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11.1 General Specifications

11.1.1 Primary Voltage

St. Thomas Energy's underground distribution system for residential subdivisions will be designed to 28 kV standards unless otherwise indicated. Temporary power installations, if required, are not covered in this standard.

11.1.2 Secondary Voltage

All residential dwellings or units are to be provided with a standard 100 Amp, 120/240 Volt, 3 wire services as per CSA voltage limit specification (see table 1.1). Residential dwellings that require 200 Amp or 400 Amp 120/240V services are not covered in this standard.

11.1.3 Underground Cables, Transformers and Equipment

Underground cables, equipment and transformers can be categorized as:

1. Three phase main feeders
2. Three phase loops
3. Single phase, taps or laterals,
4. Secondaries
5. Transformers & Equipment

11.1.4 Three phase main feeders

Three phase main feeder cables can be rated at 400 Amp or 600 Amp. Generally, transformers are not connected to three phase main underground feeders. These feeders are generally used to supply power to three phase loops.

11.1.5 Three Phase Loops and Transformers

Underground distribution systems are fed radial (feed from one end) and can be considered to be a tap or lateral off the main overhead distribution system. Furthermore, underground distribution cables through subdivision are configured such that they can be supplied by the main overhead distribution system from both ends. This configuration is known as a "loop". A loop is an underground cable that can be feed from either end but is only feed from one end.

Three phase loops are rated 200 Amps. 2/0 AL 28kV cable is used (see material specification section 11.2). Single phase loops may be used for some situations. The maximum length for 2/0 AL 28KV cable should not exceed 2 kilometres. For three phase loops, the maximum number of single phase 50 kVA transformers connected shall not exceed 20 transformers per phase or 60 transformers for a three phase loop. The maximum number of secondary services connected to each 50KVA transformer shall not exceed 15. This will allow a maximum of 900 services for a three phase loop.

During construction, loops may not be completed until the entire subdivision is completed or until a neighbouring subdivision is completed. If loops remain open (cable supply from only one end), the maximum number of connected transformers that will be allowed on an open three phase loop is 30 (450 services). No further development will be allowed until the loop is complete.

11.1.6 Single phase taps or laterals

Single phase taps or laterals connected to loops are also rated 200 Amps, however, no more than 2 transformers shall be connected to a tap or lateral. Transformers connected to taps or laterals are counted as a transformer connected to the loop and the total number of transformers per 3 phase loop is still 60 regardless of how many taps or laterals are in the 3 phase loop.

11.1.7 Secondary Services

Secondary service cables shall be rated for 100 Amps of continuous current with 3% maximum voltage drop at the customer's service entrance. For typical residential services without electric heat, 3/0 Aluminium triplex cable is to be used for all secondary services (see material specification section 11.2). The maximum length from transformer terminals to the customer's service entrance for the above condition to be satisfied is 100 metres.

11.1.8 Transformers

Transformers used for residential subdivisions are single phase with 120/240 V secondary windings. Transformers sizes available are 50 kVA, 75 kVA, 100 kVA and 167 kVA. The standard size used for residential subdivisions without electric heating is 50 kVA. Up to fifteen services may be connected to one transformer. To meet future or unforeseen loading conditions, transformers up to 167 kVA can be used. For this reason, the standard transformer base can accept transformers up to 167 kVA.

11.1.9 Street Lighting

The design of the street lighting system shall generally conform to applicable ANSI/I.E.S. standards. The street lights are to be design in accordance with City of St. Thomas Illumination Standards.

City of St. Thomas streets shall conform to the following minimum average in service horizontal lux:

Arterial Roads:	13 lux,
Collector Streets:	10 lux,
Local Streets:	6 lux.

The lowest lux value on the pavement shall not be less than one-third of the average value. Any variation in design from the standard is to be approved by the City of St. Thomas.

11.2 Material Specifications

11.2.1 Primary Cable

All test results for primary cables shall be forwarded to St. Thomas Energy prior to installation. In all cases, primary cable will be single conductor cable for each phase.

Three phase 600 Amps main feeder cables shall be constructed using 500 kcmil copper with 28 kV insulation with 1/3 neutral manufactured to Hydro One specification (see section 12.12). The cable can be briefly described as: 28 kV stranded central compressed copper conductor, approved strand-fill compound, extruded semiconducting thermosetting conductor shield, extruded thermosetting tree-retardant cross-linked polyethylene insulation, extruded semiconducting thermosetting insulation shield, copper concentric neutral, 133% insulation and linear low density polyethylene encapsulating (LLDPE) jacket.

The separate ground conductor required for three phase 600 Amp feeder cables is 3/0 AWG copper conductor CSA type TWU with green colour insulation.

Three phase 400 Amp main feeder cables shall be constructed using 4/0 AWG copper with 28 kV insulation with full neutral manufactured to Hydro One specification (see section 12.12). The cable can be briefly described as: 28 kV stranded central compressed copper conductor, approved strand-fill compound, extruded semiconducting thermosetting conductor shield, extruded thermosetting tree-retardant cross-linked polyethylene insulation, extruded semiconducting thermosetting insulation shield, copper concentric neutral, 100% insulation and linear low density polyethylene encapsulating (LLDPE) jacket.

All other 200 Amp loops, taps and lateral feeders, shall be constructed using 2/0 AWG aluminum cables with 28 kV insulation with full neutral manufactured to Hydro One specification (see section 12.12). The cable can be briefly described as: 28 kV stranded central compact Aluminium conductor, approved strand-fill compound, extruded semiconducting thermosetting conductor shield, extruded thermosetting tree-retardant crosslinked polyethelene insulation, extruded semiconducting thermosetting insulation shield, copper concentric neutral 100% insulation and linear low density polyethelene encapsulating (LLDPE) jacket.

11.2.2 Secondary Cable

All secondary cable shall be 600 volt type, suitable for direct burial.

Secondary cable can be briefly described as: 3/0 AWG aluminum triplex or 250 kcmil aluminum triplex, 3 conductor (black, white and red) polyethylene insulation and PVC jacket; As per Specification USC-75.

11.2.3 Street Lighting Cable

Secondary street light cable from the transformer to the base of the street light pole hand-hole shall be: Non-metallic sheath cable 2 conductor No. 6 copper with No. 10 bare copper CSA type NMWU (6/2 AWG CSA type NMWU). Each circuit must be supplied by a 60 Amp breaker with 22,000 Amp Fault Current Rating. The bare copper ground from the transformer ground terminal to the street light circuit breaker shall be increased to No. 8 AWG.

Cable in street light pole from hand-hole to luminaire shall be: Non-metallic sheath cable 2 conductor No. 12 copper with No. 14 bare copper CSA type NMWU (12/2 AWG CSA type NMWU).

11.2.4 Grounding Cable

2/0 AWG Bare Copper, Soft Drawn 19 Strand

11.2.5 Transformer Bases

The foundation base for all single phase transformers shall be a precast reinforced concrete well capable of supporting up to a 167 kVA transformer.

Transformer bases purchased shall be manufactured according to Drawing 11-95 or 11-100 as specified.

11.2.6 Pad Mount Transformers Specifications

Single phase pad mount transformers shall be low profile, dead front with the following tank dimensions: width 915mm ± 50, depth 1220mm ± 50, height of 610mm and are to be designed and built to St. Thomas Energy specification PDTX-1 (see Section 12.14 Transformer Design and Specification)

Single phase pad mounted transformers will have a Horstman fault indicator installed on the H1 terminal elbow (see section 12.4 Horstman Fault Indicators) for details. A hole 8mm in diameter will also be drilled in the transformer cabinet for the red LED display light and a 2 meter fiber optic cable will connect the fault indicator on the elbow to the red LED on the cabinet. The location of the red LED in the cabinet is to be determined in the field at the time of installation for the best viewing from the road during a drive buy.

11.2.7 PJ Sectionalizing Enclosures Specification

Single Phase and 3 Phase Sectionalizing enclosures used for underground distribution in subdivisions. 3 phase 3 way and 3 phase 4 way use the same Maysteel enclosure model number CC366-22TH (Width 66" Depth 22" Height 30" or 1675mm x 521mm x 762mm, Weight 243 lbs), Refer to drawing number 11-116. Single phase 3 way and single phase 4 way use the same Jesstec enclosure AMSPR 12423-0 (refer to drawings 11-114 and 11-115)

11.2.8 Pad mounted Switch Specification

S&C Electric Company Pad mounted switches model number PMH9 are used for subdivision underground distribution. The manufacturer shall submit two copies of the drawings prior to manufacturing. Reference drawing number 11-160. Cable guides are ordered separately. 100 Amp SMD20 fuses also ordered separately.

11.2.9 Pad mounted Oil switch Specification

G&W Pad mounted switches model number LPRA 12/12-192-20M are used for subdivision underground distribution. The manufacturer shall submit two copies of the drawings prior to manufacturing. Reference drawing number 11-165.

11.2.10 Pad mounted Switch Gear Bases

Three phase switching unit bases shall be of a precast reinforced concrete well-type foundation which shall be manufactured according to Drawing 11-130 or 11-140 (to be specified).

11.2.11 Underground Duct

Underground duct used for primary and secondary conductors shall be 4 inch (100mm) in diameter either FRE or rigid PVC (schedule 40) along with any necessary accessories. For built up areas, where directional boring may be more economical than open trench, high density polyethylene pipe (HDPE) will also be allowed. Normally 4 inch (100mm) SDR19 with 0.237 inch wall thickness shall be used which is equivalent to 4 inch (100mm) PVC (schedule 40).

11.2.12 Street Lighting Equipment

Street Lighting equipment is specified by the City of St. Thomas and reviewed by St. Thomas Energy. Typical specifications that have been used in the past are as follows:

Poles

Poles shall be similar to G.T.E. Sylvania Powerlight Aluminum Type " E ", FRE Composite or approved equivalent. The mounting height of the luminaire shall be 7.6 metres above the pavement on local streets and 9.1 metres above the pavement for Collector and Arterial streets. Poles on all streets shall be mounted on " Power Installed " galvanised steel bases.

Alternate decorative lighting poles- spun concrete 13'11" Belmont Style pole, Cat # KBC14-G-E51-BP

Luminaries

Luminaries shall be equivalent to Sylvania # LXBC 2227S, High Pressure Sodium (Cobra Head Style) and shall be 70 watt for Local streets, 100 watt for Collector streets and 150 watt or 250 watt for Arterial streets. Each luminaries shall be individually controlled by its own photocell.

Alternate decorative lighting fixtures- King Luminaire, K118 Washington luminaire with external optics c/w filigree GR ring.

Mast Arms

Mast arms shall be of aluminum construction in lengths of 1.8, 2.4, 3.0 or 3.7 metres. Length to be determined by City Illumination Standard.

11.3 Installation Specifications

In general, the installation of the electrical plant shall not begin until all water and sewer services are in place and the area to be installed has been graded to within 150 mm of final grade.

Unless otherwise stipulated, the location of the underground distribution system is to be on the road allowance to conform with the current regulations of the City of St. Thomas, and other Utilities

A typical road allowance cross section is shown on Drawings 11-300, 11-305, 11-310, 11-315, 11-320 and 11-325.

11.3.1 Layout

The survey shall be done by a qualified land surveyor and is to include center line of trench staked opposite each property bar. At transformer and switchgear base locations, two grade stakes shall be set 2.0m from each back corner. Locations shall be governed by the standard drawings included in this specification. St. Thomas Energy may approve changes in locations during installation if the standard locations are in conflict with other facilities.

11.3.2 Utility Locates

Contractor are responsible for obtaining existing utility locates prior to excavating for electrical plant.

11.3.3 Trenches

Trench excavation shall be carried out in conformation with all applicable Acts and By-laws.

Where cables terminate at an existing hydro pole, the trench shall not be left open for more than 2 days and shall be fenced or barricaded. If a substantial amount of fill has been removed around the pole, the pole shall be supported.

Trenching shall not be done too far ahead of cable installation to minimize chances of rain filling the trench, or other similar weather hazards.

Rocks, boulders and similar large obstructions shall be removed if encountered in trenching, and no such removed material nor any such scrap, other refuse, or broken concrete pieces shall be used for any backfill material. The trench bottom shall be free of stones and other sharp objects and kept as level as possible. Existing active services encountered shall be protected, braced and supported as required. Standard trench cross section showing required widths and depths is shown on Drawing 11-15.

11.3.4 Underground Ducts

All primary 200Amp 2/0 AL three phase and single phase loops, taps and laterals are to be installed in 100mm duct, direct buried, and laid straight end to end (Drawing 11-15).

Three phase main feeder cables 600 Amp 500 CU copper or 400 Amp 4/0 CU shall be installed in 100mm duct, direct buried, and depending on soil conditions or location may also be encased in concrete. St. Thomas Energy will determine any locations other than road crossings that require concrete encasement. Typical trench cross section for main feeders are shown in Drawing 11-15.

Wherever a road crossing is made, all primary and secondary cables shall be installed in 100mm duct and encased in concrete. Road Crossings for main feeder 600 Amp 500 CU cable shall have one 50mm PVC duct installed for the separate 3/0 insulated ground conductor. If provision for SCADA control wiring is required, one 50mm PVC duct shall be installed for SCADA control wiring.

Secondary and other service cables shall never be installed in the same duct as primary cables and all primary cables are to be installed singly in their own duct. Secondary and streetlight cables may be grouped within a secondary cable duct so that up to two secondary cables with one streetlight cable is permissible. Note that a secondary service cable is made up of three 3/0 AL wires (triplex). Only two secondary triplex cables are permissible in one 100mm duct.

Ducts are to extend at least one metre beyond the road curb at both sides of the road and are to be as straight as possible at a 0.25 % minimum grade. Bell ends are to be used on all ducts.

One spare duct shall be provided at each road crossing. The spare duct shall be sized the same as the largest duct in the road crossing. After installation the duct bore shall be cleaned of any loose material or obstructions. A 10 mm polypropylene rope shall be placed in the duct and the duct suitably capped at each and to prevent the ingress of foreign material. Typical road crossing shown on Drawing 11-15.

Where developments occur opposite existing asphalted roadways, directional boring will be allowed with the use of high-density polyethylene pipe SDR11 and fittings.

11.3.5 Backfilling

Clean well-graded bedding sand to provide at least a 150mm cover over and under cables shall be placed by hand before mechanical backfilling. Where concrete encased ducts have been installed, select granular screenings may be used instead of sand.

All subsequent backfill material may be native earth but shall be clean and free of rocks and other large sharp objects. Mechanically tamped backfill may be required at all driveway locations. For road crossings, compaction and backfill material used shall meet City of St. Thomas requirements.

11.3.6 Laying & Pulling Cables

Considerable care shall be taken in handling and laying cables to avoid damage to the insulation. Trench bottoms are to be clean and prepared as required before laying cable and are to be pumped free of water, if any has accumulated.

In all trenches where primary cable is installed with secondary and other cable, the primary shall be laid in the center or toward the street side of the trench. A minimum of 150mm separation shall be maintained between primary and secondary and between secondary and communication cables. This separation is to be vertical.

Cables are to be laid in the trench from the reel and not pulled in by any mechanical means. Where this is not possible, the cables are to be walked in by hand.

Since cable splicing will not be permitted, care should be taken in selecting reel sizes and in cutting cables, in order to ensure adequate cable for each run.

Prior to pulling cables in ducts, a swab or brush shall be pulled through each duct to remove loose abrasive material.

Wherever cables are installed requiring a bend, such bending shall be done with care to ensure it is done in such a manner and with a radius such as not to damage the cable construction or insulation. Under no circumstances shall the bending radius be less than 12 times the cable diameter.

11.3.7 Primary Cables

Primary cables shall be identified by phase and destination wherever a termination is made or where they are to emerge above the ground. Such identification must be well visible at termination points. Rigid coloured plastic tags affixed with plastic ties shall be used, coloured red white and blue according to phase. In addition coloured tape bands shall be used to identify phasing. Primary cables shall be installed into bases and enclosures and a 5 metre coil of cable left for termination by St. Thomas Energy employees. Where primary cable runs up a pole to be terminated to an overhead line a minimum of 15 metres of cable shall be left for termination. Primary cable ends shall be capped and taped to make a waterproof seal as soon as a cut is made.

Maximum Pulling Tension for Primary 28KV Cable

Cable Size	Max Tension
2/0 AL	800 lbs
4/0 CU	1000 lbs
500 CU	1000 lbs
1000 CU	1000 lbs

Maximum Pulling Lengths for Straight Ducts for Primary 28KV Cable

Cable Size	Cable Weight	Max Length in PVC	Max Length in FRE
2/0 AL	1.289 lbs/ft	1217 feet 371 meters	1612 feet 491 meters
4/0 CU	2.775 lbs/ft	706 feet 215 meters	936 feet 285 meters
500 CU	4.293 lbs/ft	456 feet 140 meters	605 feet 184 meters
1000 CU	7.861 lbs/ft	249 feet 76 meters	330 feet 100 meters

Ninety degree bends in the duct system add about 60lbs of tension, which reduce the maximum pulling distance by about 30 meters for every bend

Three phase 600 Amps main feeder 500 CU cables, shall be installed with a separate ground 3/0 AWG copper conductor CSA type TWU with black colour insulation run parallel in the same trench and on top of the ducts. A separate 50mm PVC duct shall be installed for SCADA control wire throughout. For road crossings the ground conductor and control wire shall be in a separate 50mm PVC duct.

Three phase 400 Amp main feeder 4/0 CU cables shall be installed without a separate ground conductor but with a separate 50mm PVC duct for SCADA control wire throughout.

All other 200 Amps 2/0 AL loops, taps and lateral cables shall be installed without a separate ground conductor and without a separate 50mm SCADA duct.

11.3.8 Secondary Cables

Service cables shall run directly from transformers to one metre inside the front lot line and shall enter the lot parallel to and at a point approximately one metre from the side lot line.

For semi-detached lots, the service cables for each side of the semi shall still be run one metre inside the front lot line and shall enter the lot parallel to and at a point approximately one metre from the side lot line.

At the transformer end, three metres of secondary cable above the top of the base shall be left for termination.

At the lot end, a 15 metre coil shall be secured to a 100mm x 100mm wooden post 2.4 m long. The 15m coil is based on city by-law minimum building setback requirements. It is the the developer's responsibility to notify design personal if any buildings requires longer secondaries.

Where cable ends are left unconnected or exposed, they shall be capped and taped to make a waterproof seal. A combination of rubber tape and plastic tape, or some other form of waterproofing seal is to be used.

All secondary cables shall be identified in the transformer compartment as to house number or lot number they serve. Permanent self laminating cable markers shall be used for marking. The lot ends of the secondary cable shall be identified the same way and identify which transformer they are supplied by.

11.3.9 Cold weather Installation

When the outside temperature falls below 0 degrees Celsius; cable installation may be discontinued if, at the discretion of St. Thomas Energy's representative, the cables performance may be affected due to temperature or installation conditions.

When outside temperature falls below -10 degrees Celsius, cable installation shall be discontinued until such time as installation conditions are acceptable to St. Thomas Energy representative.

11.3.10 Transformers and Switchgear Bases

Transformer and switchgear bases are to be located, wherever possible one metre off the projection of the side lot line centred over the common utility trench. Other obstructions such as fire hydrants, street lights, poles, trees, shrubs, fences etc, shall be located a minimum of 3 metres away from transformers and switchgear bases. Transformers and switchgear bases shall preferably not be located in hollows or depressions which could collect water in heavy rains. A minimum of one metre shall be maintained from the edge of bases to adjacent driveways.

Transformer bases shall be centred over the main trench and to be set on at least 300mm of tamped crushed stone, extending at least 150mm beyond the sides of the base. This stone must be placed on undisturbed, fully compacted earth. Bases to be level at 75mm above finish grade. A 20mm plywood cover to fit over the base is to be installed and drilled to fit hold down bolts.

After bringing in cables and training cables for correct positioning, sand backfill shall be placed in by hand up to incoming trench requirements through cable openings to ensure that all cables are on a minimum of 150mm of sand.

Switching unit bases shall be installed the same as transformer bases but due to the physical size of the unit, it may be necessary to locate it onto a lot by use of an easement. This to be determined on an individual basis at preliminary discussions.

11.3.11 Grounding for Transformer and Switchgear Bases

Grounding shall be provided by two 20mm x 3m galvanized steel ground rods driven 1m off the edges of the base, so as to be covered by at least 300 mm of soil to final grade. Bare copper ground wire, 2/0 AWG soft drawn 19 strand, shall run from ground rod to ground rod, completely encircling the base and fastened securely to each ground rod by an approved ground rod connector. Two lengths of ground wire shall be fastened with compression connectors near diagonally opposite ground rods and run into the base, with at least 3m. free conductor above the top of the base for connection.

Refer to Drawing 11-20 for pad mounted equipment and grounding details.

11.3.12 Pad Mounted Transformer

Pad mounted transformers are to be carefully placed onto their base (see section 11.3.10 and 11.3.11). Care must be taken to ensure all connections and terminations are properly made and that all manufacture's specifications or requirements are met. Also ensure that equipment documentation such as transformer numbers and conductor number tags are correct. Loop feed transformers that are at the end of a loop are terminated with a lightning arrestor. Care must also be taken when the transformer is energized for the first time and after it is energized all secondary voltages are to be checked before connecting load.

11.3.13 PJ Sectionalising Enclosures

PJ Sectionalising enclosures are to be carefully placed onto their base (see section 11.3.10 and 11.3.11). Care must be taken to ensure all connections and terminations are properly made and that all manufacture's specifications or requirements are met. Also ensure that equipment documentation such as equipment numbers and conductor number tags are correct

11.3.14 Pad Mounted Switch PMH-9

Pad mounted switches are to be carefully placed onto their base (see section 11.3.10 and 11.3.11). Care must be taken to ensure all connections and terminations are properly made and that all manufacture's specifications or requirements are met. All switches should be operated before energization to ensure proper operation. Also ensure that equipment documentation such as equipment numbers and conductor number tags are correct.

11.3.15 Pad Mounted Oil Switch

Pad mounted oil switches are to be carefully placed onto their base (see section 11.3.10 and 11.3.11). Care must be taken to ensure all connections and terminations are properly made and that all manufactures specifications or requirements are met. All switches should be operated before energization to ensure proper operation. Also ensure that equipment documentation such as equipment numbers and conductor number tags are correct.

11.3.16 Street Lighting

Street lights shall be located on the boulevard according to the City of St. Thomas' requirements and shall generally be located on the projection side of the side lot line. Locations shall respect proximity to fire hydrants, driveways and other underground services and shall not be closer than 3 metres to a transformer or switch unit. Street lights will generally be installed on the opposite side of the street to the water main. All street light circuits have to be inspected by ESA before they are energized.

11.3.17 Street Lighting Cables

The street light cable is specified in section 11.2.3 as non-metallic sheath cable 2 conductor No. 6 copper with No. 10 bare copper CSA type NMWU (6/2 AWG CSA type NMWU). Street light cables shall be run from transformer locations to street light poles using, where possible common trenches with other utility cable. Lights are to be fed radially and 1 street light cable (circuit) shall run from the transformer to the nearest pole (on each side if so designed) and may extend up to 200 meters with a maximum of 8 lights on 1 circuit. Each circuit must be supplied by a 60 Amp breaker with 22,000 Amp Fault Current Rating. The bare copper ground wire from the transformer terminals to the breaker shall be increased to No. 8 AWG

Where poles are not in place at the time of street light cable installation, the end of the cable shall be coiled and staked at the intended location in a similar manner to secondary cable except that at least 3 metres of cable shall be left above grade.

Where the cable is to continue on to another light, the cable shall be looped and not cut and at least 6 metres in total shall be left above grade.

Cables are to be inserted into poles via the cable access port and the bare ground shall be connected to the internal ground lug in the hand hole of the pole. Compression type tap or approved "Wire Nut " type connectors are to be used for all connections and the service wire shall not be cut if it is to carry on to another light. All connections to ground and to the luminaire conductors are to be made in the hand hole and taped or otherwise insulated.

Each luminaire shall be fused by means of a separable fused secondary connector kit utilising a 15 Amp midget fuse. This connector is to be CSA approved and shall be installed with the line supply conductor connected to the female side of the plug and the luminaire connected to the male side of the plug. Each luminaire shall be controlled by it's own photo-cell. Refer to Drawing 11-200 for street light installation details.

11.4 System Commissioning

St. Thomas Energy personnel will be responsible to ensure that all work done by contractors is acceptable . Once the underground distribution system has been completed and the municipal street numbers have been received from the City, St. Thomas Energy will schedule staff to complete all connections and terminations

11.4.1 Inspection

All work performed by contractors is subject to inspection at any time by St. Thomas Energy personnel. A St. Thomas Energy inspector must be present at all times when work is being done by contractors. A minimum of 24 hours notice is required to schedule inspection.

Contractors are also responsible to have street lighting systems inspected by ESA (Electrical Safety Authority).

11.4.2 Testing

All primary cables shall be tested by the application of a D.C. potential (Hi-potting), as per IPCEA S-66-524 and to levels specified by St. Thomas Energy and test results recorded.

All secondary cables shall be meggered with a 1000 volt megger. Test results are to be recorded and any cables not registering infinite resistance shall be replaced.

All test results must be acceptable to St. Thomas Energy.

11.4.3 Energization

Under no circumstances will any one other than St. Thomas Energy employees work on any energized apparatus or make or install a connection to any equipment or part of equipment which is live.

St. Thomas Energy will not energize any part of the plant until all requirements have been met.

Prior to energization, St. Thomas Energy will perform all testing it deems necessary and may request the contractor to make any repairs or changes necessary for acceptance.

Once energization of the plant has taken place, no one other than St. Thomas Energy employees shall have access to energized equipment.

11.4.4 Locks

Following completion of all installation and testing on transformers and switchgear, the completed units shall be locked by St. Thomas Energy.