Attachment V

Revenue Metering Requirements for the Orangeville Battery Storage Project

4/12/2017

Revenue Metering Requirements for the Orangeville Battery Storage Project

1.0 Scope:

This document defines technical requirements and responsibilities for the design, installation and commissioning of revenue grade electric metering equipment for the Orangeville Battery Storage project.

2.0 Description:

Twenty (20) MW of battery storage capacity is planned to be added at the existing Orangeville wind farm. This is comprised of 20 banks of batteries, each bank having a storage capacity of 1 MW each. The existing revenue meter is located at a NYSEG-owned and operated substation adjacent to the wind farm on the primary, 230 kV side of Orangeville's 230/34.5/13.8 kV 3-winding transformer.

The proposed NYISO metering arrangement involves separately measuring the combined gross generation of the wind turbines and the combined gross generation of the battery banks at net points on Orangeville's 34.5 kV system. The gross output for the two sources of generation; along with the existing 230 kV metering information will be reported to the NYISO by NYSEG.

3.0 Responsibilities:

The developer of the battery storage system will be responsible for the procurement and installation of all metering equipment/material and all associated expenses. The developer will purchase and install all instrument transformers, telecommunications equipment, metering enclosures, sockets, test switches, etc.) and all other miscellaneous equipment required to add these additional metering points on their system. The developer will own and maintain all metering equipment with exception to the revenue meters, at their expense.

The developer will make all arrangements to provide conventional, 2-wire, leased telephone circuit(s) (i.e. a conventional "POTS" line(s)) for the two metering points. These must be circuit switched leased telephone lines and must be dedicated to the revenue meters (i.e. telecommunication devices such as fax machines, etc. may not share the same line(s) used by the meters). A dedicated port off a telephone switch may be acceptable if port routing through the switch is controlled by DTMF signaling (i.e. telephone number followed by ",,1", ",,2", etc.). A simulated analog circuit off a digital ISDN switch is not acceptable nor any circuit operating over IP.

The developer shall be responsible to supply and install all necessary equipment needed to transmit metering signals from each revenue meter's RS-485 port over an existing fiber optic cable to NYSEG's existing SCADA RTU located at NYSEG's adjacent 230 kV substation.

NYSEG will provide, install, own and maintain the revenue meters at the developer's expense.

Any electrical inspections required to meet code enforcement requirements is the developer's responsibility.

4.0 Process

The developer is required to supply all the information included in attached form #1 along with an electrical one-line diagram/sketch and submit the completed form and diagram to NYSEG through their designated contact. The one-line diagram must show all electrical components starting from the generator(s) up to the point of interconnection with the NYSEG system, indicating the proposed location of the new metering point(s) that will measure gross generation. NYSEG will review all the supplied information and provide feedback on additions/changes, if any are required.

During this initial review period, a NYSEG technician will schedule a site visit. While on site, the NYSEG technician will provide assistance to aid the developer or their agent in choosing the proper metering arrangement that will accurately measure generation and ensure that the metering installation will meet regulatory and NYSEG requirements. The NYSEG technician will determine the metering scheme to be used and will size the CT's and VT's based on information supplied by the developer or their agent (e.g. max/min generator kVA, source type and voltage at the metering point).

Following this initial meeting, the developer will have all information needed to initiate procurement and installation of all the metering equipment.

NYSEG requires that certified factory test data be provided for all revenue metering CTs and VTs. This test data must be specific to each device (i.e. representative or typical test data is not acceptable). The developer is required to provide NYSEG with all metering CT/VT information listed in attachment #2.

As the developer nears the completion of their installation and working telephone line(s) are in place (i.e. tip and ring terminated inside the meter socket enclosure(s)), the developer may schedule NYSEG final inspection. During final inspection, a NYSEG technician will visit the site to install the revenue meters, inspect the installation to verify billing constants and functionally test remote communications to make sure NYSEG has the ability to access the meters remotely through the developer's supplied leased telephone line(s).

Please note, access to the instrument transformers must be provided to the NYSEG technician during final inspection so that CT/VT nameplate information may be verified and documented.

5.0 Metering Equipment

5.1 General:

All revenue metering equipment (i.e. voltage and current instrument transformers) used to measure the Orangeville facility's gross generation must be revenue grade and Public Service Commission (PSC)

approved equipment. A list of PSC-approved metering devices can be found on-line using the following link:

http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/598975070d80733e85257687006f3ac4/$FILE/62410416.pdf/2-9-16%20Approved%20Electric%20Meter%20List.pdf

The revenue meters must be installed in a safe and readily accessible location, in an upright (plumb) position with the top of the meter not less than 48" or more than 60" from the floor or final grade. The location must be at a safe distance from all sources of combustion, free from vibration, dust and corrosive atmospheres. A minimum of four foot of clearance must be maintained in front of the meter. Separation between the outlet side of a gas meter and electric meter(s) must be a minimum of 6" and a minimum of 12" between electric meter(s) and gas regulators.

5.2 Transformer Rated Installations:

Metering current transformers (CT's) and voltage transformers (VT's) must meet ANSI 0.3% accuracy class or better.

The secondary burden on metering CT's and VT's must be kept as small as practicable and dedicated to the revenue meter(s). No other devices shall be fed off the same instrument transformers that are supplying potential (i.e. voltage) and current to the revenue meters.

Attachment #3 shows the maximum distance between CT's and the revenue meters. These limits must not be exceeded.

All secondary CT and VT connections must be made using a minimum size of #10 AWG copper conductors and limited to the length necessary to complete the circuit to the revenue meter(s).

Other than the test switch within the meter socket, no other disconnecting means must be placed in the secondary circuits of CT's (i.e. switches, test blocks, fuses or other quick disconnect means).

If fuses are used on VT secondary circuits, they must be of high speed, high-current interrupting construction, have low electrical impedance and resist the effects of corrosion and vibration.

When a common CT secondary return conductor (i.e. neutral) is utilized, the conductor must be separate from the common return of any voltage transformers. CT and VT commons shall be grounded at only one point; at the meter test switch close to the revenue meter.

In the case where more than one metering point exists, parallel connection of CT secondary windings for current summation purposes is prohibited.

The developer is advised to order transformer rated meter sockets prewired from the factory (i.e. the wiring from the meter side of the test switch to the meter block terminal lugs should be made at the factory by the meter socket enclosure manufacturer).

Instrument transformer enclosures must be provided with a locking provision.

5.3 Additional Reference Information:

Attachment #4 includes wiring sketches and metering equipment specifications for the developer's use. The NYSEG technician will specify which of the scheme and equipment is pertinent for this application.

Revenue Metering Requirements for the Orangeville Battery Storage Project

Attachment #1

Developer: _____

Contract Account # _____

Service Address: _____

Number of generators: _____

At Metering Point:
Gross Generator Output: (Max. kVA): _____ (Min. kVA): _____

No. of Metering Points: _____

Number of Phases: Single Phase 2-W____Single Phase 3-W____3-Phase, 3W____3-Phase, 4W____

At Metering Point:
Nom. Voltage (Ph.-Ph.): _____ Max. Amps: _____ Min. Amps: _____

Proposed Metering Scheme: Self-Contained____ CT Rated____ CT/VT Rated ____

Proposed VT/CT Installation Location: N/A____ Outdoor Structure____ Outdoor Enclosure____ Outdoor Switchgear____ Indoor Enclosure____ Indoor Switchgear____

Proposed Meter Installation Location: Indoor____ Outdoor____

Est. Distance Between CT/VT Location and the Meter (ft): _____

Submitted By: _____ Date: _____

Developer Technical Contact: Name: _____

Phone: _____

Email: _____

A one-line electrical diagram shall be provided showing all electrical components starting from the generator(s) up to the point of interconnection with the NYSEG system, indicating the proposed location of the new metering point that will measure gross generation.

Revenue Metering Requirements for the Orangeville Battery Storage Project

Attachment #2

REVENUE GRADE VOLTAGE TRANSFORMERS (VTs):

	Phase A	Phase B	Phase C
Acquisition Date:			
Manufacturer:			
Model:			
Serial Number:			
Dual Winding Flag (Y/N):			
Dual Ratio Flag (Y/N):			
In Service Ratio Vpr : Vsec			
Rated % Accuracy (ANSI Class):			
Burden Rating:			
Thermal Rating (VA):			
BIL Rating:			
RCF @ Rated Bdn:			
PACF @ Rated Bdn.:			
RCF @ Zero VA:			
PACF @ Zero VA:			

REVENUE GRADE CURRENT TRANSFORMERS (CT's):

	Phase A	Phase B	Phase C
Acquisition Date:			
Manufacturer:			
Model:			
Serial Number:			
Voltage Class:			
Dual Ratio Flag (Y/N):			
In Service Ratio (XXXX:5):			
Rated % Accuracy (ANSI Class):			
Burden Rating:			
BIL Rating:			
TRF:			
RCF @ FL:			
PACF @ FL:			
RCF @ LL:			
PACF @ LL:			

The above information, including factory certified test reports must be sent to the NYSEG for review and acceptance.

Attachment #3

CT Burden Guide

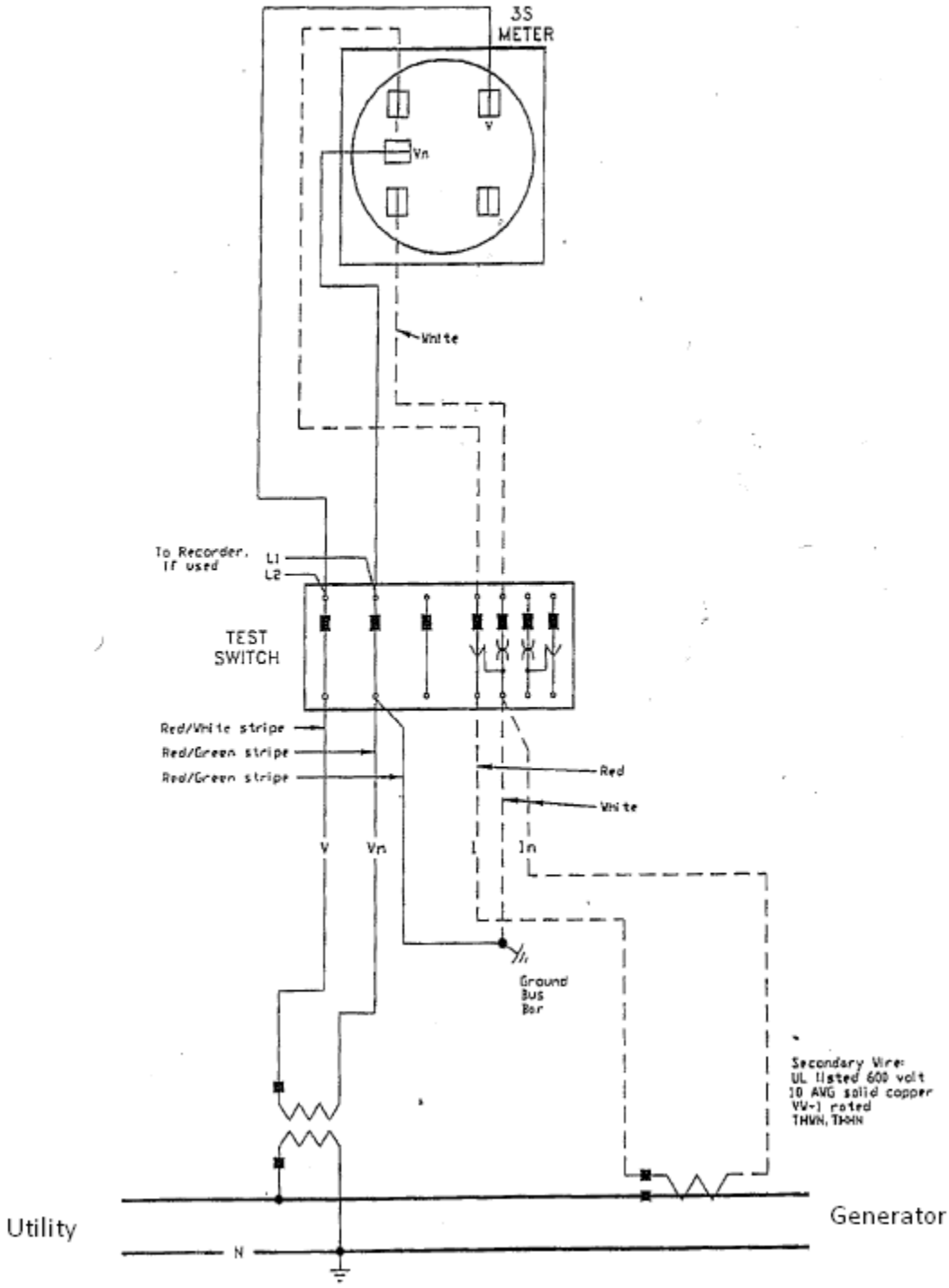
Maximum distance (in feet) allowed from CT's to meter using #10 AWG size copper conductors.

0.3% ANSI Accuracy Class ANSI Burden Rating	VA Rating	Maximum Distance (ft)
B0.1	2.5	25
B0.2	5.0	80
B0.5	12.5	225
B1.0	22.5	425
B1.8	45.0	475
B2.0	50.0	965

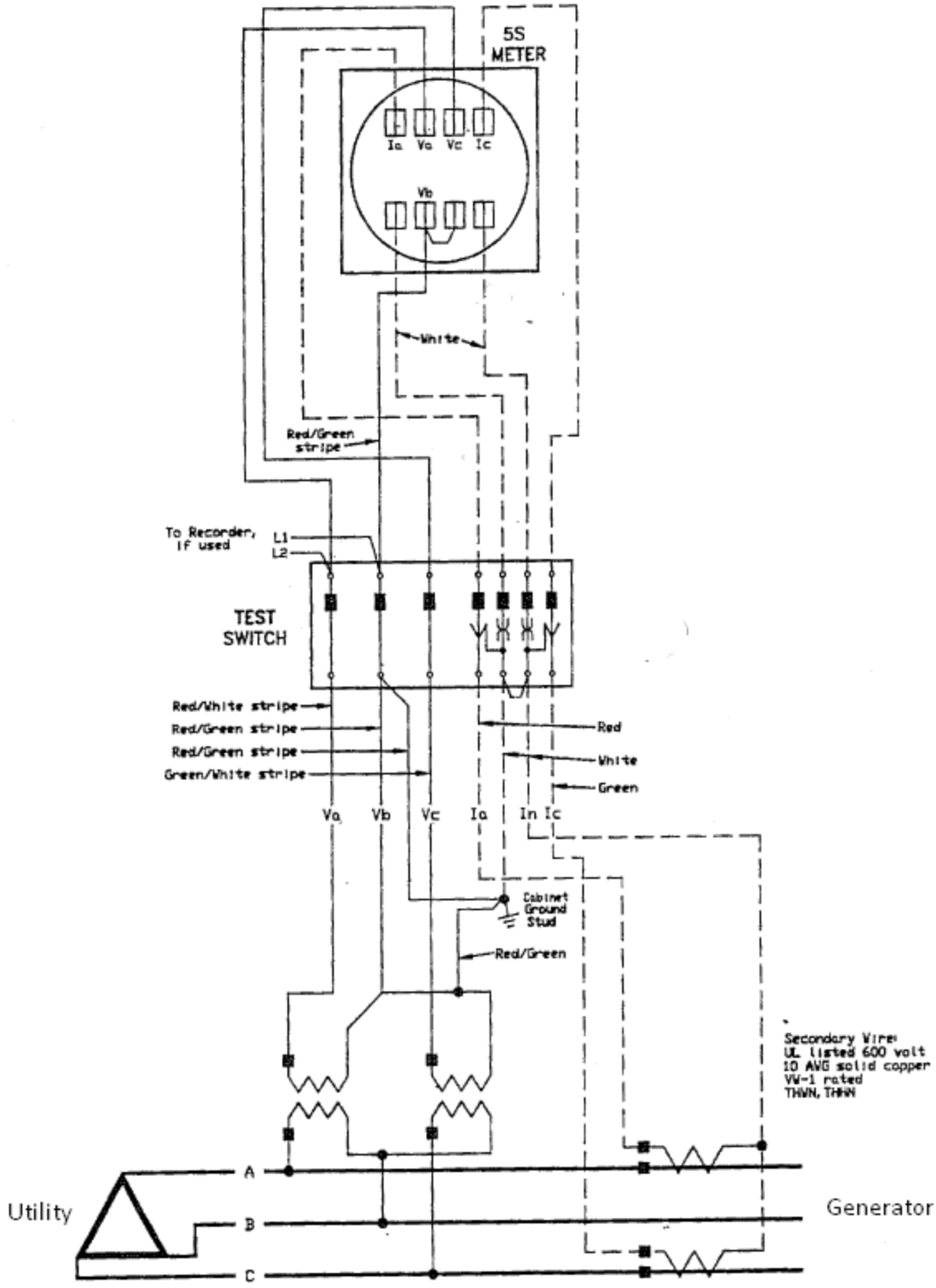
Attachment #4

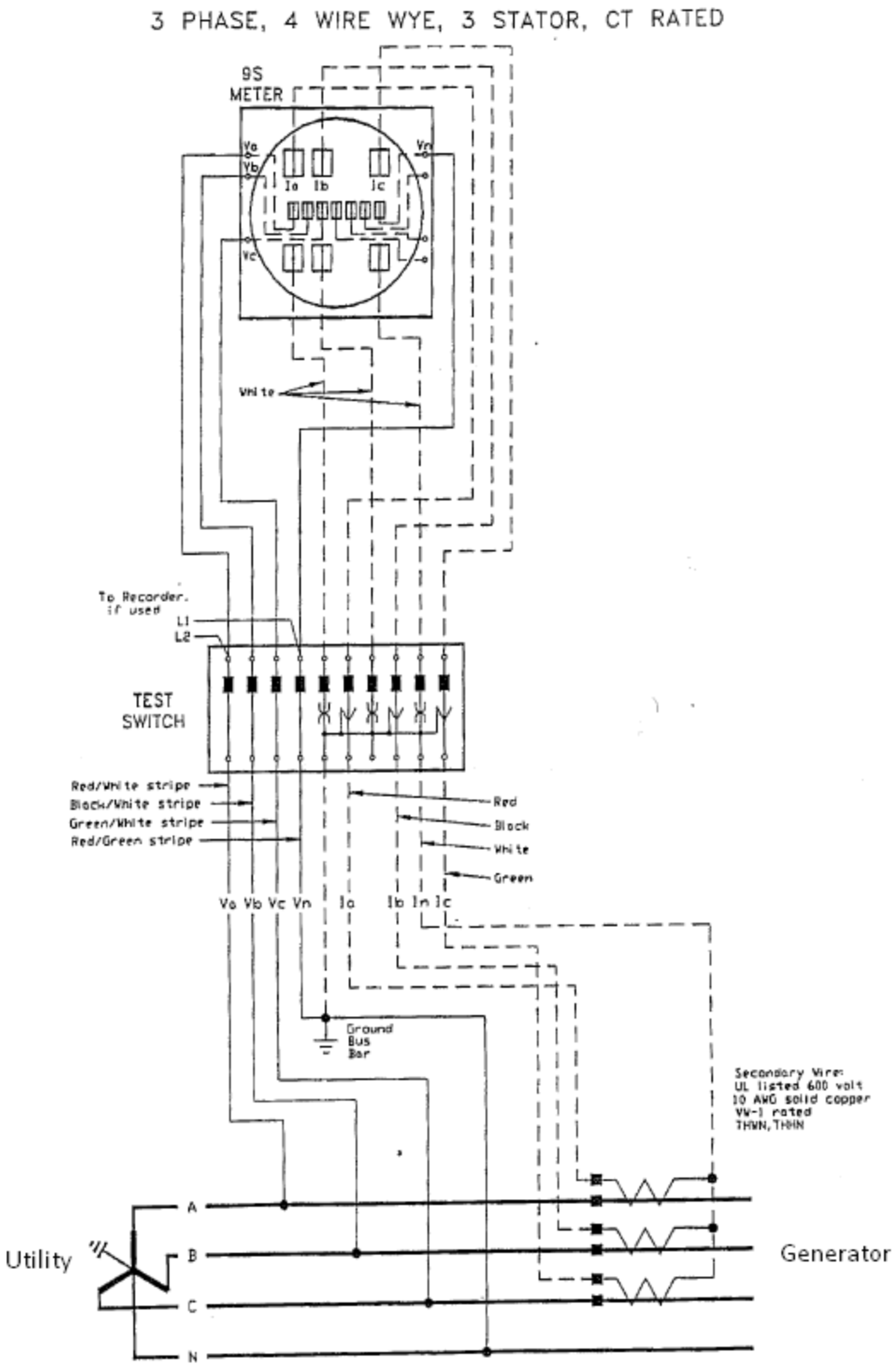
Transformer Rated Wiring Sketches:

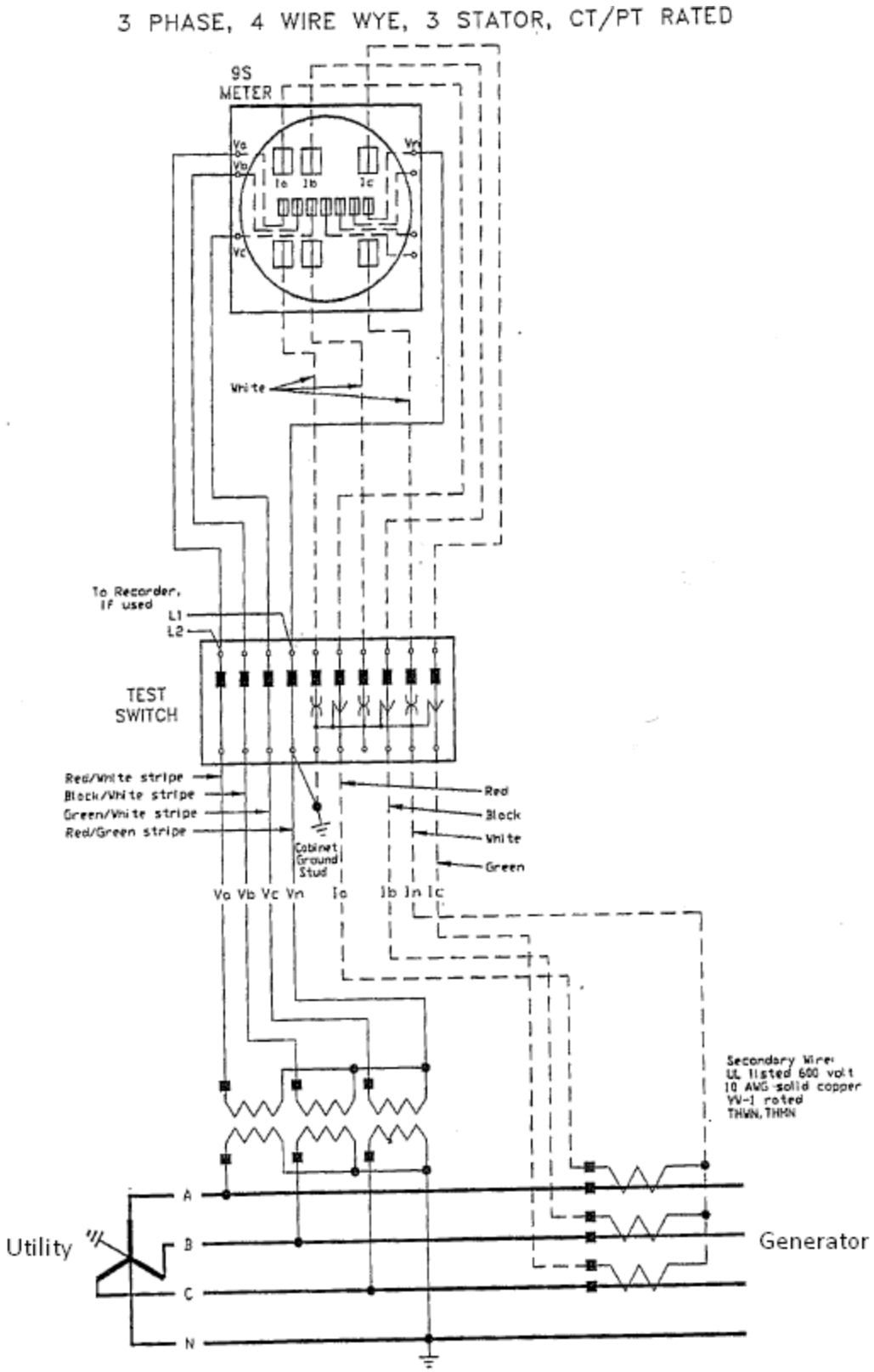
SINGLE PHASE, 2 WIRE, CT/PT RATED (2.4KV to 34.5KV)



3 PHASE, 3 WIRE DELTA, 2 STATOR, CT/PT RATED (2.4KV to 34.5KV)

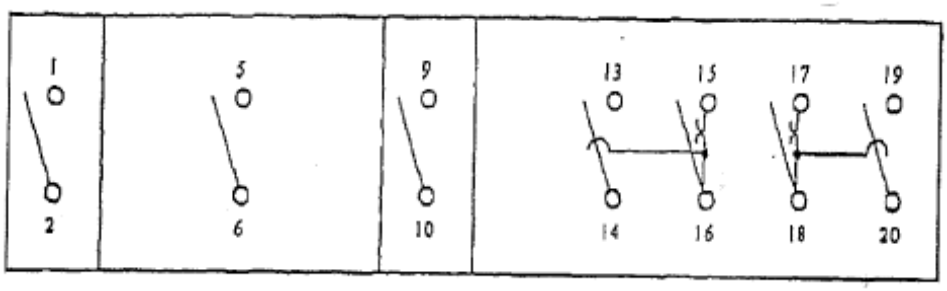



3 PHASE, 4 WIRE WYE, 3 STATOR, CT RATED
9S
METER
Va
Vb
Vc
Vn
Ia
Ib
Ic
White
To Recorder,
if used
L1
L2
TEST
SWITCH
Red/White stripe
Black/White stripe
Green/White stripe
Red/Green stripe
Red
Black
White
Green
Va Vb Vc Vn
Ia
Ib In Ic
Ground
Bus
Bar
Secondary Wire:
UL listed 600 volt
10 AWG solid copper
VW-1 rated
THWN, THHN
A
B
C
N
Utility
Generator

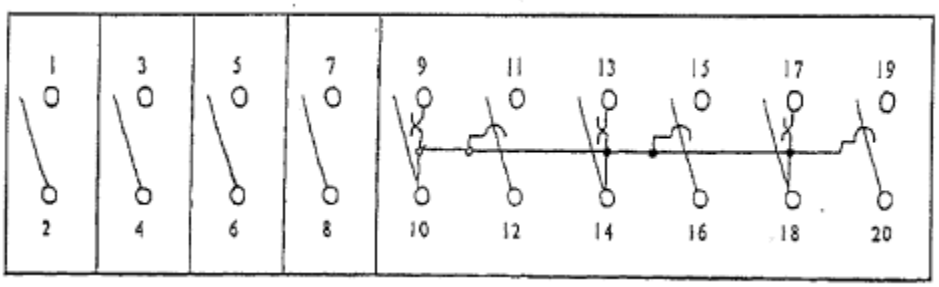

3 PHASE, 4 WIRE WYE, 3 STATOR, CT/PT RATED
9S
METER
Ve
Vb
Vc
Va
Ia
Ib
Ic
White
To Recorder,
If used
L1
L2
TEST
SWITCH
Red/White stripe
Black/White stripe
Green/White stripe
Red/Green stripe
Red
Black
White
Green
Cabinet
Ground
Stud
Vo Vb Vc Vn
Ia
Ib In Ic
Secondary Wire:
UL listed 600 volt
10 AWG solid copper
XV-1 rated
THWN, THHN
A
B
C
N
Utility
Generator

Meter Test Switch Configurations for Transformer Rated Installations:

For Single-Phase & for Three-Phase, 3-Wire Applications (7-Pole Test Switch):



Foe Three-Phase, 4-Wire Applications (10-Pole Test Switch):



Transformer Rated Metering Enclosure Specifications:

Specification for a Transformer Rated, 6-Terminal Meter Socket with a Prewired 7-Pole Test Switch:

Enclosure Type:	Electric Meter Socket With Prewired Test Switch
No. of Positions:	Single
NEMA Rating:	3R
UL Listed:	Yes
Enclosure :	
Material:	G90 galvanized steel
Minimum Thickness:	16 gauge
Color:	ANSI 61 gray.
Coating:	Polyester powder over phosphatized G90 steel.
Cover/Door:	Single, ringless style cover
Locking Provision:	Stainless steel latch and hasp.
Knock Outs:	Side & Bottom per NEMA 250
Meter Block/Socket :	
Type:	6 Terminal Socket
5th Jaw Position:	N/A
SC/TR Rated:	Transformer Rated
Voltage Rating:	600 Volts
Ampacity Rating:	20 Ampere
Thermal Rating:	75 °C
Short Circuit Rating:	N/A
Service Bypass:	N/A
Bypass Type:	N/A
Terminal Screw Type/Size:	Lay-In connectors (14 AWG - 10 AWG).
Grounding Terminal:	14 AWG - 2/0 AWG
Test Switch:	Low test switch bridge with 7-pole test switch.

Notes:

Purchasing Description: Socket, Meter, 600 Volt, 20 Amp Continuous, Transformer Rated 6-Terminal Socket, Ringless Style, OH/UG, Ground Stud Min #4 Cu, Low Test Switch Bridge With Prewired, 7-Pole Test Switch.

Specification for a Transformer Rated, 8-Terminal Meter Socket with a Prewired 7-Pole Test Switch:

Enclosure Type:	Electric Meter Socket With Prewired Test Switch
No. of Positions:	Single
NEMA Rating:	3R
UL Listed:	Yes
Enclosure :	
Material:	G90 galvanized steel
Minimum Thickness:	16 gauge
Color:	ANSI 61 gray.
Coating:	Polyester powder over phosphatized G90 steel.
Cover/Door:	Single, ringless style cover
Locking Provision:	Stainless steel latch and hasp.
Knock Outs:	Side & Bottom per NEMA 250
Meter Block/Socket :	
Type:	8 Terminal Socket
5th Jaw Position:	N/A
SC/TR Rated:	Transformer Rated
Voltage Rating:	600 Volts
Ampacity Rating:	20 Ampere
Thermal Rating:	75 °C
Short Circuit Rating:	N/A
Service Bypass:	N/A
Bypass Type:	N/A
Terminal Screw Type/Size:	Lay-In connectors (14 AWG - 10 AWG)
Grounding Terminal:	14 AWG - 2/0 AWG
Test Switch:	Low test switch bridge with 7-pole test switch.

Notes:

Purchasing Description: Socket, Meter, 600 Volt, 20 Amp Continuous, Transformer Rated 8-Terminal Socket, Ringless Style, OH/UG, Ground Stud Min #4 Cu, Low Test Switch Bridge With Prewired 7-Pole Test Switch.

Specification for a Transformer Rated, 13-Terminal Meter Socket with a Prewired 10-Pole Test Switch:

Enclosure Type:	Electric Meter Socket With Prewired Test Switch
No. of Positions:	Single
NEMA Rating:	3R
UL Listed:	Yes
Enclosure :	
Material:	G90 galvanized steel
Minimum Thickness:	16 gauge
Color:	ANSI 61 gray.
Coating:	Polyester powder over phosphatized G90 steel.
Cover/Door:	Single, ringless style cover
Locking Provision:	Stainless steel latch and hasp.
Knock Outs:	Side & Bottom per NEMA 250
Meter Block/Socket :	
Type:	13 Terminal Socket
5th Jaw Position:	N/A
SC/TR Rated:	Transformer Rated
Voltage Rating:	600 Volts
Ampacity Rating:	20 Ampere
Thermal Rating:	75 °C
Short Circuit Rating:	N/A
Service Bypass:	N/A
Bypass Type:	N/A
Terminal Screw Type/Size:	Lay-In connectors (14 AWG - 10 AWG)
Grounding Terminal:	14 AWG - 2/0 AWG
Test Switch:	Low test switch bridge with 10-pole test switch.

Notes:

Purchasing Description: Socket, Meter, 600 Volt, 20 Amp Continuous, Transformer Rated 13-Terminal Socket, Ringless Style, OH/UG, Ground Stud Min #4 Cu, .Low Test Switch Bridge With Prewired, 10-Pole Test Switch.