# CONSTRUCTION SPECIFICATION FOR INSTALLATION OF POWER SUPPLY EQUIPMENT

**TABLE OF CONTENTS**



## 614.01 SCOPE

This specification covers the requirements for the installation of distribution assemblies and supply control cabinet assemblies.

## 614.02 REFERENCES

This specification refers to the following standards, specifications, or publications:

**Ontario Provincial Standard Specifications, Construction**

OPSS 603 Installation of Ducts
OPSS 604 Installation of Cable
OPSS 609 Grounding
OPSS 616 Footings and Pads for Electrical Equipment

**Ontario Provincial Standard Specifications, Material**

OPSS 2414 Power Supply Equipment
OPSS 2485 Photoelectric Controllers

**Electrical Safety Authority (ESA)**

Ontario Electrical Safety Code

## 614.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

**Service Box** means an approved assembly consisting of an enclosure designed and constructed so that it can be effectually locked or sealed, contain either service fuses and a service switch or a circuit breaker, and allow the switch or circuit breaker to be manually operated.

## 614.04 DESIGN AND SUBMISSION REQUIREMENTS

### 614.04.01 Submission Requirements

The following information shall be submitted to the Contract Administrator:

a) Actual breakdown cost of Utility work, such as hook up, transformation, etc.

b) Utility company contact person's name, title, address, and telephone and mobile phone numbers.

Working drawings shall be submitted according to OPSS 2414.

A Manufacturer's Certificate of Conformance and Request to Proceed shall be submitted to the Contract Administrator upon completion of the fabrication of the power supply equipment.

The power supply equipment shall not be delivered to the site until the Contract Administrator has received the Manufacturer's Certificate of Conformance, Request to Proceed, and issued a Notice to Proceed.

## 614.05 MATERIALS

### 614.05.01 Distribution Assemblies

Distribution assemblies shall be according to OPSS 2414 and the Contract Documents.

### 614.05.02 Supply Control Cabinet Assemblies

Supply control cabinet assemblies shall be according to OPSS 2414 and the Contract Documents.

Supply control cabinet assemblies shall include an Arc Flash and Shock Hazard warning label according to Figure 1. The warning sign shall be prominently displayed on the outside of each exterior door. The Contractor shall enter the location information in Figure 1 as indicated by the local MTO electrical coordinator.

The AC arc flash analysis and results in Figure 1 are applicable to ministry highway electrical systems with the following characteristics:

a) Single phase.

b) Nominal system voltage of 240 VAC or less.

c) Continuous current rating of main breaker of 100 A or less.

d) Size of upstream transformer of 100 kVA or less.

e) Condition of electrical plant shall be in good condition and well maintained.

**614.05.03 Service Boxes**

Non-metallic enclosures for service boxes shall be certified or approved and marked Suitable for Use as Service Equipment.

**614.05.04 Photoelectric Controllers**

Photoelectric controllers shall be according to OPSS 2485.

**614.05.05 Cables and Cable Connectors**

Cables and cable connectors shall be according to OPSS 604.

**614.05.06 Grounding Materials**

Grounding materials shall be according to OPSS 609.

**614.05.07 Conduit and Fittings**

Rigid ducts and fittings shall be according to OPSS 603.

**614.07 CONSTRUCTION**

**614.07.01 General**

General requirements for electrical work shall be as specified in the Contract Documents.

Concrete pads shall be according to OPSS 616 and as specified in the Contract Documents.

**614.07.02 Distribution Assemblies**

Equipment enclosures shall be installed squarely and symmetrically on concrete pads.

A neoprene gasket shall be attached squarely and symmetrically on the bottom base H-beam of the enclosure prior to installation. Base H-beam anchor bolts shall be secured in place at locations specified in the Contract Documents.

**614.07.03 Supply Control Cabinet Assemblies**

Supply control cabinet assemblies shall be mounted securely on poles using stainless steel strapping.

Rigid ducts and fittings shall be installed on wooden poles using two-hole galvanized pipe straps one trade size larger with galvanized lag screws and on metal or concrete poles using stainless steel strapping, at intervals specified in the Ontario Electrical Safety Code. The conduit system shall be installed in straight lengths to follow the taper of the pole. Offset bends, meter hubs, terminal adapters, and fittings shall be used when required to avoid pole attachments and be kept free of kinks or scorch marks.

When specified in the Contract Documents, a meter socket, acceptable to the power supply authority, shall be installed.

### 614.07.04 Cables and Fuses

Cables, terminations, and connections shall be installed according to OPSS 604. Service cables from the point of service connection to the main disconnecting means shall be installed according to the Ontario Electrical Safety Code and the requirements of the power supply authority.

Only high-voltage fuses that have a current rating approved by the power supply authority shall be installed.

### 614.07.05 Grounding

All grounding work shall be according to OPSS 609.

All concrete pad mounted equipment shall be bonded by means of bonding jumpers connected between the equipment ground bus and the exterior ground grid. Lightning arrestors shall have the ground cable connected securely to the equipment ground bus. The neutral bus of the main disconnecting means or the secondary neutral terminal of the transformer shall be grounded.

The system ground wire and the service ground wire shall be connected to the neutral bus in supply control cabinet assemblies.

### 614.07.06 Photoelectric Controllers

#### 614.07.06.01 General

Photo-conductive cell windows shall be set to face in a northerly direction and away from any nearby light sources.

#### 614.07.06.02 Distribution Assemblies

Photoelectric controllers shall be installed according to the Contract Documents.

#### 614.07.06.03 Supply Control Cabinet Assemblies

Photoelectric controllers shall be installed on poles with twist lock mounting sockets and brackets. Brackets shall be mounted on metal or concrete poles with stainless steel strapping or on wooden poles with galvanized lag screws.

### 614.07.07 Quality Control

#### 614.07.07.01 Pre-Installation Testing and Inspection

Power supply equipment shall be inspected prior to installation to ensure that it meets the requirements of the Contract Documents. A visual inspection of all the power supply equipment shall be performed prior to its delivery. The following components shall be inspected to ensure that they meet the requirements of the Contract Documents:

a) Barriers and raceways

b) Breakers

c) Cabinet materials

k) Grounding connections

l) Insulation

m) Labels

d) Conduits and tubings

e) Contactors

f) Disconnect switches

g) Doors and latching mechanisms

h) Enclosure materials

i) Cabinet general appearance

j) Grounding and bonding materials

n) Lightning arrestors

o) Panelboards

p) Photoelectric controllers

q) Switches

r) Transformers

s) Wires and connectors

A Request to Proceed shall be submitted to the Contract Administrator after completion of the pre-installation testing and inspection.

The next operation after the completion of the pre-installation testing shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

**614.07.07.02 Proof of Performance Testing and Inspection**

The installed power supply equipment shall be inspected and tested. All components listed under the Pre-Installation Testing and Inspection clause shall be inspected. Low voltage system tests shall be performed on wiring of the equipment according to OPSS 604. Grounding of equipment shall be tested according to OPSS 609.

A Request to Proceed shall be submitted to the Contract Administrator after completion of the proof of performance testing and inspection.

The next operation after the completion of the proof of performance testing and inspection shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

**614.07.08 As Constructed Drawings**

In the event changes to the accepted Working Drawings are necessary, as constructed drawings bearing the stamp and signature of an Engineer shall be submitted to the Contract Administrator.

**614.07.09 Temporary Electrical Work**

The work for temporary electrical installations shall be the same as for permanent installations of the same type of work, except the work shall include the removal of the installations when they are no longer required.

**614.07.10 Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

## 614.09 MEASUREMENT FOR PAYMENT

### 614.09.01 Actual Measurement

#### 614.09.01.01 Distribution Assemblies
#### Supply Control Cabinet Assemblies

For measurement purposes, a count shall be made of the number of assemblies installed.

### 614.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

## 614.10 BASIS OF PAYMENT

### 614.10.01 Distribution Assemblies - Item
### Supply Control Cabinet Assemblies - Item

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

### 614.10.02 Distribution Assemblies, Temporary - Item
### Supply Control Cabinet Assemblies, Temporary - Item

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, Material to do the work.

Progress payment for temporary installation of the above tender items shall be based on the following percentages of the Contract price:

80% for supply and installation
20% for removal

Additional payment shall not be made for the electrical energy and service required to do the work.

**Figure 1**
**Arc Flash and Shock Hazard Warning Label**


## Arc Flash and Shock Hazard

**Location:** _____

| **Arc Flash** | | **Shock** | |
|---|---|---|---|
| Working distance: | 460 mm (19 inches) | Nominal system voltage: | 240 VAC |
| Incident energy: | 2.1 cal/cm$^2$ | Limited approach: | 1000 mm (40 inches) |
| Arc Flash Boundary: | 635 mm (26 inches) | Restricted approach: | 300 mm (12 inches) |

**Minimum PPE Requirements: PPE according to CSA Z462 Arc Flash PPE Category 2**

Analysis Date: October 2015