Q. Please provide electronic copies of documents describing distribution substation equipment and relay inspection, testing, and maintenance programs and practices. These documents should describe the activities to be conducted by equipment type, the time period between time-based activities, and what triggers condition-based activities.

A. <u>Distribution Substations</u>

Substations are inspected by line personnel every 120 days (see PUB-NLH-089 Attachment 1 and PUB-NLH-089 Attachment 2).

<u>Reclosers</u>

See attachment PUB-NLH-089 Attachment 3 and PUB-NLH-089 Attachment 4 for the frequency and procedures for inspection of reclosers.

Reclosers in substations and on distribution lines have four levels of inspection, as shown below:

1. Monthly: see PUB-NLH-089 Attachment 5;
2. 120 Day: see PUB-NLH-089 Attachment 6;
3. Annual: see PUB-NLH-089 Attachment 6 and PUB-NLH-089 Attachment 7; and
4. Duty Cycle: see PUB-NLH-089 Attachment 8 and PUB-NLH-089 Attachment 9.

Regulators

See attachments PUB-NLH-089 Attachment 10 and PUB-NLH-089 Attachment 11 for the frequency and procedures for inspection of regulators.

Regulators in substations and on distribution lines have three levels of inspection as shown below:

1. Monthly: see PUB-NLH-089 Attachment 12;
2. Four Month: see PUB-NLH-089 Attachment 13; and
3. Three-Five years: see PUB-NLH-089 Attachment 14.

For all of the inspections listed above, condition-based activities are triggered when an inspector notes an abnormal condition on the form provided for the particular inspection. For minor conditions, repairs may be done while the inspector is on site. For others, a work order would be created based on the report and submitted to the appropriate crew for action.

HYDRO
THE POWER OF COMMITMENT

DISTRIBUTION LINE MAINTENANCE MANUAL

TITLE: Substation Inspection (< 46 kV Station)	Inst. No. 110 Rev. No. 1 Page 1 of 1

1.0 Introduction:

All substations will be visually inspected as determined by the System Maintenance Review and will receive a climbing inspection at the discretion of the supervisor.

2.0 Procedure:

Each substation will be carefully inspected following the standard form # 110 and any additional instruction given by the supervisor.

.

3.0 Checklists:

To complete the checklist refer to Standard Code Instructions.

APPROVED BY:	ISSUED DATE:1990/12/10	REV. DATE: 2013/03/06
Distribution Maintenance Committee		

HYDRO THE POWER OF COMMITMENT

Distribution System: _____
Sub Station#: _____

Asset Information

Pole # _____ # of Anchors _____
Unique # _____ Aliant Attached _____ Strand □ Drop □
Pole Height _____ CATV Attached _____ Strand □ Drop □
Treatment _____ Trans # _____ kVA _____ Voltage _____
Wood Species _____ Sec. Wire (Type/Size) _____
Class _____ Sec. Leads (Type/Size) _____
Vintage _____ Geographic Location _____
Structure Type/s _____ Community/Highway _____

DMM INSTRUCTION # 110
Substation Inspection

□ Climbing Inspection
□ Visual Inspection

Structure Condition (Check box if condition is OK, N/A - Not Applicable
or Circle box if condition is abnormal and comment)

Code		Item	Code		Item
01	☐	BRUSH A__B__C__D__E__	61	☐	CONDUITS
03	☐	INSULATOR	64	☐	TERMINATORS
05	☐	INSULATOR HARDWARE	66	☐	FENCE
06	☐	CROSSARM A __ B __ C __	70	☐	BYPASS SWITCHES
19	☐	GUY WIRE	80	☐	STRUCTURE/UNIQUE NUMBER TAG
20	☐	GUY WIRE BONDED	82	☐	GATES
21	☐	GUY GUARD	84	☐	STEEL STRUCTURES
24	☐	POLE A ☐ B ☐ C ☐	85	☐	CRUSHED STONE
27	☐	GROUND WIRE	86	☐	LIGHTING
32	☐	SWITCH/DEVICE NUMBER	87	☐	CONCRETE PADS
33	☐	CABLES	88	☐	CONDUCTOR LEADS
39	☐	PLATFORM	89	☐	CONDUCTOR BUS
46	☐	LOCKS	90	☐	STATION SERVICE
47	☐	GROUNDING MATS	91	☐	SNOW CONDITIONS
50	☐	WARNING SIGNS	92	☐	TRANSFORMERS A __ B __ C __
54	☐	OIL LEAKS	93	☐	REGULATORS A __ B __ C __
56	☐	LIGHTNING ARRESTOR	94	☐	RECLOSERS A __ B __ C __
57	☐	DISCONNECT SWITCHES			

Code	Comments
☐	_____
☐	_____
☐	_____
☐	_____
☐	_____
☐	_____
☐	_____
☐	_____

Inspector _____ Date _____
Supervisor _____ Date _____
W/O Assigned for Corrective Action. W/O # _____ Date _____

DMC Rev. 6/3/2013

HYDRO
THE POWER OF COMMITMENT

DISTRIBUTION LINE MAINTENANCE MANUAL

TITLE: Recloser Inspection	Inst. No. 70 Rev. No. 2 Page 1 of 2

1.0 Introduction:

The frequency of maintenance on reclosers will depend upon local climatic conditions and the interrupting duty cycle. The inspections will be done as per the system maintenance review. (The pole and associated hardware will be inspected under the heading, “Transformer Structure / Line Structures” – Instruction # 20.

2.0 Procedure:

Each recloser will be inspected on the following intervals ;

(a) 30/60 day - Reclosers & associated hardware will be visually inspected on a monthly basis by Linecrews & recorded on Form 70A.
Demand Load readings, counter operations & battery voltage will be recorded on a Recloser Monthly Reading form .

(b) 120 Day / Annual - Visual inspection will be performed by electrical maintenance personnel which will also include battery / charger and lamp test as per Form DMM 70B.

(c) Duty Cycle - Inspections as per all items on Recloser Inspection form #70. Each unit will be completely inspected, cleaned, oil tested, and filled with new oil, if necessary.

3.0 Checklist:

To complete the checklist refer to Standard Code Instructions.

APPROVED BY:	ISSUED DATE:	REV. DATE:
Distribution Maintenance Committee	1990/12/10	2013/01/08

HYDRO
THE POWER OF COMMITMENT

DISTRIBUTION LINE MAINTENANCE MANUAL

TITLE: **Recloser Inspection**	**Inst. No.** 70 **Rev. No.** 2 **Page** 2 **of** 2

4.0 Safety Summary:

4.1 A Tailboard Safety Talk is a vital part of pre job planning and Hazard recognition/Control. Tailboard Safety Talks must be held prior to commencement of each job.

4.2 Safety Creed

"No work is of such urgency and importance as to preclude the steps and time that shall be taken to ensure the safety of every member of the working force and the general public."

Hazard	Control
Electrical	Obtain hold-off
Equipment	Visually inspect tools and equipment
Mechanical	Visually inspect structure at worksite
Communication	Good verbal communication is required by all crew members and Controlling Authorities.

120 Day Inspection - (DMM 70 A)

1. Visual inspection of Bushings for signs of arcing, cracked bushings, deteriorated gaskets and oil leaks.

2. Tank - Check for rust conditions, oil leaks/stains and proper grounding.

   Condition " A " – No or minor amount of rust. (Clean with brush and touch up with paint, if possible).
   Condition " B " – Fairly heavy rust , shall be refurbished within 12-24 months
   Condition " C " – Extremely heavy rust , unit should be removed from service within 30 working days .

3. Control cabinet – Check for signs of rust, broken or sticky door hinges, water leaks. Repair or lubricate as necessary.

   Condition " A " – No or minor amount of rust. (Clean with brush and touch up with paint, if possible).
   Condition " B " – Fairly heavy rust , shall be refurbished within 12-24 months
   Condition " C " – Extremely heavy rust , unit should be removed from service within 30 working days .

4. Visually check primary connections for signs of overheating.

5. Check cabinet heater.

6. Record operations count, and Meter Amperage readings. Ensure correct meter multiplier.

7. On electronic reclosers complete battery test and lamp test.

8. Electronic Reclosers:
   Record battery voltage;
   Note: 1 If battery volts is below 24 V (AC supply removed) or above 29 V with (AC supply on) replace battery.

9. Complete Inspection Form

Annual Electronic Recloser- DMM 70B
Duty cycle Inspection - DMM 70C
Hydraulic Recloser Inspection - DMM 70D

1. Outage required.

2. Overhaul maintenance (frequency) varies. The number of operations and magnitude of load current and fault operations are governing factors.

3. Lower tank and inspect interior for water ingress and carbon build up. Clean and replace oil if necessary.

4. Clean mechanism and inspect contacts for burns and loose connections. Repair or replace oil if necessary.

5. Record data as per appropriate DMM Recloser Inspection Forms and any other auxiliary equipment.

6. Inspect and complete continuity test on bushing corona shields (If applicable)

7. Electronic Type:
   - Record programmed settings.
   - Complete test to confirm settings and compare with reference graphs.
   - Complete non-reclose test, battery discharge rate, battery change rate, and ground block test.

8. Function test recloser operation.

9. Record final operation counts and load current.

10. Clean up oil stains or spills.

11. Complete Inspection Form.

DMM 70 F (Single Phase Hydraulic Recloser) INSPECTION

12. After duty cycle of 100 operation or 5 year by-pass recloser, remove recloser and return to Maintenance Shop for overhaul.

HYDRO
THE POWER OF COMMITMENT

Form 70A

PREVENTIVE MAINTENANCE PROGRAM
RECLOSER MONTHLY INSPECTION

System _____ Line No _____ Site _____

Serial No. _____ Recloser I.D. _____

Manufacturer_____

Condition of Recloser (check if ok √, or X if not acceptable and comment)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
10	Cutouts												
21	Guy Guards												
32	Switch Number												
35	Tank Condition												
40	Bushings												
54	Oil Leaks												
56	Lightning Arrestor												
63	Control Cable												
70	Bypass Switch												
72	Control Cabinet												
73	Operation Counter												
76	Lamp Check												
95	Grounding												
106	Metering												
	Inspector (initials)												

Comments

_____

_____

_____

_____

_____

_____

Distribution Supervisor _____

Rev. 13-01-09

PREVENTIVE MAINTENANCE INSPECTION
120 Day / Annual Recloser Inspection
DMM 70A

JDE W/O # _____ Station/Line _____ Date _____

Recloser No. _____ Serial No. _____ Type _____

Manufacturer _____ Controller S/N _____ Inspection Completed by _____

34	Windlass Rust Condition A __ B __ C __ Lubricated		
44	Connections: Check for sings of overheating_____		
40	Check brushings: flashover/cracks/gasket	48	Lubricate Recloser External Linkages _____
35	Tank rust condition A __ B __ C __ Note **	63	Control Cable/connectors condition _____
95	Check Grounding to Standard _____	106	Check Metering for Corrosion/broken _____
54	Oil Leaks _____	81	Mounting Bolts _____
		75	Heaters Cabinet __ Amps. Tank ___ Amps
		60	Head Gasket
Controller Cabinet Checks for Electronic Units			
72	Cabinet Rust Conditions A __ B __ C __ Note **	79	PC Board Condition
74	Spare Fuses _____	76	Indicating Lights ____
75	Cabinet Heater _____ Amps		
73	Counter ---- Operations _____ G _____ A _____ B _____ C _____		
Battery Volts _____ * Note			
Counter Operations, Hydraulic Unit _____			

* Note: 1. If battery volts is below 24 V (AC supply removed) or Above 29 V with (AC Supply on) replace battery.

2. Replace battery if charge date is greater than 5 years.

** Note: Condition A – No rust or minor rust. (clean with brush and touched up with paint, if possible).
Condition B – Fairly heavy rust. Shall be refurbished within 12 – 24 months
Condition C – Extremely heavy rust. Unit should be removed from service within 30 working days.

Remarks: Note: Record all alarms on Form 4C and Form 6 controllers

_____

_____

_____

_____

Supervisor: _____

PREVENTIVE MAINTENANCE INSPECTION
Annual Electronic Recloser
DMM 70B

JDE W/O # _____ Station/Line _____ Date _____

Recloser No. _____ Serial No. _____ Type _____

Manufacturer _____ Controller S/N _____ Inspection Completed by _____

Oil Condition: Good ____ Bad ____ Oil Changed: Yes _____ No _____						
New Insulation Oil Dielectric Test …….. Test Method (ASTM 877)						
Shots	1 _____ kV	2 _____ kV	3 _____ kV	4 _____ kV	5 _____ kV	Avg ____ kV
Control Settings						
Operations Counter Before Testing _____						
Min Trip	Gnd _____	A _____	B _____	C _____		
Dial Setting	Gnd _____	Fast _____	Delay _____	Lockout _____	Shots _____	
	Phase _____	Fast _____	Delay _____	//////////////////////	//////////////////////	
Phase Timing Plugs:		#1 _____	#2 _____	//////////////////////	//////////////////////	
Ground Timing Plugs:		#1 _____	#2 _____	//////////////////////	//////////////////////	
TCC Checks						
Timing	200% Amps	1st Shot	2nd Shot	3 rd Shot	4th Shot	
A Phase						
B Phase						
C Phase						
Ground						
Reclosing	1st _____	2nd _____	3rd _____	Reset _____ sec		
Battery Discharge Rate _____ ma. Load Test _____ (2 volt Drop Max.)			Battery Charge Rate _____ ma			
Note: 1. If battery voltage is below 24 V (AC Supply Removed) or above 29 V with (AC Supply On) replace Battery. 2. Replace Battery if charge date is greater than 5 years.						
Battery Voltage as left _____ volts			Ground Block Test _____			
Final Counter Reading After Testing						
Checks After Energizing						
Ground Trip Blocking Switch Normal _____						
Metering Operational _____						
Final Counter: _____						

* Note: Class A – Small amount of Rust. (Clean with brush and touched up with paint, if possible)
Class B – Remove unit from service within 12-24 months and refurbish
Class C – Remove unit from service, ASAP (within same maintenance year) and replace unit.

** Note: Meggar Test Required on Commissioning if Requested.

Revised: 06-11-24

PREVENTIVE MAINTENANCE INSPECTION
Electronic Recloser
Duty Cycle DMM 70C

JDE W/O # _____ Station/Line _____ Date _____

Recloser No. _____ Serial No. _____ Type _____

Manufacturer _____ Controller S/N _____ Inspection Completed by _____

34	Windlass Rust Condition A __ B __ C __ Lubricated		
44	Check Primary Connections _____	48	Lubricate External Linkages
40	Check Bushings: Flashover/Cracks ____	106	Check Metering for Corrosion/Broken _____
35	Tank Rust Condition A __ B __ C __ Note*	72	Cabinet Rust Condition A __ B __ C __ Note*
95	Check Grounding _____	75	Heaters Cabinet __ Amps. Tank ____ Amps
79	PC Board Condition _____	60	Tank Head Gasket _____
74	Spare Control Fuses ____		Bushing Gaskets _____
	Check CT's & Connections _____	81	Mounting Bolts _____
	Ground Trip Blocking Switch _____		Control Cable/Connectors Condition _____
	Corona Shield Continuity (max 2 ohms) _____ ohms (no shields on vacuum reclosers)		
	Internal Inspection		
	Scribe Marks (VWVE only) _____		Moving Contacts _____
	Tank Liner _____		Stationary Contacts _____
	Sight Glass _____		Arc Chutes _____
	Mechanical Operations _____		Signs of Flashover _____
	Internal Components _____		Exhaust Chamber Orifices _____

Note: Contact/Resistance Checks (to be used as a trouble shooting guide only)
Not Required on a PM

Recloser Contacts	Manual Operating Lever	SW1 Pin Sockets C&D	SW2 Pin Sockets F&N	SW3 Pin Sockets A&N
Open	Down	Open _____	Open _____	Closed _____
Open	Up	Open _____	Closed ____	Closed _____
Closed	Up	Closed ____	Closed ____	Open _____

Recloser Resistance Test		
Trip Solenoid	Pin (A-B = 9.5 Ohms)	Actual _____ Ohms
Rotary Solenoid	Pin (E-F = 19 Ohms)	Actual _____ Ohms
CT-A Phase	Pins (K-G = 5.5 Ohms)	Actual _____ Ohms
CT-B Phase	Pins (K-H = 5.5 Ohms)	Actual _____ Ohms
CT-C Phase	Pins (K-J = 5.5 Ohms)	Actual _____ Ohms

Revised: 13-02-07

PREVENTIVE MAINTENANCE INSPECTION
Electronic Recloser
DMM 70C

JDE W/O # _____ Station/Line _____ Date _____

Recloser No. _____ Serial No. _____ Type _____

Manufacturer _____ Controller S/N _____ Inspection Completed by _____

Remarks:

Front Line Supervisor _____

Revised: 06-11-24

PREVENTIVE MAINTENANCE INSPECTION
Hydraulic Recloser
DMM 70D

JDE W/O # _____ Station/Line _____ Date _____

Recloser No. _____ Serial No. _____ Type _____

Manufacturer _____ Controller S/N _____ Inspection Completed by _____

34	Windlass Rust Condition A __ B __ C __ Lubricated		
44	Check Primary Connections _____	48	Lubricate External Linkages
40	Check Bushings: Flashover/Cracks ____	106	Check Metering for Corrosion/Broken _____
	Bushing Gaskets _____		Operating (Yellow) Handle _____
95	Check Grounding to Standard _____		Non/Reclosing Lever _____
35	Tank Rust Condition A__ B__ C__ Note*	60	Tank Head Gasket _____
81	Mounting Bolts _____		
	Check CT's & Connections _____		Check Operations Counter _____
	Corona Shield Continuity (max 2 ohms) _____ ohms (if applicable)		

Internal Inspection			
	Series Trip Coil connections _____		Interrupters
	Tank Liner _____		Moving Contacts _____
	Sight Glass _____		Stationary Contacts _____
	Mechanical Operations _____		Arc Chutes _____
	Internal Components _____		Signs of Flashover _____
			Exhaust Chamber Orifices _____

Oil Condition: Good ____ Bad ____ Oil changed: Yes ____ No ____

New Insulation Oil Dielectric Test……..Test Method (ASTM 877)

Shots	1 ____ kV	2 ____ kV	3 ____ kV	4 ____ kV	5 ____ kV	Avg ____ kV

Settings

Series Trip Coils _____ Amps.

Shunt close _____ Shunt Lockout _____ Ground Trip Amps. _____

Characteristics Curves

Phase	A	_____	Ground	1	_____
Phase	# Fast _____	# slow _____	Ground	# Fast _____	# Slow _____

Note: All fast curves fro Phase are (a) and all fast curves for ground are (1) Factory set

Non/Reclosing Lever Placed in Original Position _____

Metering Operational _____

Final Counter Reading _____

Revised: 13-02-07

PREVENTIVE MAINTENANCE INSPECTION
Hydraulic Recloser
DMM 70D

JDE W/O # _____ Station/Line _____ Date _____

Recloser No. _____ Serial No. _____ Type _____

Manufacturer _____ Inspection Completed by _____

Remarks:

Front Line Supervisor _____

Revised: 06-11-24

HYDRO
THE POWER OF COMMITMENT

DISTRIBUTION LINE MAINTENANCE MANUAL

TITLE: Voltage Regulator Inspection	Inst. No. 80 Rev. No. 1 Page 1 of 1

1.0 Introduction:

All Voltage Regulator inspections will be done as per the system maintenance review. (The pole and associated hardware will be inspected under the heading, “Transformer Structure / Line Structures” – Instruction # 20.

2.0 Procedure:

Each regulator will be inspected on the following intervals ;

(a) 30/60 day - Regulators & associated hardware will be visually inspected on a monthly basis by Linecrews & recorded on Form 80A.
Regulator readings, counter operations & test terminal voltages will be recorded on a Regulator Monthly Reading form DMM #80B

(b) 120 day – Regulator Inspection DMM#80 will be completed by electrical maintenance personnel and a general look over of the regulator and associated hardware.

(c) 3-5 yr Off Line Inspection DMM#80A will be performed by electrical maintenance personnel .

3.0 Checklist:

To complete the checklist refer to Standard Code Instructions.

4.0 Safety Summary:

4.1 Warning

If the regulator has an “Automatic By-Pass Switch”, consult Work Methods for proper procedure .

APPROVED BY: Distribution Maintenance Committee	ISSUED DATE: 1990/12/10	REV. DATE: 2013/01/09

VOLTAGE REGULATOR MAINTENANCE PROCEDURE **Page 1 of 3**

(DDM 80 – 4-Month Inspection)

1. Complete required Equipment and Location Information as per Form DMM 80 for all Phases at Regulator Site.

2. Visual inspection of Brushings for signs of arcing, cracked bushings, deteriorated gaskets and oil leaks.

3. Tank-General check of for rust conditions, oil leaks/stains and proper grounding.

   Condition
   Class A – Small amount of Rust. (Clean with brush and touched up with paint, if possible).
   Class B – Remove unit from service within 12-24 months and refurbish
   Class C – Remove unit from service, ASAP (within same maintenance year) and replace unit.

4. Control cabinet – for signs of rust, broken or sticky door hinges, water leaks. Repair or lubricate as necessary.

   Class A – No rust or minor rust (clean with brush and touched up with paint, if possible).
   Class B – Daily heavy rust – remove in 1-5 years Recheck 12-24 months
   Class C – Extremely heavy rust with risk of leaking replace within 30 working days.

5. Visually check primary connections for signs of overheating.

6. Visually check By-Pass Switch for signs of overheating.

7. Record operations count, tap position, drag hand positions.

8. Manually Operate Controls (OPERATE TAP CHANGER 3-4 TAPS & RETURN TO AUTO);

   Record:
   a) Time Delay in Seconds.
   b) Auto Operation Tap --- to Tap ---
   c) Output Voltage
   d) Check Neutral Light if: (Tap Changer is within +/- 5 taps of neutral)

9. Record Final Operations Counter:

   Tap Regulator to Neutral Position: By-Pass and Ground (Using approved Work Method)

Note: On three phase banks remove all regulators from service to provide safe working distances.

10. Record Control Settings.

11. Complete Megger Test.

12. Complete Oil insulation Test.

13. Return Regulator/s to Service and Observe normal Operation.

DMM 80A (5-year Inspection)

1. Complete required Equipment and Location Information as per Form DDM 80A.

2. Visual inspection of Bushings for sings of arcing, cracked bushings, deteriorated gaskets and oil leaks.

3. Tank-General check of for rust conditions, oil leaks/stains and proper grounding Conditions;

   Class A – Small amount of rust. (Clean with brush and touched up with paint, if possible).
   Class B – Remove unit from service within 12-24 months and refurbish
   Class C – Remove unit from service, ASAP (within same maintenance year) and replace unit.

4. Control cabinet – for signs of rust, broken or sticky door hinges, water leaks. Repair or lubricate as necessary.

   Class A – No rust or minor rust (clean with brush and touched up with paint, if possible).
   Class B – Daily heavy rust – remove in 1-5 years Recheck 12-24 months
   Class C – Extremely heavy rust with risk of leaking replace within 30 working days.

5. Visually check primary connections for signs of overheating.

6. Visually check By-Pass Switch for sings of overheating.

7. Record Operations Count, Tap Position, Drag hand Positions.

8. Manually Operate Controls (OPERATE TAP CHANGER 3-4 TAPS & RETURN TO AUTO).

Record:

a. Delay in seconds.
b. Auto Operations Tap --- to Tap ---
c. Output voltage.
d. Check Neutral light if: (TAP CHANGERS IS WITHIN +/- 5 TAPS OF NEUTRAL)

9. Record Final Operations Counter:

PREVENTIVE MAINTENANCE PROGRAM
REGULATOR MONTHLY INSPECTION
DMM INSTRUCTION # 80A

SYSTEM _____ SITE _____

SERIAL NO _____ AMP RATING _____

MANUFACTURER _____REGULATOR I.D._____

Condition of Regulator (check if ok √, or **X** if not acceptable and comment)

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
10	Cutouts												
17	Drag Hand Reset												
21	Guy Guard												
29	Minimum Limit												
30	Maximum Limit												
32	Switch Number												
35	Tank Condition												
40	Bushings												
54	Oil Leaks												
56	Lightning Arrestors												
59	Neutral Light *												
63	Control cable												
70	Bypass Switch												
71	Tap Changer Operation												
72	Control Cabinet												
95	Grounding												
	Inspector (initials)												

* Check neutral light if within 5 positions.

COMMENTS_____

DISTRIBUTION SUPERVISOR _____ Rev Date 13-01-09

VOLTAGE REGULATOR 4-MONTH DMM#80 FORM

Line/Station: _____ Date: _____

JDE W/O : _____ Completed by: _____

A - Phase		
MFG: _____	SERIAL #: _____	VR# _____
SYSTEM ID# _____		
COUNTER FOUND: _____	TAP POSITION: _____	
DRAG HAND POSITIONS	RAISE: _____	LOWER: _____
MANUALLY OPERATE CONTROLS: (Operate tap changer 3-4 taps & return to auto)		
CHECK: Time Delay: _____ Seconds. AUTO (operations form) TAP _____ TO _____		
RESET DRAG HANDS:___	OUTPUT VOLTAGE: _____	
CHECK NEUTRAL LIGHT: _____(Check neutral light if within +/-5 taps of neutral)		
FINAL COUNTER: _____ RUST CONDITION: * A ____ B ____ C ____		

B - Phase		
MFG: _____	SERIAL #: _____	VR# _____
SYSTEM ID# _____		
COUNTER FOUND: _____	TAP POSITION: _____	
DRAG HAND POSITIONS	RAISE: _____	LOWER: _____
MANUALLY OPERATE CONTROLS: (Operate tap changer 3-4 taps & return to auto)		
CHECK: Time Delay: _____ Seconds. AUTO (operations form) TAP _____ TO _____		
RESET DRAG HANDS:___	OUTPUT VOLTAGE: _____	
CHECK NEUTRAL LIGHT: _____ (Check neutral light if within +/-5 taps of neutral)		
FINAL COUNTER: _____ RUST CONDITION: * A ____ B ____ C ____		

C - Phase		
MFG: _____	SERIAL #: _____	VR# _____
SYSTEM ID# _____		
COUNTER FOUND: _____	TAP POSITION: _____	
DRAG HAND POSITIONS	RAISE: _____	LOWER: _____
MANUALLY OPERATE CONTROLS: (Operate tap changer 3-4 taps & return to auto)		
CHECK: Time Delay: _____ Seconds. AUTO (operations form) TAP _____ TO _____		
RESET DRAG HANDS:___	OUTPUT VOLTAGE: _____	
CHECK NEUTRAL LIGHT: _____(Check neutral light if within +/-5 taps of neutral)		
FINAL COUNTER: _____ RUST CONDITION: * A ____ B ____ C ____		

* Note: Class A – Small amount of rust (Clean with brush and touch up with paint, if possible
Class B – Remove unit from service within 12-24 months and refurbish
Class C – Remove unit from service, ASAP (within same maintenance year) and replace unit.

Checks: Porcelain _____ Grounding _____ By-Pass Switch _____
Oil Level _____ Oil Leaks _____
Structure Condition Platform Condition

REMARKS:

_____
_____
_____

VOLTAGE REGULATOR OFF LINE (3-5 YR) DMM#80A FORM

Line/Station: _____ Date: _____

JDE W/O : _____ Completed by: _____

_____Phase		
MFG: _____	SERIAL #: _____ VR# _____	
SYSTEM ID# _____	SYSTEM kV: _____	
COUNTER FOUND: _____	TAP POSITION: _____	
DRAG HAND POSITIONS	RAISE: _____	LOWER: _____
MANUALLY OPERATE CONTROLS: (Operate tap changer 3-4 taps & return to auto)		
CHECK: Time Delay: _____ Seconds. AUTO (operations form) TAP _____ TO _____		
RESET DRAG HANDS:___	O/P VOLTAGE: _____	
CHECK NEUTRAL LIGHT: _____		
FINAL COUNTER: _____ RUST CONDITION: * A ____ B ____ C ____		

TAP REGULATOR TO NEUTRAL POSITION: BY-PASS AND GROUND
(USING APPROVED WORK METHOD)

CONTROL SETTINGS		
VOLTAGE: _____	BANDWIDTH: _____V	TIME DELAY: _____ Sec.
R: _____	X: _____	X/R: _____

MEGGER: _____ Meg Ω	(S/L/SF to Ground) 500V/1000 V Megger)

OIL INSULATION TEST – ASTM 1816						
Shots	1. ____kV	2. ____ kV	3. ____ kV	4. ____ kV	5. ____ kV	Avg.__ kV
Color	Clear ___	Yellow __	Brown ___	Dark ___	Black _____	

* Note: Class A – Small amount of rust (Clean with brush and touch up with paint, if possible
Class B – Remove unit from service within 12-24 months and refurbish
Class C – Remove unit from service, ASAP (within same maintenance year) and replace unit.

Checks:

Porcelain _____	Grounding _____	Connections _____
Oil Level _____	Oil Leaks _____	By-Pass Switch _____
Platform _____	PC Board _____	Control Panel Fuses _____

REMARKS:

_____
_____
_____
_____
_____