuit current at a customer service entrance supplied by secondary voltages of 120/240V, 208/120V and 600/347V is determined by the transformer size, transformer impedance, conductor size and length of conductor from the transformer to the service entrance. When the service is inspected, Electrical Safety Authority (ESA) may request the short circuit levels to check equipment ratings.

When consultants, contractors or customers, request fault current information, St. Thomas Energy quotes the worst case scenarios.

For single-phase services supplied by shared overhead pole-mounted transformers, the transformer size is quoted as 167KVA and the impedance as 1.5%. For three phase services, supplied by overhead pole-mounted transformers, the transformer size is quoted as 500KVA and the impedance as 1.5%. It will be the consultants, contractors or customers responsibility to determine the length and size of the secondary service that is being used and do the final fault current calculation at the service entrance.

For services that are supplied by a dedicated transformer, the transformer size is quoted as the next size up and the impedance is quoted as 3.0% for pad-mounted transformers and 1.5% for pole mounted transformers. The next size up is quoted because under emergency conditions, when transformers are damaged, St. Thomas Energy may install the next size up. For example, if a 300KV pad-mounted transformer is being installed, for the purpose of fault current calculations, the transformer size is quoted as 500KVA and the impedance as 3.0%. It will be the consultants, contractors or customers responsibility to determine the length and size of the secondary service that is being used and do the final fault current calculation at the service entrance.

It can be assumed that fault current levels on the high voltage side of the transformer (the system impedance on the primary distribution system) is infinite (ie. zero impedance). The fault current can be quoted as infinite because the majority of the impedance when calculating secondary fault currents is in the transformer. The system impedance is typically less than 10% of the transformer impedance and can be neglected in the calculation. The error in the fault current calculation will be slightly on the high side.

3.0 Privately Owned Transformer

For a privately owned transformer, a primary high voltage switch will be required. It is also recommended that the transformer meet the maximum no load and full load losses specified by St. Thomas Energy. To verify the transformer meets the loss specification, the transformer loss specifications must be submitted to St. Thomas Energy before ordering the transformer. If the transformer meets the loss specifications, The same requirements as a Utility owned transformer apply for metering and the Utility will install the metering. If the transformer does not meet the loss requirements, the service will be primary metered and the customer/owner will be responsible for the cost of the primary metering PTs and CTs. St. Thomas Energy will order and install the Primary PTs and CTs.

300 KVA transformer:
No Load @ 105% Voltage no higher than 700 Watts
Full Load no higher than 2000 Watts

500 KVA transformer:
No Load @ 105% Voltage no higher than 1000 Watts
Full Load no higher than 3000 Watts

750 KVA Transformer:
No Load @ 105% Voltage no higher than 1200 Watts
Full Load no higher than 5000 Watts

1000 KVA Transformer
No Load @ 105% Voltage no higher than 1400 Watts
Full Load no higher than 7000 Watts

1500 KVA Transformer
No Load @ 105% Voltage no higher than 2500 Watts
Full Load no higher than 8500 Watts

For a privately owned transformer, the customer's contractor is responsible for the complete installation, which includes the transformer, cable riser pole with cross arm, transformer primary switch (which could be on the Cable riser pole or on the primary side of the transformer), S&C SMD-40 fuses (or equivalent), lightning arrestors, high voltage 28KV primary cable from the cable riser pole to the transformer, secondary cables from the transformer to the switch gear and all trenching. The Utility will make final connections to the cross arm on the cable riser pole and install primary metering PTs and CTs if they are required (which could be on the cable riser pole or on the primary side of the transformer).

3.1 Revenue Metering

If the transformer meets the loss specifications, the same requirements as a Utility owned transformer apply for metering and the Utility will install the metering. If the transformer does not meet the loss requirements, the service will be primary metered and the customer/owner will be responsible for the cost of the primary metering PTs and CTs. St. Thomas Energy will order and install the Primary PTs and CTs.

3.2 Available Short Circuit Current (Fault Current) at Customer Service Entrance

It is the customer or customer's electrical contractor responsibility to ensure that the equipment being installed has the appropriate short circuit ratings. For privately owned transformers, St. Thomas Energy will not provide transformer size or transformer impedance information.

It can be assumed that fault current levels on the high voltage side of the transformer (the system impedance on the primary distribution system) is infinite (ie. zero impedance). The fault current can be quoted as infinite because the majority of the impedance when calculating secondary fault currents is in the transformer. The system impedance is typically less than 10% of the transformer impedance and can be neglected in the calculation. The error in the fault current calculation will be slightly on the high side.

3.3 Primary Customer Equipment Fault Current Rating

The Electrical Safety Authority (ESA) requires customer equipment connected to the primary distribution system to have the following short circuit ratings:

27600/16000 Volt supply: 3 phase, short circuit rating of 835 MVA (17.5 KA) symmetrical.
8000/4800 Volt supply: 3 phase, short circuit rating of 500 MVA (36.1 KA) symmetrical.
4160/2400 Volt supply: 3 phase, short circuit rating of 250 MVA (37.4 KA) symmetrical.

4.0 Service Size

Section 8 of the Ontario Electrical Safety Code outlines the methods used to determine electrical service sizes for buildings. The methods of section 8 determine the electrical service size based on the physical size and type of the building, the amount of connected load, and on the operating schedules of the loads.

It is important to realize that the methods used to determine the electrical service size in Section 8 of the Electrical Safety Code are specific for the type of building or facility and amount of load at the time of construction. They are also a minimum requirement. Over time the building or facility type may change or be expanded and the amount of load may change. Normally, the electrical service is sized for the initial building usage and load and if the building usage and load increases in the future, the service size must also be increased.

Most of the rules in section 8 are for residential and commercial buildings such as houses, apartments, schools, hospitals and hotels. Rule 8-210 list the requirements for other types of occupancy which include industrial. Rule 8-106(2) is intended to include installations with requirements in excess of section 8 or not covered in section 8. For these types of installations, the service size is based on the actual load, regardless of section 8 requirements.

If a building has the possibility or capability to accommodate future expansion, it may be economical to prepare the electrical service to accept future loading at the time of construction. It may also be economical to actually size and build the electrical service for the complete future building even though only a portion of the building will be initially complete.

It is the customer or customer's representative responsibility to determine the service size for the proposed connected load and operation. The service size is determined by the rating of the cable or wire supplying the main service breaker or switch. If the customer discloses or submits information about the operations and connected load, the Utility can assist in determining the electrical service size.

The maximum amperage rating of the main switch or breaker can be higher than the rating of the cable or wire supplying the main switch or breaker. If the capacity or rating of the main switch or breaker is higher than the rating of the cable or wire, the breaker protection settings have to be lowered to accommodate the lower rating of the cable or wire.

At the time of construction, it is difficult to predict what the future electrical loading of a building may be specially if the building has multiple units. To avoid costly upgrades in the future, it may be prudent to install some empty duct from the transformer to the electrical service entrance switchgear. For example, the initial building load may require a 600 Volts service with a 400 Amp service size. The transformer size for a 600 Volt, 400 Amp service is 300KVA. The main switchgear and breaker installed can be rated at 800 Amps as long as the breaker is set to trip at 400 Amps. In the future, if the load increases and an 800Amps service size is required, another 400 Amps service can be brought into the switchgear utilizing the spare ducts. The transformer can then be changed from a 300 KVA to 500 KVA and the breaker setting can be reset back to 800Amps.

5.0 Buildings with Multiple Units and Meters

Section 8 of the Ontario Electrical Safety Code outlines the methods used to determine electrical service sizes for buildings, however, section 8 may be somewhat confusing when designing multiple services inside commercial and industrial buildings. Many industrial and commercial buildings are designed to accommodate various configurations of multiple units. For example, a commercial or industrial building may be divided into 3, 4 or perhaps 5 units depending on the businesses that are leasing the facility. Furthermore, it is usually unknown what type of businesses will occupy the units and typically the type of business in the units change over time.

Attempting to follow some of the rules in section 8 of the Ontario Electrical Safety Code to size the electrical services for these buildings can be a challenge since the information required to determine the services sizes is simply not available, however, estimates and forecasts can usually be made. It is common to size and install new electrical services only for the load that they will be initially supplying and to build the service with provisions for future expansion (see section 4.0).

For industrial and commercial buildings with multiple units, the main electrical cable/wire size (service size) that supplies the building defines the amount of power that can be available. Although the main breaker or switchgear can be sized larger than the service cable/wire size, the settings are lowered to accommodate the service cable/wire size. After the main breaker or switch, there can be as many services (meters) connected as required to supply all the units in the building. All the meters supplying the buildings units are to be located in an electrical room on the main floor with door access to the outside. Services inside the building can be sized as required and added or removed as required. For example, an industrial building with 4 units may have a main 800 Amp service and 2 units with 400 Amp services and 2 units with 200 Amp services. In the future, 1 unit with a 400 Amps service may be split into 2 units with 200 Amp services. As long as the capacity of the main 800 Amp service is not exceed, there can be as many services as required. If more power is required, then the main 800 Amp service must be increased.

Any transformation required inside building electrical rooms must be down stream of any revenue meter (load side of the revenue meter). For example, If the main building supply is 600/347V and 208/120V is required, any loads or services that have to be metered must be metered at the 600/347V level. If the main building supply is 208/120Vand 600/237 is required, any loads or services that have to be metered must be metered at the 208/120V level.

For commercial and industrial buildings with multiple meters, a meter center must be installed indoors inside an electrical room with door access to the outside and a key supplied to the Utility.

For commercial and industrial buildings supplied with a single phase 120/240 Volt 200 Amps main service, up to 3 meters including a common services meter (maximum 2 metered units) can be located outdoors without a main service entrance disconnect switch using a gang meter base and supplied by a single stack.

Where the number of metered units supplied by a single phase 120/240 Volt 200 Amp main service exceed 2 metered units, a 200 Amp main service entrance disconnect switch shall be installed ahead of the splitter trough and meters. Furthermore, an electrical room on the main floor with door access to the outside will also be required.

Where multiple meters are supplied by a single phase 120/240V main service and the service capacity exceeds 200 Amps, a main service entrance disconnect switch shall be installed rated for the capacity of the main service ahead of the splitter trough and meters. Furthermore, an electrical room on the main floor with door access to the outside will also be required

6.0 Properties with Multiple Buildings

Properties with more than one building on it must not be supplied from a common electrical room in one building. Each building must have its own supply and its own electrical room and meter or meters (see section 5.0)

7.0 Contact Person

There are usually several organizations involved in the construction process. Typically the customer/owner hires an Architect or an Engineering Consultant, they in turn hire a Electrical Engineering Consultant to prepare the electrical work and the Electrical Engineering Consultant hires and Electrical Contractor to do the work. It is important that these organizations agree among themselves who the contact should be with St. Thomas Energy. Once the contact person has been established, St. Thomas Energy will work with the contact to ensure all requirements are met to complete the transformer installation. Any specifications or design information that is required from St. Thomas Energy will be sent to the contact person and it will be the contact person's responsibility to send the information to the appropriate people.

8.0 Quotation and Invoice

The customer/owner or the representative must obtain and prepare an "Electrical Service Application" Form 91 and submit it to St. Thomas Energy. The information requested on this form must be provided to the Engineering Department along with a site plan drawing showing existing and proposed property lines, existing and proposed building footprints, existing pole locations, proposed electrical room and/or proposed metering location and show how the metering can be accessed. All drawings are to be submitted in AutoCAD Format. For large services where a dedicated transformer will be required, the site plan should also show the proposed transformer location. All transformer locations must be approved by St. Thomas Energy. If new services and meters are being added to an existing main service in an existing commercial or industrial building, a site plan drawing will not be required but a drawing showing the electrical room with the new proposed meter location(s) will be required. All information and drawings submitted to St. Thomas Energy will be protected by the Personal Information Protection & Electronic Documents Act (PIPEDA).

If the customer/owner would like to proceed with the work, full payment will be required before any material ordered and before any work begins. If transformers are required, transformer delivery can be up to 14 weeks from the time payment is received.

9.0 Easements

If easements are required on the customer/owner's property for any power supply equipment, it is the customer/owner's or his representative (the contact person) responsibility to get the easement registered and to send a copy of the registered plan and documents to St. Thomas Energy. Be advised that it takes time to secure an easement, and the service will not be connected until the easement is registered. All correspondence regarding easements should be sent to:

Attention: Mr. K. Stewart Bowsher, B.A., LL.B.
bowsher+bowsher
Law Firm
112 Centre Street,
St. Thomas, Ontario
N5R 2Z9
ph 519-633-3301
fax 519-633-5995
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10.0 Electrical Safety Authority (ESA)

The customer/owner must have all new electrical systems that are not installed by St. Thomas Energy Inspected by the Electrical Safety Authority (ESA). St. Thomas energy must have a copy of the ESA inspection certificate and the contractor must also complete St. Thomas Energy's Meter & Service Address Verification Form 8 before a new service is energized. Along with a copy of ESA's inspection certificate, St. Thomas Energy's Meter & Service Address Verification Form must also be completed.

11.0 Energy Supply Contract

Weather the customer/owner chooses to purchase energy from St. Thomas Energy or a third party supplier, the customer is required to complete a service agreement with St. Thomas Energy From 59, which will include a security deposit. If the customer chooses to purchase energy from a third party supplier, the third party supplier must be approved by St. Thomas Energy and meet all St. Thomas Energy's requirements. The energy supply agreement and the security deposit must be in place before St. Thomas Energy will energize a new service.