State of New York
Public Service Commission

Case 04-M-0159

Niagara Mohawk Power Corporation
d/b/a National Grid

Stray Voltage Testing and Facility Inspection

2020 Annual Report

Report on the results of stray voltage testing and facility inspections
for the 12-month period ended December 31, 2020

February 16, 2021

Table of Contents

I.	**Background**	**1**
II.	**Company Overview**	**1**
III.	**Stray Voltage Testing Program**	**2**
IV.	**Facility Inspection Program**	**4**
V.	**Company Facilities**	**5**
VI.	**Annual Performance Targets**	**6**
VII.	**Certifications**	**9**
VIII.	**Analysis of Causes of Findings and Stray Voltage**	**9**
IX.	**Analysis of Inspection Results**	**10**
X.	**Quality Assurance**	**12**

I. Background

The New York State Public Service Commission's ("Commission") Electric Safety Standards adopted on January 5, 2005 in Case 04-M-0159, with subsequent revisions issued on July 21, 2005, December 15, 2008, March 22, 2013, January 13, 2015, and January 28, 2021 (collectively referred to herein as the "Safety Standards" or "Order"), require annual stray voltage testing of certain electric facilities accessible to the public and inspections of utility electric facilities on a minimum of a five-year cycle.

In the March 22, 2013 Order, the Commission revised the annual testing requirement for stray voltage. Under the revision, overhead distribution facilities, underground residential distribution ("URD") facilities, overhead and underground transmission structures, and substation fences will be tested for stray voltage at least once every five years. Streetlights and underground distribution facilities will continue to be tested annually. On January 28, 2021, the Commission issued an order revising the Electric Safety Standards to allow utilities the option to inspect underground facilities in accordance with their respective asset management instead of every five years.

This report describes Niagara Mohawk Power Corporation's d/b/a National Grid ("Niagara Mohawk" or "Company") stray voltage detection program and facility inspection program conducted for the 12-month period ended December 31, 2020.

II. Company Overview

Niagara Mohawk provides electric service to approximately 1,600,000 customers in a service area of approximately 25,000 square miles in New York State. The Company operates an electric transmission and distribution system. For the stray voltage detection and facility inspection programs, Niagara Mohawk divides its system into subprograms to schedule and track testing and inspections. The subprograms include the Company's (a) distribution overhead system, (b) distribution and transmission underground system, (c) streetlight system, (d) transmission overhead system, and (e) substations.

a. Distribution Overhead System

Niagara Mohawk's distribution overhead system consists of structures supporting circuits energized at voltages of up to 15kV and spans close to 32,000 miles. Stray voltage testing of the distribution system is currently performed by Niagara Mohawk and contractors. Facility inspections of the distribution system are currently performed by the Company's internal workforce and contractors.

b. Distribution and Transmission Underground System

Niagara Mohawk's distribution and transmission underground system is made up of facilities such as manholes, hand-holes, vaults, and switchgear. Fiberglass hand holes are exempt from stray voltage testing under the Safety Standards.[1] Stray voltage testing of the Company's underground

[1] *See* July 21, 2005 Order, at 23; March 22, 2013 Order, at Appendix A, 3(c).

system is currently performed by contractors. Facility inspections of the underground system are currently performed by contractors.

c. Streetlight System

Niagara Mohawk's streetlight system contains underground fed metallic streetlight standards and municipally-owned streetlights and traffic control devices. Overhead fed streetlights on wooden poles are not counted within the streetlight program for stray voltage testing. For the underground fed metallic streetlight standards, contractors perform the stray voltage testing at night when the lights are operational. Stray voltage testing on traffic control devices takes place in conjunction with the contractors' testing of the overhead and underground systems during the daytime hours. The streetlight facility inspections on Company-owned facilities take place during the day and are performed by an external workforce.

d. Transmission Overhead System

Niagara Mohawk's transmission overhead system, which includes the sub-transmission system, consists of structures that support circuits energized at voltages of 12 kV, 23kV, 34.5kV, 46kV, 69kV, 115kV, 230kV, and 345kV. The transmission system spans the entire state and is approximately 8,465 miles in length. Stray voltage testing on the transmission system is performed by Niagara Mohawk and contractors.

e. Substations

There are substations in Niagara Mohawk's service territory. Stray voltage results for substation fences were collected internally by the operating group. The initial dataset identified substation locations to be tested of which a number of these are customer-owned locations.

III. Stray Voltage Testing Program

During the calendar year that ended December 31, 2020, the Company conducted stray voltage testing of 100% of all Company and non-Company owned metallic streetlights and traffic signals and 100% of all publicly accessible Company-owned underground distribution facilities that are capable of conducting electricity. In addition, the Company conducted stray voltage testing of its publicly accessible overhead distribution facilities, URD facilities, overhead and underground transmission structures, and substation fences that are capable of conducting electricity.

In addition, and in compliance with the Safety Standards, Niagara Mohawk:

a. Immediately safeguarded and/or mitigated all voltage findings $\geq$ 1.0 volt. In instances where the stray voltage finding was determined to be caused by customer-owned equipment, the area was immediately made safe and the customer or responsible person associated with the premises was notified of the unsafe condition and the need for the customer to arrange for a permanent repair. Voltage findings determined to be caused by a Company-owned facility were immediately safeguarded and/or mitigated. All permanent repairs were made within 45 days.

b. Tested all publicly accessible structures and sidewalks within a 30 foot radius of the electric facility or streetlight where there was a stray voltage finding ≥ 1.0 volt.

c. Responded, investigated, and mitigated positive findings of shock incidents reported by the public.

Niagara Mohawk visited 406,341 facilities for stray voltage testing in calendar year 2020. Testing was not required on 137,525 facilities because: the facilities are wood utility poles that have no attached appurtenances capable of conducting electricity; the facilities' electrically conductive appurtenances are not accessible to the public (pre-wired wood); the facilities are enclosed in fiberglass (non-conductive materials); the facilities are de-energized; and/or the facilities are inaccessible to the public.

Inaccessible facilities include:

a. Locked Gate/Fence – Poles behind locked gates and fences that are not accessible to the public, (*e.g.*, facilities located in fenced areas owned by other utilities such as water companies).

b. Dangerous Grades – Poles located on cliffs and other dangerous grades are generally inaccessible to Company personnel and the general public and are approached only under urgent circumstances. The performance of stray voltage testing on these facilities would constitute an unacceptable risk to the employee.

c. Company Property – Poles located on Company property such as substations are accessible only to Company personnel and authorized contractors.

d. Vaults – Structures located inside buildings. These structures are accessible only to Company and building maintenance personnel.

e. Limited Access Highway Facilities – Structures located on highways and highway exit and entrance ramps. The performance of stray voltage testing on these structures would constitute an unacceptable risk to the employee.

As required by the Safety Standards, Niagara Mohawk performed 2,994 miles of mobile testing system scans between January 1, 2020 and December 31, 2020. A summary of the results of the mobile testing scans is contained in Appendix 8, which is a copy of the Company's mobile scan report filed with the Commission on December 4, 2020.

IV. Facility Inspection Program

The Safety Standards require Niagara Mohawk to visually inspect approximately 20% of its facilities annually, resulting in a five-year inspection goal for all facilities to be inspected.

Niagara Mohawk visually inspects its overhead distribution and transmission systems on a five-year cycle from the ground, as prescribed by the Safety Standards.

In addition, Niagara Mohawk performs the following inspections, some of which are recurring on specific cycles, and others scheduled on an as-needed basis:

- Aerial Infrared – Helicopter-based thermographic imaging of connections and equipment.
- Tower Footing – Embedded support structure that supports a transmission tower.
- Wood Pole – Inspection of the wood pole at and below the ground line.
- Aerial Patrols – Helicopter based visual examination of transmission facilities and equipment.
- Comprehensive Helicopter Patrol – A comprehensive methodical examination of all components comprising the transmission system by helicopter.

Niagara Mohawk's ground-based visual inspection program is segmented into five categories: distribution facility inspection; underground facility inspections; streetlight inspections; transmission facility inspections; and substation inspections.[2] Each program is summarized by its associated procedure document. The inspections include visual inspections of the assets to determine if deficiencies exist. Deficiencies are captured by codes entered into handheld computers. Data is then downloaded for review and follow up work.

In accordance with the Safety Standards, Niagara Mohawk uses the following severity levels to establish priority for repairs and scheduling:

a. Level I – Repair as soon as possible but not longer than one week. A Level I classification represents an actual or imminent safety hazard to the public or a serious and immediate threat to the delivery of power. Critical safety hazards present at the time of the inspection shall be guarded until the hazard is mitigated.

b. Level II – Repair within one year. A Level II classification represents conditions that are likely to fail prior to the next inspection cycle and represent a threat to safety and/or reliability should a failure occur prior to repair.

[2] Substation inspections are more complex than those performed on other facilities and differ in a variety of ways including, but not limited to: inspection schedules, system that captures inspection data, and work prioritization (supervisory review determines work to be completed versus Levels I-IV). Substation inspection procedure and protocols are provided in Attachment 15 (400.13.2 Substation Maintenance Visual and Operational (V&O) Inspection).

c. Level III – Repair within three years. A Level III classification represents conditions that do not present immediate safety or operational concerns and would likely have a minimal impact on the safe and reliable delivery of power should a failure occur prior to repair.

d. Level IV – A Level IV classification represents conditions found, but repairs are not needed at this time. Level IV is used to track atypical conditions that do not require repair within a five-year timeframe. This level is used for future monitoring purposes and planning proactive maintenance activities.

In accordance with the Safety Standards, when a temporary repair is located during an inspection or is performed by the Company, best efforts are made to make a permanent repair of the facility within 90 days. Temporary repairs that remain on the system for more than 90 days are due to extraordinary circumstances (*e.g.*, storms and outage constraints), and usually require extensive repair activity. Niagara Mohawk has compiled a list of exceptions of temporary repairs that still remain in place after the 90-day requirement. The list and justifications can be found in Appendix 5 of this report.

Niagara Mohawk provides classroom and field training to personnel inspecting facilities in accordance with the Company's Electric Operating Procedures ("EOPs"). The classroom training covers topics including: EOPs, distribution maintenance inspection and elevated voltage testing training, Computapole handheld training, Computapole database training, distribution vegetation training, geographic information system training, feeder patrols training, and basic electricity training.

The Company provides new distribution inspectors with training upon hiring, with ongoing yearly refresher courses. As part of the refresher training, Niagara Mohawk updates all training materials due for updates from the following year. Specifically, the updates are done yearly using relevant EOPs and Company standards that have been updated.

V. Company Facilities

Niagara Mohawk has approximately 1,527,053 individual facilities that must be visited for stray voltage testing and approximately 1,599,684 individual facilities that require a facility inspection. These facilities are broken down into the following five main categories and are summarized in the tables beginning on page 9:

a. Distribution Overhead – The Company's testing criteria for distribution overhead facilities involves testing all Company-owned or jointly-owned wood poles with utility electrical facilities located on both public thoroughfares and customer property, including backyards or alleys. Stray voltage testing is performed on all wooden poles with metallic attachments (*e.g.* ground wires, ground rods, anchor guy wires, or riser pipes), and/or any electrical equipment within reach of the general public. Distribution overhead facilities are included in both the stray voltage and facility inspection programs.

b. Distribution and Transmission Underground Facilities –The Company's testing criteria for underground facilities involves testing all subsurface structures, including above ground, pad-mounted structures. Included in the underground facilities are padmount switchgear cases, padmount transformer cases, electric utility manhole covers, submersible transformer covers, electric utility handhole covers, network vaults, and grates. These facilities are included in both the stray voltage and facility inspection programs. Inspections of the underground system involve underground and padmount assets.

c. Streetlights and Traffic Signals – Streetlights include Company-owned metal pole streetlights and municipal-owned metal pole streetlights to which the Company provides service. The testing criteria for streetlights and traffic signals involves testing all metal pole streetlights, traffic signals, and pedestrian crosswalk signals located on publicly accessible thoroughfares. Stray voltage testing of streetlights is performed at night while the fixtures are energized. Privately-owned light fixtures are not included in the stray voltage testing program, per the Safety Standards.[3] All Company-owned streetlights are included in the facility inspection program.

d. Substation Fences - Niagara Mohawk operates and maintains substation facilities that are necessary for the operation of the electric grid. These substations are fenced in for security, as well as to ensure the safety of the general public. Substation fences are included in the stray voltage testing program.

e. Transmission Overhead Structures – The testing criteria for transmission overhead structures involves testing all structures, guys, and down leads attached to the facilities. Transmission structures support circuit voltages of 12 kV and greater. Transmission poles with distribution underbuild are included in the transmission category. All transmission structures are included in both the stray voltage and facility inspection programs.

VI. Annual Performance Targets

The year ended December 31, 2020 was the first year of inspection Cycle 4 of the Company's stray voltage program. In compliance with the Safety Standards, Niagara Mohawk met the annual performance target for stray voltage testing of 20% of overhead distribution facilities, URD facilities, overhead and underground transmission structures, and substation fences, as well as 100% of metallic streetlights and underground distribution facilities. In addition, in compliance with the Safety Standards, Niagara Mohawk met the annual performance target for inspection of approximately 20% (*i.e.,* 95% of the annual target of 20%, or 19%) of its electric facilities for the year ended December 31, 2020.

[3] March 22, 2013 Order, at Appendix A, §§ 1(d) and 3(a).

The results are summarized in the tables below.

Stray Voltage Testing Results

Elevated Voltage Testing Annual Summary			
Program	**Total Units**	**Units Completed in 2020**	**% Completed**
Distribution**	1,308,911	271,112	20.713%
Underground	28,222	28,222	100.000%
Streetlights*	84,528	84,528	100.000%
Transmission**	104,524	21,611	20.676%
Substation	868	868	100.000%

*Note: Streetlights include traffic controls but exclude fiberglass standards.
**Note: Pursuant to the March 22, 2013 Order, the Company is required to test 100% of streetlights and underground distribution facilities annually. Overhead distribution facilities, URD facilities, overhead and underground transmission structures, and substation fences are required to be tested at least once every five years.

Facility Inspection Program Results

Category	Total System Units	Units Completed in 2020	Actual Inspected in 2020
Overhead Distribution	1,263,459	257,879	20.411%
Overhead Transmission	105,272	22,112	21.005%
Underground	101,622	18,729	18.430%
Pad-mounted Transformers	72,788	13,061	17.944%
Streetlights	56,543	12,974	22.945%
TOTAL	1,599,684	324,755	20.301%

Inspection Performance Summaries

Overhead Distribution Facilities

Inspection Year	Number of Overhead Distribution Structures Inspected	% of Overall System Inspected (Cumulative)
2020	257,879	20%

Overhead Transmission Facilities

Inspection Year	Number of Overhead Transmission Facilities Inspected	% of Overall System Inspected (Cumulative)
2020	22,112	21%

Underground Facilities

Inspection Year	Number of Underground Facilities Inspected	% of Overall System Inspected (Cumulative)
2020	18,729	18%

Padmount Transformers

Inspection Year	Number of Padmount Transformers Inspected	% of Overall System Inspected (Cumulative)
2020	13,061	18%

Streetlights

Inspection Year	Number of Streetlights Inspected	% of Overall System Inspected (Cumulative)
2020	12,974	23%

VII. Certifications

Pursuant to Section 7 of Appendix A of the Safety Standards, the president or officer of each utility with direct responsibility for overseeing stray voltage testing and facility inspections shall provide an annual certification to the Commission that the utility has, to the best of his or her knowledge, exercised due diligence in carrying out a plan, including quality assurance, that is designed to meet the stray voltage testing and inspection requirements, and that the utility has:

- Tested its publicly accessible electric facilities and street lights in accordance with the Safety Standards, and

- Inspected the requisite number of electric facilities.

The certifications are attached as Appendix 17 to this report.

VIII. Analysis of Causes of Findings and Stray Voltage

The Safety Standards require the electric utilities to perform an inventory on all stray voltage findings and report on the number of these findings each year. Section 1(f) of the December 15, 2008 Order defines a finding as "any confirmed voltage reading on an electric facility or streetlight greater than or equal to 1 volt measured using a volt meter and 500 ohm shunt resistor." Section 1(c) defines stray voltage as "voltage conditions on electric facilities that should not ordinarily exist. These conditions may be due to one or more factors, including, but not limited to, damaged cables, deteriorated, frayed, or missing insulation, improper maintenance, or improper installation." Utilities are required to report on all findings whether or not the voltage is normal to the electric system.

Niagara Mohawk identified 11 instances of stray voltage during the Company's manual stray voltage testing program in 2020. These voltages resulted from a variety of conditions including: deterioration of conductors; age of equipment; exposure to the elements; and various customer related issues. A majority (6) of stray voltage conditions identified were on distribution structures.

The following table contains a breakdown of the causes of stray voltage findings identified through the Company's 2020 manual testing effort. Niagara Mohawk has repaired and/or mitigated all findings that were determined to be hazardous. Mobile testing findings are addressed in the Mobile Stray Voltage Testing Report attached as Appendix 8.

Structure Type	Cause of Stray Voltage	Stray Voltage Found
Distribution	Info Missing	4
Distribution	Guy	1
Distribution	Customer Problem	1
Street Lights - Traffic Signals	Lamp Wiring	1
Street Lights - Traffic Signals	Neutral	1
Street Lights - Traffic Signals	Remade All Connections	1
Street Lights - Traffic Signals	Customer Problem	2
TOTAL		11

In accordance with the Safety Standards, when Niagara Mohawk discovered a finding on an electric facility or streetlight during stray voltage testing, the Company tested all publicly accessible structures and sidewalks within a minimum 30-foot radius of the electric facility or streetlight. Niagara Mohawk did not identify any additional findings associated with the initial test structure as a result of the 30-foot radius testing.

IX. Analysis of Inspection Results

Note: Total Number of Deficiencies may add up to more than the total Locations with Deficiencies due to deficiencies on multiple facilities at a single location.

Overhead Distribution Structures

Table of Locations with Deficiencies

Locations Inspected	Locations w/Deficiencies	%Locations w/Deficiencies
257,879	104,685	40.595%

Breakdown of Locations with Deficiencies

Priority Rate	Number of Deficiencies	% Deficiencies Found
1	807	0.506%
2	3,198	2.003%
3	27,690	17.346%
4	127,939	80.145%
Total:	159,634	100.000%

Overhead Transmission Facilities

Table of Locations with Deficiencies

Locations Inspected	Locations w/Deficiencies	%Locations w/Deficiencies
22,112	14,958	67.647%

Breakdown of Locations with Deficiencies

Priority Rate	Number of Deficiencies	% Deficiencies Found
1	9	0.036%
2	112	0.453%
3	1,193	4.829%
4	23,390	94.681%
Total:	24,704	100.000%

Underground Facilities

Table of Locations with Deficiencies

Locations Inspected	Locations w/Deficiencies	%Locations w/Deficiencies
19,729	10,673	54.098%

Breakdown of Locations with Deficiencies

Priority Rate	Number of Deficiencies	% Deficiencies Found
1	119	1.046%
2	1,040	9.144%
3	255	2.242%
4	9,959	87.567%
Total:	11,373	100.000%

Pad-mount Transformers

Table of Locations with Deficiencies

Locations Inspected	Locations w/Deficiencies	%Locations w/Deficiencies
13,061	3,790	29.018%

Breakdown of Locations with Deficiencies

Priority Rate	Number of Deficiencies	% Deficiencies Found
1	70	1.089%
2	448	6.973%
3	97	1.510%
4	5,810	90.428%
Total:	6,425	100.000%

Streetlights

Table of Locations with Deficiencies

Locations Inspected	Locations w/Deficiencies	%Locations w/Deficiencies
12,974	8,315	64.090%

Breakdown of Locations with Deficiencies

Priority Rate	Number of Deficiencies	% Deficiencies Found
1	0	0.000%
2	428	3.304%
3	2,726	21.044%
4	9,800	75.652%
Total:	12,954	100.000%

In 2020, Niagara Mohawk identified an overall total of 215,090 deficiencies:

- Priority Rating 1 Total = 1,005, or 0.467% of the overall total.
- Priority Rating 2 Total = 5,226, or 2.429% of the overall total.
- Priority Rating 3 Total = 31,961, or 14.859% of the overall total.
- Priority Rating 4 Total = 176,898 (inventory), or 82.243% of the overall total.

X. Quality Assurance

Electric Quality Assurance/Quality Control Program

National Grid's Elevated Voltage ("EV") and Visual Inspection & Maintenance ("I&M") Quality Assurance/Quality Control ("QA/QC") program provides for increased program continuity, monthly audits for monitoring of program performance, and assurance that a QA/QC program independent of the EV and I&M work groups is maintained.

Separate from the independent Electric QA/QC program, Quality Control ("QC") audits are conducted by National Grid I&M supervisory staff. The purpose of the QC audits is to self-validate recorded findings involving all distribution, transmission, and sub-transmission assets that have been inspected to identify potential maintenance codes and elevated voltage issues. Conversely, the independent Electric QA/QC program encompasses a quantitative random sampling of the entire population of inspection results derived from the field audited EV testing and I&M inspections.

Revisions to QA/QC Program 2020

- NA

I&M Risk Levels Identified

The analysis of the QA/QC I&M Program data is intended to identify the nature and magnitude of Risk Level 1 and Risk Level 2 as applicable to the I&M Program results.

Electric QA/QC I&M Risk Level Definitions
QA/QC program involves performing an additional QA/QC audit of randomly selected assets having been previously assessed by the field inspector, with the intent of verifying previously identified maintenance codes.
Risk 1 • Reliability/ Safety Concern. • Identified facility/component repaired or replaced within one week of the inspection date.
Risk 2 • Facility/component condition that must be repaired/replaced within 1 year. • QA/QC identification of maintenance codes which may affect reliability.
Risk 3 • Facility/component condition that must be repaired/replaced within 3 years. • QA/QC identification of maintenance codes which may not affect reliability. • The QA/QC auditor determined the original I&M inspector's maintenance code was incorrect. • The independent QA/QC auditor determines a data quality issue.

Asset Inspection & Maintenance Audits

National Grid's Electric QA/QC group audited 6,756 distribution, transmission and sub-transmission assets that had been field inspected for maintenance during 2020. The method used to confirm and/or achieve the required quality of asset audits involved follow-up field audit by QA/QC personnel through a monthly random sample, with the intent of verifying identified maintenance codes derived from the population of assets inspected by field force operations during calendar year 2020. This process captured incorrect or missed maintenance codes and noted timeliness of repairs when evident. To achieve a minimum 95% level of confidence, applicable to the entire population of inspection data and resulting random sample analysis, commonly applied statistical principles were utilized to conduct the audit process.

The QA/QC field audit process is designed to validate the field inspector findings. Results are considered to be passing when there is a match between the field inspection maintenance codes and QA/QC follow-up audit results. Based upon the accrued inspection data provided by the Company's Inspections Department, and the findings identified through follow-up QA/QC process, the overall accuracy of field inspection findings that impacts reliability (Risk 1 and Risk 2), was validated at **97%**.

2020 Field Inspections – QA/QC Audit Results

The following table illustrates the population and breakdown of assets inspected by field force and compliance percentages related to system reliability concerns (Risk Levels 1 & 2 findings) identified through QA/QC process during calendar year 2020.

Asset Category	I & M Field Inspector	QA/QC Field Auditor		QA/QC Risk Levels		Compliance Percent (%)
	Assets Inspected	Assets Audited	M Codes Audited	Risk 1	Risk 2	

Distribution	257,879	5672	7098	2	238	97%
Sub-Transmission	10,645	524	891	1	8	99%
Transmission	11,468	560	760	0	9	99%
		Total Compliance Percent				**97%**

QA/QC I&M Audit Analysis

National Grid desires a minimum threshold for inspection compliance percentage at 95%. QA/QC analysis of regional findings by misidentified maintenance codes and missed maintenance codes are conducted for the purpose of determining compliance percentage of maintenance code trending for a particular region.

- Misidentified Maintenance Code – When the field Inspector incorrectly identifies a maintenance code for a condition found at a structure.

- Missed Maintenance Code – When the QA/QC Inspector identifies a maintenance code that the field inspector did not account for at a structure.

If the compliance percentage is between 95% and 90%, the electric QA/QC group will conduct further analysis of accrued data for potential trending. Operations will be responsible for corrective action where applicable. If the validation accuracy is less than 90%, Operations is responsible for further trending analysis and/or corrective action and implantation plan to improve field force inspections.

QA/QC Misidentified Maintenance Code Trends

Region	QA/QC Misidentified M Codes	Maintenance Code Description	Trending Quantity	Total Sample Size Audited YTD		Compliance Percent
48	760-Sub-T	GIS – Map doesn't match field	14	181		92%
54	218-Dist	Guy – Not in compliance with NESC Code	13	985		99%
57	211-Dist	Ground – Hazard condition	12	1577		99%
	218-Dist	Guy – Not in compliance with NESC Code	16			99%
	221-Dist	Guy – Not in compliance with NESC Code	11			99%

QA/QC Missed Maintenance Code Trends

Region	QA/QC added M Codes	Maintenance Code Description	QTY	Total Sample Size Audited YTD	Compliance Percent
48	099-Dist	Street Light – Not Bonded	10	938	99%
	215-Dist	Guy – Guy Span not in compliance w/Code	15		98%
	218-Dist	Guy – Not in compliance with code	12		99%
	221-Dist	Guy – Guy Span not in compliance w/Code	14		99%
	272-Dist	Spacer Cable – Bracket not bonded	15		98%
	274-Dist	Spacer Cable – Messenger guard missing	12		99%
	291-Dist	Riser – Improper/Missing bond	11		99%
50	215-Dist	Guy – Guy Span not in compliance w/Code	15	915	98%
	218-Dist	Guy – Not in compliance with code	24		97%
51	218-Dist	Guy – Not in compliance with code	14	805	98%
54	221-Dist	Guy – Not in compliance with NESC Code	18	985	98%
57	155-Dist	Transformer – Animal Guards Required	17	1577	99%
	213-Dist	Ground – Non – Standard	27		98%
	215-Dist	Guy – Guy Span not in compliance w/Code	12		99%
	218-Dist	Guy – Guy Span not in compliance w/Code	12		99%
	221-Dist	Guy – Not in compliance with NESC Code	19		99%

I&M Results – Repairs

Per the Safety Standards, the QA/QC program is responsible to verify permanent repairs have been made in response to field force operations inspections performed, along with the timeliness of the repair. The 2020 field force inspection process yielded the following asset deficiencies and repair activities for I&M defined Level 1, Level 2, and Level 3 priorities:

Summary of Deficiencies and Repair Activity Resulting from the Inspection Process

Year	Priority Level / Repair Expected		Deficiencies Found (Total)	Repaired Within Required Time Frame	Repaired Past Required Due Date	Not Repaired and Not Due	Not Repaired – Overdue
2020							
	I	Within 1 week	1005	991	14	0	0
	II	Within 1 year	5226	1179	0	4047	0
	III	Within 3 years	31961	269	0	31692	0
	IV	N/A	176898	31116	0	145782	0
	Temp Repairs	Within 90 days	61	55	6	0	0

The QA/QC group performed 437 Level 1 only follow-up field audits and validated that the 421 repairs were completed within the required time frame and 16 Level 1 had not been repaired and were overdue at time of audit.

Elevated Voltage (EV) Assets Audited

The National Grid QA/QC 2020 EV Field Audit program targeted an overall minimum confidence level of 95% applicable to field force operations inspection of its Distribution, Underground, Transmission and Sub-Transmission assets. Additionally, a minimum confidence level of 98% should be realized for tested streetlights and traffic controls. The inspection process requires elevated voltage testing be conducted for each utility asset that can conduct electricity and is publicly accessible. For each QA/QC EV audit to have successfully "passed," the following test parameters must be validated:

- The voltage recording shall be below established regulatory thresholds ($\leq$ 1 volt or mitigated)
- All assets having a "testable object" were in fact tested by the field Inspector.

EV Risks Identified

The analysis of the QA/QC EV Program data is intended to identify the nature and magnitude of Risk Level 1 and Risk Level 2 as applicable to the EV Program results.

Electric QA/QC EV Risk Level Definitions
QA/QC program methodology involved performing an additional QA/QC audit of randomly selected assets having been previously tested by field inspector. For the QA/QC test to have "passed," it must confirm that all assets having a 'testable object' were in fact tested.
Risk 1

• An elevated voltage reading was identified by the EV field tester and the independent QA/QC auditor found the voltage not mitigated below regulatory/company thresholds after the 45 days. • The QA/QC auditor measured a voltage that exceeds the regulatory/ company thresholds greater than or equal to 1 volt.
Risk 2 • The EV field tester determined there was not a testable object, and the independent QA/QC auditor identifies a testable component existed at the audited asset. • The EV field tester determined there was in fact a testable component and the independent QA/QC auditor revealed no testable component at the audited asset.
Risk 3 • The EV field tester and or the independent QA/QC field auditor deem the structure inaccessible or non-testable. • The independent QA/QC field auditor determines a data quality issue. • Reasonable effort to effectively eliminate the stray voltage condition on overhead Sub-Transmission or Transmission structures was attempted but it some cases cannot achieve a reading of 1 volt or less after mitigation due to neutral currents and induced voltages.

2020 QA/QC EV Field Asset Audit Results

The QA/QC group audited **7652** elevated voltage assets for Distribution, Underground, Transmission, Sub-Transmission and Streetlights during eight operating regions.

QA/QC EV Assets Audited

Region	QA/QC Assets Audit Totals
48	988
50	982
51	934
54	1043
56	431
57	1671
60	761
62	842
Total	**7652**

Total QA/QC EV Asset Audits Totals by Category Type

Category Type	Region 48	Region 50	Region 51	Region 54	Region 56	Region 57	Region 60	Region 62	Totals
Distribution	553	668	636	698	253	1321	529	571	**5229**
Underground	58	29	40	58	56	98	74	90	**503**
Sub Trans	114	107	68	34	35	78	30	45	**511**
Transmission	83	71	69	103	32	96	48	37	**539**
Streetlights	180	107	121	150	55	78	80	99	**870**
Totals	**988**	**982**	**934**	**1043**	**431**	**1671**	**761**	**842**	**7652**

2020 QA/QC EV Field Asset Audit Results – Risk Level

Risk Level 1 Identified

The National Grid 2020 QA/QC EV audits achieved an overall confidence level of **100%** for Risk Level 1 for distribution, underground, transmission and sub-transmission assets.

Additionally, an overall confidence level of **100%** for Risk 1 Level was achieved for the electric QA/QC EV streetlight/ traffic control audits.

QA/QC Risk 1 Level Identified

Category Type	Region 48	Region 50	Region 51	Region 54	Region 56	Region 57	Region 60	Region 62	Total
Distribution	0	0	0	0	0	0	0	0	0
Underground	0	0	0	0	0	0	0	0	0
Sub Trans	0	0	0	0	0	0	0	0	0
Transmission	0	0	0	0	0	0	0	0	0
Streetlights	0	0	0	0	0	0	0	0	0
Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Risk Level 2 Identified

A total of 145 QA/QC EV audits (approximately 2% of 7652 audits performed) resulted in Risk Level 2 being identified. The Company's 2020 QA/QC EV audits achieved an overall confidence level **98%** accuracy of identification of testable components.

QA/QC Risk Level 2 Identified

Category Type	Region	Region 50	Region 51	Region 54	Region 56	Region 57	Region 60	Region 62	Total

	48								
Distribution	26	12	19	9	2	33	2	4	**107**
Underground	2	0	0	0	0	3	0	1	**6**
Sub Trans	15	4	1	0	0	1	0	0	**21**
Transmission	0	0	0	0	0	0	0	0	**0**
Streetlights	0	0	1	0	0	2	8	0	**11**
Totals	**43**	**16**	**21**	**9**	**2**	**39**	**10**	**5**	**145**

QA/QC EV Audit Analysis – Risk Level 1 & Risk Level 2

(1) Category Type: Distribution, Underground, Sub - Transmission & Transmission

Region	**Dist., UG, Sub-T, Trans**			**Compliance Percent**	**Electric QA/QC Additional Analysis Required**	**Operations Corrective Action Required**
	Risk 1	**Risk 2**	**Assets Audited**		**≥90% and ≤95%**	**<90%**
48	0	43	808	95%	X	
50	0	16	875	98%		
51	0	20	813	98%		
54	0	9	893	99%		
56	0	2	376	99%		
57	0	37	1593	98%		
60	0	2	681	99%		
62	0	5	743	99%		

Note: In regions where QA/QC field audits validated the minimum confidence level to have been met or exceeded, no additional analysis or Corrective action is required (N/A).

- If the validation accuracy range is between 90% to 95%, (Distribution, Underground, Sub-Transmission & Transmission) the electric QA/QC group will conduct further analysis of accrued data for potential trending. Operations will be responsible for corrective action where applicable.

- If the validation accuracy is less than 90%, (Distribution, Underground, Sub-Transmission & Transmission) Operations is responsible for further trending analysis and/or corrective action and implantation plan to improve field force inspections.

QA/QC EV Audit Analysis – Risk Level 1 & 2

(2) Category Type: Streetlights & Traffic Controls

Regions	**Street Lights & Traffic Controls**			**Compliance Percent**	**Electric QA/QC Additional Analysis Required**	**Operations Corrective Action Required**
	Risk 1	**Risk 2**	**Total Sample**		**≥95% and ≤98%**	**<95%**

			Size Audited YTD			
48	0	0	180	100%		
50	0	0	107	100%		
51	0	1	121	99%		
54	0	0	150	100%		
56	0	0	55	100%		
57	0	2	78	97%	X	
60	0	8	80	90%		X
62	0	0	99	100%		

Note: In regions where QA/QC field audits validated the minimum confidence level to have been met or exceeded, no additional analysis or Corrective action is required (N/A).

- If the validation accuracy range is 95% to 98%, (Street Lights & Traffic Controls) the electric QA/QC group will conduct further analysis of accrued data for potential trending. Operations will be responsible for corrective action where applicable.

- If the validation accuracy is less than 95%, (Street Lights & Traffic Controls) Operations is responsible for further trending analysis and/or corrective action and implantation plan to improve field force inspections

Summary

QA/QC I&M Audit Program

The National Grid Electric QA/QC analysis of the Missed maintenance codes (defects) conducted in 2020 by the National Grid QA/QC team concluded that the following:

Distribution

Maintenance Code 218/221 (Guy – Not in compliance with NESC Code) was missed repetitively across the NY territory. QA/QC discovered 125 errors applicable to maintenance Code 218/221.

Sub-Transmission

Maintenance Code 528 (Pole – Aerial number missing) was missed repetitively across the NY territory. QA/QC discovered 13 errors applicable to maintenance Code 528.

Transmission

Maintenance Code 528 (Pole – Aerial number missing) was missed repetitively across the NY territory. QA/QC discovered 12 errors applicable to maintenance Code 528.

Action item:
The Electric QA/QC and Electric Operations conducted further analysis of the data file and additional investigation into identification of deficiency causal factors. Corrective actions have been assigned to the appropriate regional Inspection groups.

QA/QC EV Program

No Risk Level 1 deficiencies for Distribution, Underground, Sub-Transmission and Transmission were identified through the QA/QC audit process. Based upon the compliance percentage of QA/QC inspection program findings (100% accuracy), further analysis of the accrued QA/QC EV inspection data is not warranted.

Action Item: NA

APPENDIX SUMMARY

Appendix 1: Stray Voltage Testing Summary

Appendix 2: Summary of Energized Objects

Appendix 3: Summary of Shock Reports from the Public

Appendix 4: Summary of Deficiencies and Repair Activity Resulting from the Inspection Process

Appendix 5: Temporary Repair Exceptions

Appendix 6: Inspections Summary

Appendix 7: Summary of Overdue Repairs

Appendix 8: Mobile Testing

Appendix 9: NG-USA EOP G016 Equipment Elevated Voltage Testing

Appendix 10: NG-USA EOP D004 Distribution Line Patrol and Maintenance

Appendix 11: NG-USA EOP UG006 Underground Inspection and Maintenance

Appendix 12: NG-USA EOP T007.01 Transmission and Sub Transmission Ground Level Visual Inspection

Appendix 13: NG-USA EOP G017 Street Light Standard Inspection Program

Appendix 14: NG-USA EOP G004 Shock Complaints

Appendix 15: NG-USA SMP 400.13.2 Substation Maintenance Visual and Operational (V&O) Inspection

Appendix 16: NG-USA EOP G029 Tracking Temporary Repairs to Electric System

Appendix 17: Certifications

Appendix 1

Stray Voltage Testing Summary

Appendix 1

Stray Voltage Testing Summary

Nationalgrid Data as of December 31, 2020	Total System Units Requiring Testing	Units Completed	Percent Completed	Units with Voltage Found (>= 1.0v)	Percent of Units Tested with Voltage (>= 1.0v)	Units Classified as Inaccessible
Distribution Facilities	1,308,911	271,112	20.71%	6	0.002%	3,638
Underground Facilities	28,222	28,222	100.00%	0	0.000%	2,471
Street Lights / Traffic Signals	84,528	84,528	100.00%	5	0.006%	54
Substation Fences	868	868	100.00%	0	0.000%	868
Transmission	104,524	21,611	20.68%	0	0.000%	10
TOTAL	1,527,053	406,341	26.61%	11	0.00%	7,041

Appendix 2

Summary of Energized Objects

Appendix 2

Summary of Energized Objects (Manual Testing)

Summary of Voltages Found

nationalgrid	Initial Readings				Readings After Mitigation		
	1 - 4.4 V	4.5 - 24.9 V	> 25 V	Total	< 1 V	1 - 4.4 V	> 4.5 V
Distribution Facilities	4	1	1	6	6	0	0
Pole (910)	0	0	0	0	0	0	0
Ground (914)	3	1	0	4	4	0	0
Guy (915)	2	0	1	3	3	0	0
Riser (916)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Underground Facilities	0	0	0	0	0	0	0
Handhole / Pull box (950)	0	0	0	0	0	0	0
Manhole (951)	0	0	0	0	0	0	0
Padmount Switchgear (952)	0	0	0	0	0	0	0
Padmount Transformer (953)	0	0	0	0	0	0	0
Vault – Cover/Door (954)	0	0	0	0	0	0	0
Pedestal	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Street Lights / Traffic Signals	0	2	3	5	4	1	0
Metal Street Light Pole (971/981)	0	1	0	1	1	0	0
Traffic Signal Pole (991)	0	1	1	2	2	0	0
Control Box (992)	0	0	0	0	0	0	0
Pedestrian Crossing Pole (993)	0	0	0	0	0	0	0
Other	0	0	2	2	1	1	0
Substation Fences	0	0	0	0	0	0	0
Fence (995)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Transmission	0	0	0	0	0	0	0
Lattice Tower (931)	0	0	0	0	0	0	0
Pole (930)	0	0	0	0	0	0	0
Ground (933)	0	0	0	0	0	0	0
Guy (934)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Totals	4	3	4	11	10	1	0

NOTE - National Grid is only mitigating those locations where voltage is confirmed to be 1.0 volts or greater

NOTE - Individual facility counts (pole, ground, guy, etc) may add up to more than the total on a summary line due to voltage on multiple facilties at a single location or pole

NOTE - "Other" category generally includes incorrect facility types reported (example - a pole code turned in for voltage found on an underground device).

Appendix 3

Summary of Shock Reports from the Public

Appendix 3

Summary of Shock Reports from the Public

nationalgrid 2020 1st Quarter January 1, 2020 - March 31, 2020	Quarterly Update	Yearly Total
I. Total shock calls received:	**11**	**11**
Unsubstantiated	1	1
Normally Energized Equipment	3	3
Stray Voltage:		
Person	6	6
Animal	1	1
II. Injuries Sustained/Medical Attention Received Due To SV		
Person	1	1
Animal		
III. Voltage Source:	**7**	**7**
Utility Responsibility		
Issue with primary, joint, or transformer		
Secondary joint (Crab)		
SL service Line		
Abandoned SL service line		
Defective service line		
Abandoned service line		
OH Secondary		
OH Service		
OH Service neutral	2	2
Pole		
Riser		
Other	1	1
Customer Responsibility		
Contractor damage		
Customer equipment/wiring	4	4
Other Utility/Gov't Agency Responsibility		
SL Base Connection		
SL Internal wiring or light fixture		
Overhead equipment		
IV. Voltage Range:	**7**	**7**
1.0V to 4.4V		
4.5V to 24.9V	1	1
25V and above		
Unknown	6	6

nationalgrid 2020 2nd Quarter April 1, 2020 - June 30, 2020	Quarterly Update	Yearly Total
I. Total shock calls received:	**31**	**42**
Unsubstantiated	4	5
Normally Energized Equipment	4	7
Stray Voltage:		
Person	23	29
Animal		1
II. Injuries Sustained/Medical Attention Received Due To SV		
Person	2	3
Animal		
III. Voltage Source:	**23**	**30**
Utility Responsibility		
Issue with primary, joint, or transformer		
Secondary joint (Crab)		
SL service Line		
Abandoned SL service line		
Defective service line		
Abandoned service line		
OH Secondary		
OH Service		
OH Service neutral	2	4
Pole		
Riser		
Other	5	6
Customer Responsibility		
Contractor damage		
Customer equipment/wiring	15	19
Other Utility/Gov't Agency Responsibility		
SL Base Connection		
SL Internal wiring or light fixture		
Overhead equipment	1	1
IV. Voltage Range:	**23**	**30**
1.0V to 4.4V	1	1
4.5V to 24.9V	3	4
25V and above	1	1
Unknown	18	24

nationalgrid 2020 3rd Quarter July 1, 2020 - September 30, 2020	Quarterly Update	Yearly Total
I. Total shock calls received:	**46**	**88**
Unsubstantiated	9	14
Normally Energized Equipment	11	18
Stray Voltage:		
Person	26	55
Animal		1
II. Injuries Sustained/Medical Attention Received Due To SV		
Person	0	3
Animal		
III. Voltage Source:	**26**	**56**
Utility Responsibility		
Issue with primary, joint, or transformer		
Secondary joint (Crab)		
SL service Line		
Abandoned SL service line		
Defective service line		
Abandoned service line		
OH Secondary		
OH Service		
OH Service neutral	3	7
Pole		
Riser		
Other	5	11
Customer Responsibility		
Contractor damage	1	1
Customer equipment/wiring	16	35
Other Utility/Gov't Agency Responsibility		
SL Base Connection		
SL Internal wiring or light fixture		
Overhead equipment	1	2
IV. Voltage Range:	**26**	**56**
1.0V to 4.4V	2	3
4.5V to 24.9V	3	7
25V and above	4	5
Unknown	17	41

nationalgrid 2020 4th Quarter October 1, 2020 - December 31, 2020	Quarterly Update	Yearly Total
I. Total shock calls received:	**13**	**101**
Unsubstantiated	1	15
Normally Energized Equipment	10	28
Stray Voltage:		
Person	2	57
Animal		1
II. Injuries Sustained/Medical Attention Received Due To SV		
Person	2	5
Animal		
III. Voltage Source:	**2**	**58**
Utility Responsibility		
Issue with primary, joint, or transformer		
Secondary joint (Crab)		
SL service Line		
Abandoned SL service line		
Defective service line		
Abandoned service line		
OH Secondary		
OH Service		
OH Service neutral	0	7
Pole		
Riser		
Other	0	11
Customer Responsibility		
Contractor damage	0	1
Customer equipment/wiring	2	37
Other Utility/Gov't Agency Responsibility		
SL Base Connection		
SL Internal wiring or light fixture		
Overhead equipment	0	2
IV. Voltage Range:	**2**	**58**
1.0V to 4.4V	0	3
4.5V to 24.9V	1	8
25V and above	0	5
Unknown	1	42

Appendix 4

Summary of Deficiencies and Repair Activity Resulting from the Inspection Process

Appendix 4

Summary of Deficiencies and Repair Activity Resulting from the Inspection Process

Detail of Deficiencies by Facilities	2016				2017				2018				2019				2020			
Priority Level	I	II	III	Temp Repairs	I	II	III	Temp Repairs	I	II	III	Temp Repairs	I	II	III	Temp Repairs	I	II	III	Temp Repairs
Repair Expected	Within 1 week	Within 1 year	Within 3 years	Within 90 days	Within 1 week	Within 1 year	Within 3 years	Within 90 days	Within 1 week	Within 1 year	Within 3 years	Within 90 days	Within 1 week	Within 1 year	Within 3 years	Within 90 days	Within 1 week	Within 1 year	Within 3 years	Within 90 days
Overhead Facilities																				
Repaired in Time Frame	894	6489	45420	56	978	4701	13723	111	1825	449	1528	65	872	641	363	51	798	688	256	49
Repaired - Overdue	19	230	3424	15	46	327	0	14	71	3	0	12	22	0	0	5	9	0	0	3
Not Repaired - Not Due	0	0	0	0	0	0	29329	0	0	0	39918	0	0	2480	33363	3	0	2510	27434	0
Not Repaired - Overdue	0	11	3644	0	0	129	0	1	0	3	0	2	0	0	0	8	0	0	0	0
Total Overhead Facilities	913	6730	52488	71	1024	5157	43052	126	1896	455	41446	79	894	3121	33726	67	807	3198	27690	52
Underground Facilities																				
Repaired in Time Frame	125	481	35	2	153	668	11	1	286	872	23	1	110	131	3	1	117	324	12	1
Repaired - Overdue	4	48	0	0	0	36	0	1	9	1	0	1	0	0	0	0	2	0	0	2
Not Repaired - Not Due	0	0	0	0	0	0	2	0	0	0	106	0	0	414	82	0	0	716	243	0
Not Repaired - Overdue	0	0	2	0	0	1	0	0	0	20	0	0	0	0	0	0	0	0	0	0
Total Underground Facilities	129	529	37	2	153	705	13	2	295	893	129	2	110	545	85	1	119	1040	255	3
Pad Mount Facilities																				
Repaired in Time Frame	51	520	56	2	65	429	17	2	59	472	10	2	74	193	1	1	67	150	1	0
Repaired - Overdue	2	17	5	0	0	9	0	1	5	4	0	0	0	0	0	0	3	0	0	0
Not Repaired - Not Due	0	0	0	0	0	0	33	0	0	0	52	0	0	221	68	0	0	298	96	0
Not Repaired - Overdue	0	1	7	0	0	41	0	0	0	25	0	0	0	0	0	1	0	0	0	0
Total Pad Mount Facilities	53	538	68	2	65	479	50	3	64	501	62	2	74	414	69	2	70	448	97	0
Street Light Facilities																				
Repaired in Time Frame	0	121	0	0	0	341	2	0	0	197	0	0	0	3	0	0	0	13	0	3
Repaired - Overdue	0	8	0	0	0	12	0	0	0	7	0	0	0	0	0	0	0	0	0	0
Not Repaired - Not Due	0	0	0	0	0	0	0	0	0	0	2	0	0	240	319	0	0	415	2726	0
Not Repaired - Overdue	0	0	0	0	0	1	0	0	0	24	0	0	0	0	0	1	0	0	0	0
Total Street Light Facilities	0	129	0	0	0	354	2	0	0	228	2	0	0	243	319	1	0	428	2726	3
Transmission Facilities																				
Repaired in Time Frame	4	136	1215	0	8	129	878	1	10	95	56	2	8	12	4	3	9	4	0	2
Repaired - Overdue	3	38	132	0	1	37	0	3	0	11	0	1	0	0	0	0	0	0	0	1
Not Repaired - Not Due	0	0	0	0	0	0	2736	0	0	0	2418	0	0	110	1213	0	0	108	1193	0
Not Repaired - Overdue	0	27	1464	0	0	65	0	0	0	87	0	1	0	0	0	3	0	0	0	0
Total Transmission Facilities	7	201	2811	0	9	231	3614	4	10	193	2474	4	8	122	1217	6	9	112	1193	3

Summary of Deficiencies and Repair Activity Resulting from the Inspection Process - Level IV Conditons										
Overhead Facilities	**2016**		**2017**		**2018**		**2019**		**2020**	
	Number of Conditions Found	**Number of Conditions Repaired**	**Number of Conditions Found**	**Number of Conditions Repaired**	**Number of Conditions Found**	**Number of Conditions Repaired**	**Number of Conditions Found**	**Number of Conditions Repaired**	**Number of Conditions Found**	**Number of Conditions Repaired**
Overhead Facilities										
Pole Condition										
Pole Condition	54633	36777	50025	32600	46079	30212	35975	23286	30843	16535
Grounding System	22116	0	23367	4319	23821	9206	20737	7431	13616	1817
Anchors/Guy Wire	52678	13874	54553	9906	53856	9976	38725	6697	39445	5523
Cross Arm/Bracing	1781	1	1687	2	851	1	889	3	1013	0
Riser	3	0	4	0	772	0	777	1	953	0
Conductors										
Primary Wire/Broken Ties	0	0	2	2	1	0	0	0	0	0
Secondary Wire	0	0	0	0	0	0	1	0	0	0
Neutral	0	0	0	0	0	0	0	0	0	0
Insulators	8594	0	7311	4	5678	2	5551	0	7614	0
Pole Equipment										
Transformers	23085	0	22807	20	23978	5	21385	8	25212	0
Cutouts	128	0	1	0	3	0	2	0	0	0
Lightning Arrestors	5447	0	5994	2	5821	0	6925	0	6226	4
Other Equipment	974	55	1085	90	1718	746	1353	607	1992	156
Miscellaneous										
Trimming Related	0	0	0	0	0	0	0	0	0	0
Other	64	7	143	75	1129	654	1153	442	1025	626
Overhead Facilities Total	169503	50714	166979	47020	163707	50802	133473	38475	127939	24661
Transmission Facilities										
Towers/Poles										
Steel Towers	753	0	739	0	519	0	901	0	776	0
Poles	4955	0	6749	0	5584	0	2937	0	3706	0
Anchors/Guy Wire	1195	797	1997	1319	1299	970	950	713	585	284
Crossarm/Brace	4	0	60	0	0	0	0	0	1	0
Grounding System	52	0	684	0	46	0	367	0	71	0
Conductors										
Cable	5	0	16	0	7	0	11	0	2	0
Static/Neutral	0	0	0	0	0	0	0	0	0	0
Insulators	203	0	247	0	167	0	119	0	82	0
Miscellaneous							159	0		
Right of Way Condition	118	0	205	0	89	0			452	0
Other	23537	4068	27205	6070	23382	4120	17328	3539	17715	3051
Transmission Facilities Total	30822	4865	37902	7389	31093	5090	22772	4252	23390	3335

Underground Facilities										
Underground Structures										
Damaged Cover	1	0	0	0	1	0	6	3	26	9
Damaged Structure	189	3	31	24	90	9	44	1	804	0
Congested Structure	0	0	0	0	0	0	0	0	0	0
Damaged Equipment	2	0	1	1	2	0	3	0	0	0
Conductors										
Primary Cable	0	0	0	0	0	0	0	0	0	0
Secondary Cable	0	0	0	0	0	0	0	0	0	0
Neutral Cable	0	0	0	0	0	0	0	0	0	0
Racking Needed	0	0	0	0	0	0	0	0	0	0
Miscellaneous										
Other	8559	2645	8885	2578	14051	3771	9866	2049	9129	1172
Underground Facilities Total	8751	2648	8917	2603	14144	3780	9919	2053	9959	1181
Pad Mount Transformers										
Underground Structures										
Damaged Structure	2468	918	2042	1022	2298	683	1735	338	1863	160
Damaged Equipment	51	51	40	40	38	38	22	22	15	15
Damaged Cable	0	0	0	0	0	0	0	0	0	0
Oil Leak	2	0	8	0	3	0	0	0	1	0
Off Pad	0	0	0	0	1	0	0	0	0	0
Lock/Latch/Penta	0	0	0	0	0	0	0	0	0	0
Miscellaneous										
Other	6216	4121	5545	3576	8027	4920	5210	3211	3931	1764
Pad Mount Transformer Total	8737	5090	7635	4638	10367	5641	6967	3571	5810	1939
Streetlights										
Streetlight										
Base/Standard/Light	8252	11	13700	4	10554	10	8429	1	7964	0
Handhole/Service Box	0	0	0	0	0	0	0	0	0	0
Service/Internal Wiring	3174	8	451	1	1215	0	81	0	3	0
Access Cover	1343	3	1641	184	1489	0	1782	0	1740	0
Miscellaneous										
Other	15	0	414	1	111	0	218	0	93	0
Streetlight Total	12784	22	16206	190	13369	10	10510	1	9800	0
Total Level IV Conditions										
Overall Total	230,597	63,339	237,639	61,840	232,680	65,323	183,641	48,352	176,898	31,116

Summary of Deficiencies and Repair Activity Resulting from the Inspection Process

Year	Prority Level / Repair Expected		Deficiencies Found (Total)	Repaired In Time Frame	Repaired - Overdue	Not Repaired - Not Due	Not Repaired - Overdue
2016							
	I	Within 1 week	1102	1074	28	0	0
	II	Within 1 year	8127	7747	341	0	39
	III	Within 3 years	55317	47274	4799	0	3244
	IV	N/A	230597	63339	0	167258	0
	Temp Repairs	Within 90 days	75	60	15	0	0
2017							
	I	Within 1 week	1251	1204	47	0	0
	II	Within 1 year	6924	6267	481	0	176
	III	Within 3 years	44772	40644	1478	0	2650
	IV	N/A	237639	61840	0	175799	0
	Temp Repairs	Within 90 days	135	115	19	0	1
2018							
	I	Within 1 week	2257	2172	85	0	0
	II	Within 1 year	2270	2103	26	0	141
	III	Within 3 years	40654	11151	0	29503	0
	IV	N/A	232680	65323	0	167357	0
	Temp Repairs	Within 90 days	88	72	14	0	2
2019							
	I	Within 1 week	1085	1062	23	0	0
	II	Within 1 year	4441	4087	107	0	247
	III	Within 3 years	32468	2462	0	30006	0
	IV	N/A	183641	48352	0	135289	0
	Temp Repairs	Within 90 days	78	62	12	0	4
2020							
	I	Within 1 week	1005	991	14	0	0
	II	Within 1 year	5226	1179	0	4047	0
	III	Within 3 years	31961	269	0	31692	0
	IV	N/A	176898	31116	0	145782	0
	Temp Repairs	Within 90 days	61	55	6	0	0

Appendix 5

Temporary Repair Exceptions

Appendix 5

Temporary Repair Exceptions

National Grid has 0 temporary repair exceptions to report.

Appendix 6

Inspections Summary

Appendix 6

2020 PSC QTR 4 REPORT								
NATIONAL GRID		2020	2021	2022	2023	2024		
2020 - 2024	Total	Units	Units	Units	Units	Units	2020-2024	2020-2024
Inspection Summary	System Units	Completed	Completed	Completed	Completed	Completed	Units Completed	Percent Completed
Distribution - Unique Inspections	1,263,459	257,879					257,879	20.41%
Distribution - Total Inspections	0	258,158					258,158	n/a
Underground Facilities - Unique	101,622	18,729					18,729	18.43%
Underground Facilities - Total	0	18,967					18,967	n/a
URD - Unique Inspections	72,788	13,061					13,061	17.94%
URD -Total Inspections	0	13,079					13,079	n/a
Street Light / Traffic Sig - Unique	56,543	12,974					12,974	22.95%
Street Light / Traffic Sig - Total	0	12,980					12,980	n/a
Transmission - Unique Inspections	105,272	22,112					22,112	21.00%
Transmission - Total Inspections	0	22,155					22,155	n/a
Grand Total - Unique Inspections	1,599,684	324,755					324,755	20.30%

Appendix 7

Summary of Overdue Repairs

Appendix 7

Summary of Overdue Repairs for Level II Repairs

Year	Facilities	-- Repaired -- Number of Days Overdue				-- Not Repaired -- Number of Days Overdue				Comments
		1-30	31-90	91-180	>180	1-30	31-90	91-180	>180	
2016	Distribution								12	**Not Repaired: 12**
	Sub Transmission								24	**Not Repaired: 24**
	Transmission								1	**Not Repaired: 1**
	Underground									
	Pad-mounts									
	Streetlights									
2017	Distribution								112	**Not Repaired: 112**
	Sub Transmission								10	**Not Repaired: 10**
	Transmission								52	**Not Repaired: 52**
	Underground								1	**Not Repaired: 1**
	Pad-mounts									
	Streetlights									
2018	Distribution								30	**Not Repaired: 30**
	Sub Transmission								56	**Not Repaired: 56**
	Transmission								30	**Not Repaired: 30**
	Underground								1	**Not Repaired: 1**
	Pad-mounts									
	Streetlights									
2019	Distribution	12	2	9	3	57	39	16	2	**Not Repaired: 112**
	Sub Transmission		1					2	11	**Not Repaired: 13**
	Transmission						9	38	27	**Not Repaired: 74**
	Underground	1	1	1			18	4	2	**Not Repaired: 24**
	Pad-mounts									
	Streetlights									
2020	Distribution									
	Sub Transmission									
	Transmission									
	Underground									
	Pad-mounts									
	Streetlights									

Summary of Overdue Repairs for Level III Repairs

Year	Facilities	-- Repaired -- Number of Days Overdue				-- Not Repaired -- Number of Days Overdue				Comments
		1-30	31-90	91-180	>180	1-30	31-90	91-180	>180	
2016	Distribution				10				2144	**Not Repaired: 2144**
	Sub Transmission				64				805	**Not Repaired: 805**
	Transmission								295	**Not Repaired: 295**
	Underground									
	Pad-mounts									
	Streetlights									
2017	Distribution	3	22		2		142	579	606	**Not Repaired: 1327**
	Sub Transmission				15			16	128	**Not Repaired: 144**
	Transmission						19	241	919	**Not Repaired: 1179**
	Underground									
	Pad-mounts									
	Streetlights									
2018	Distribution									
	Sub Transmission									
	Transmission									
	Underground									
	Pad-mounts									
	Streetlights									
2019	Distribution									
	Sub Transmission									
	Transmission									
	Underground									
	Pad-mounts									
	Streetlights									
2020	Distribution									
	Sub Transmission									
	Transmission									
	Underground									
	Pad-mounts									
	Streetlights									

Appendix 8

Mobile Testing

2020 Mobile Stray Voltage Testing Report
December 4, 2020

A. Background

Niagara Mohawk Power Corporation d/b/a National Grid ("Niagara Mohawk" or "Company") submits its 2020 Mobile Stray Voltage Testing Report ("Report") pursuant to the Public Service Commission's *Order Adopting Changes to Electric Safety Standards* issued December 15, 2008 in Case 04-M-0159 and *Orders Requiring Additional Mobile Stray Voltage Testing* issued July 21, 2010 and June 23, 2011 in Case 10-E-0271 (collectively, the "Orders"). In compliance with the Commission's Orders, Niagara Mohawk's 2020 mobile testing consisted of one mobile scan in Albany and Niagara Falls and two mobile scans in Buffalo. The results of the mobile scans are detailed in the tables below.

Niagara Mohawk utilized Osmose Utilities Services, Inc. ("Osmose") to conduct the mobile scans. Niagara Mohawk utilized Power Survey LLC to perform the mobile scans in 2009 through 2019. Osmose acquired Power Survey in 2020.

B. Mobile Testing Verification Process

Niagara Mohawk verifies a stray voltage finding made by the mobile scan by using its own internal testing verification procedure as outlined in Section V of the Company's Electric Operating Procedure, NG-USA EOP G016. Verification entails using an HD probe to test all metallic objects in the area using a ground reference point as close as practical to the facility being tested up to 25 feet. In the event a suitable ground source cannot be located within the 25-foot range, the Company employs Osmose's verification procedure, which allows for using a ground reference point of within 100 feet of the structure.

C. Mobile Testing Results by City

1. Albany

Testing began in Albany on October 19, 2020 and was completed on October 23, 2020 with the following results:

a. Total stray voltage findings = 10*
b. Stray voltage findings at 4.4v and below = 10 (100%)
c. Stray voltage findings at 4.5v and above = 0 (0%)
d. Miles scanned = 262
e. Niagara Mohawk structures scanned = 2,254

Events/Hits					
	2016	2017	2018	2019	2020
Albany	88	121	108	111	10
*Of 66 total events, 56 were found on municipal-owned assets, including streetlights. While					

the Company is required to test municipal-owned streetlights for elevated voltage, the City of Albany is responsible for maintaining and repairing these assets.

2. Niagara Falls

Testing began in Niagara Falls on June 15, 2020 and was completed on June 17, 2020 with the following results:

a. Total stray voltage findings = 11
b. Stray voltage findings at 4.4v and below = 6 (55%)
c. Stray voltage findings at 4.5v and above = 5 (45%)
d. Miles scanned = 50
e. Niagara Mohawk structures scanned = 1,262

Events/Hits					
	2016	2017	2018	2019	2020
Niagara Falls	34	31	32	38	11
100% of events in 2020 were found on streetlights.					

3. Buffalo

Niagara Mohawk conducted two separate mobile scans of Buffalo in 2020. The first mobile scan began on April 27, 2020 and was completed on June 16, 2020 with the following results:

a. Total stray voltage findings = 401
b. Stray voltage findings at 4.4v and below = 332 (83%)
c. Stray voltage findings at 4.5v and above = 69 (17%)
d. Miles scanned = 1,349
e. Niagara Mohawk structures scanned = 27,585

The second mobile scan began on August 24, 2020 and was completed on October 3, 2020 with the following results:

a. Total stray voltage findings = 514
b. Stray voltage findings at 4.4v and below = 435 (85%)
c. Stray voltage findings at 4.5v and above = 79 (15%)
d. Miles scanned = 1,333[1]
e. Niagara Mohawk structures scanned = 27,563

[1] Variances in mileages and structures scanned are attributable to route reconfiguration due to construction, road blocks, and private roads.

Events/Hits										
	2016 – Scan 1	2016 - Scan 2	2017 – Scan 1	2017 - Scan 2	2018 – Scan 1	2018 - Scan 2	2019 – Scan 1	2019 - Scan 2	2020 – Scan 1	2020 - Scan 2
Buffalo	417	432	328	278	338	318	354	427	401	514
100% of events in 2020 were found on streetlights										

A majority of the 2020 findings were below 4.5v: Albany (100%), Niagara Falls (55%), and Buffalo (83% in Scan 1 and 85% in Scan 2).

D. Mobile Testing Repair/Mitigation Efforts

As of November 20, 2020, Niagara Mohawk completed 85.9% of the total permanent repairs in Buffalo (Scan 1 & Scan 2), Niagara Falls, and Albany.

A summary table illustrating repair status by region can be found in Appendices A-E. These tables are updated as of November 20, 2020.

E. Mobile Testing Program Costs

As of November 20, 2020, the total cost of the mobile scan surveys is $1,842,881.

City	**Actual Miles**	**Events Found**	**Event Rate**	**Repairs**	**Mobile Inspection Cost**
Buffalo Scan 1	1,349	401	0.29	401	$1,770,462
Buffalo Scan 2	1,333	514	0.38	391	
Niagara Falls	50	11	0.22	11	$32,918
Albany	262	10	0.03	*1	$39,501
Total	2,994	936	0.31	804	$1,842,881

* There were 66 events found during the 2020 scan, of which 56 were on assets owned by the City of Albany. Municipal contractors shadowed National Grid crews during the scan and all needed repairs on the municipal-owned assets were completed at that time.

F. Mobile and Manual Testing Program Comparison

It cost the Company on average five times more to conduct mobile testing (per mile cost) when compared to manual testing (per unit cost) in Albany, Niagara Falls, and Buffalo in 2020.

	Albany		**Niagara Falls**		**Buffalo Scan 1 & 2**	
2020 Estimated Costs[2]	**Manual**	**Mobile**	**Manual**	**Mobile**	**Manual**	**Mobile**
Non-Streetlighting Eqp.	$16,712	$39,501	$3,832	$32,918	$98,780	$1,770,462
Metallic Streetlighting Eqp.	$4,120		$1,807		$26,430	
Delta	**Δ** $18,669		**Δ** $27,279		**Δ** $1,645,252	

[2] The estimated manual testing costs are based on the per unit cost of conducting a manual elevated voltage test in Albany, Niagara Falls, and Buffalo and the number of facilities scanned during mobile testing in 2020. The numbers reflect what it would have cost the Company had it performed manual testing in these cities in 2020.

Appendix A

Mobile Testing & Repair Summary

NY Stray Voltage Mobile Testing Summary Report 2020 11/20/2020					
	Buffalo Scan 1	**Buffalo Scan 2**	**N. Falls**	**Albany**	***Grand Total***
Testing Summary					
Total Number of Events	401	514	11	10	**936**
At or Above 4.5 Volts	69	79	5	0	**153**
Between 1.0 and 4.4 Volts	332	435	6	10	**783**
Total NGRID Owned Events	401	514	11	10	**936**
At or Above 4.5 Volts	69	79	5	0	**153**
Between 1.0 and 4.4 Volts	332	435	6	10	**783**
Total Private Owned Events	114	105	0	56	**275**
At or Above 4.5 Volts	35	23	0	16	**74**
Between 1.0 and 4.4 Volts	79	82	0	40	**201**
Survey Percent Complete by City					
Buffalo (Scan 1)	1349				**100.00%**
Buffalo (Scan 2)		1333			**100.00%**
Niagara Falls			50		**100.00%**
Albany				262	**100.00%**
Total Miles To Be Scanned (estimates)	1,349	1,333	50	262	**2,994**

NY Stray Voltage Mobile Testing Repair Summary Report 2020 11/20/2020					
	Buffalo Scan 1	**Buffalo Scan 2**	**N. Falls**	**Albany**	***Grand Total***
Repair Summary					
NGRID Repairs					
Required	401	514	11	10	**936**
Completed	401	391	11	1	**804**
Pending (All repairs)	0	123	0	9	**132**
Pending (De-energized streetlights)	0	0	0	0	**0**
Exceeding 45 Days	0	122	0	0	**122**
Percent Complete	100.00%	76.07%	100.00%	10.00%	**85.90%**
TOH Repairs	13	2	0	0	**15**
TOH Complete	13	2	0	0	**15**
TOH Pending	0	0	0	0	**0**
TOH Exceeding 90 Days	0	0	0	0	**0**
TOH Percent Complete	100.00%	100.00%	100.00%	100.00%	**100.00%**
Private Repairs					
Required	114	105	0	56	**275**
Completed	114	79	0	0	**193**
Pending	0	26	0	56	**82**
Exceeding 45 Days	0	26	0	0	**26**
Percent Complete	100.00%	75.24%	100.00%	0.00%	**70.18%**
Total Repairs Pending	0	149	0	65	**214**
Total Repairs Complete	401	391	11	1	**804**
Total Repairs Percent Complete	100.00%	76.07%	100.00%	10.00%	**85.90%**

Appendix B

Summary of Energized Objects - Mobile Testing - City of Niagara Falls

nationalgrid
Data as of November 20, 2020

	Initial Readings				Readings After Mitigation		
	1 - 4.4 V	4.5 - 24.9 V	> 25 V	Total	< 1 V	1 - 4.4 V	> 4.5 V
Distribution Facilities	0	0	0	0	0	0	0
Pole (910)	0	0	0	0	0	0	0
Ground (914)	0	0	0	0	0	0	0
Guy (915)	0	0	0	0	0	0	0
Riser (916)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Underground Facilities	0	0	0	0	0	0	0
Handhole / Pull box (950)	0	0	0	0	0	0	0
Manhole (951)	0	0	0	0	0	0	0
Padmount Switchgear (952)	0	0	0	0	0	0	0
Padmount Transformer (953)	0	0	0	0	0	0	0
Vault – Cover/Door (954)	0	0	0	0	0	0	0
Pedestal	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Street Lights / Traffic Signals	6	5	0	11	11	0	0
Metal Street Light Pole (971/981)	6	5	0	11	11	0	0
Traffic Signal Pole (991)	0	0	0	0	0	0	0
Control Box (992)	0	0	0	0	0	0	0
Pedestrian Crossing Pole (993)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Substation Fences	0	0	0	0	0	0	0
Fence (995)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Transmission	0	0	0	0	0	0	0
Lattice Tower (931)	0	0	0	0	0	0	0
Pole (930)	0	0	0	0	0	0	0
Ground (933)	0	0	0	0	0	0	0
Guy (934)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Miscellaneous Facilities	0	0	0	0	0	0	0
Sidewalk	0	0	0	0	0	0	0
Gate/Fence/Awning*	0	0	0	0	0	0	0
Control Box	0	0	0	0	0	0	0
Scaffolding	0	0	0	0	0	0	0
Bus Shelter	0	0	0	0	0	0	0
Fire Hydrant	0	0	0	0	0	0	0
Phone Booth	0	0	0	0	0	0	0
Water Pipe	0	0	0	0	0	0	0
Riser	0	0	0	0	0	0	0
Other**	0	0	0	0	0	0	0
Totals	6	5	0	11	11	0	0

*Includes railing

**Including but not limited to manhole cover, sewer cover, no parking sign, parking meter, private sign, stop sign, storm grate.

Appendix C

Summary of Energized Objects - Mobile Testing - City of Albany

nationalgrid Data as of November 20, 2020	Initial Readings				Readings After Mitigation		
	1 - 4.4 V	4.5 - 24.9 V	> 25 V	Total	< 1 V	1 - 4.4 V	> 4.5 V
Distribution Facilities	0	0	0	0	0	0	0
Pole (910)	0	0	0	0	0	0	0
Ground (914)	0	0	0	0	0	0	0
Guy (915)	0	0	0	0	0	0	0
Riser (916)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Underground Facilities	1	0	0	1	1	0	0
Handhole / Pull box (950)	0	0	0	0	0	0	0
Manhole (951)	1	0	0	1	1	0	0
Padmount Switchgear (952)	0	0	0	0	0	0	0
Padmount Transformer (953)	0	0	0	0	0	0	0
Vault – Cover/Door (954)	0	0	0	0	0	0	0
Pedestal	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Street Lights / Traffic Signals	9	0	0	9	0	0	0
Metal Street Light Pole (971/981)	9	0	0	9	0	0	0
Traffic Signal Pole (991)	0	0	0	0	0	0	0
Control Box (992)	0	0	0	0	0	0	0
Pedestrian Crossing Pole (993)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Substation Fences	0	0	0	0	0	0	0
Fence (995)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Transmission	0	0	0	0	0	0	0
Lattice Tower (931)	0	0	0	0	0	0	0
Pole (930)	0	0	0	0	0	0	0
Ground (933)	0	0	0	0	0	0	0
Guy (934)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Miscellaneous Facilities	0	0	0	0	0	0	0
Sidewalk	0	0	0	0	0	0	0
Gate/Fence/Awning*	0	0	0	0	0	0	0
Control Box	0	0	0	0	0	0	0
Scaffolding	0	0	0	0	0	0	0
Bus Shelter	0	0	0	0	0	0	0
Fire Hydrant	0	0	0	0	0	0	0
Phone Booth	0	0	0	0	0	0	0
Water Pipe	0	0	0	0	0	0	0
Riser	0	0	0	0	0	0	0
Other**	0	0	0	0	0	0	0
Totals	10	0	0	10	1	0	0

*Includes railing

**Including but not limited to manhole cover, sewer cover, no parking sign, parking meter, private sign, stop sign, storm grate.

While there were 66 findings detected during the scan in the City of Albany, streetlight mitigation efforts are performed by Municipal contractors and therefore, not represented on Appendix C.

Appendix D

Summary of Energized Objects - Mobile Testing - City of Buffalo Scan 1

nationalgrid Data as of November 20, 2020	Initial Readings				Readings After Mitigation		
	1 - 4.4 V	4.5 - 24.9 V	> 25 V	Total	< 1 V	1 - 4.4 V	> 4.5 V
Distribution Facilities	0	0	0	0	0	0	0
Pole (910)	0	0	0	0	0	0	0
Ground (914)	0	0	0	0	0	0	0
Guy (915)	0	0	0	0	0	0	0
Riser (916)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Underground Facilities	0	0	0	0	0	0	0
Handhole / Pull box (950)	0	0	0	0	0	0	0
Manhole (951)	0	0	0	0	0	0	0
Padmount Switchgear (952)	0	0	0	0	0	0	0
Padmount Transformer (953)	0	0	0	0	0	0	0
Vault – Cover/Door (954)	0	0	0	0	0	0	0
Pedestal	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Street Lights / Traffic Signals	332	62	7	401	401	0	0
Metal Street Light Pole (971/981)	332	62	7	401	401	0	0
Traffic Signal Pole (991)	0	0	0	0	0	0	0
Control Box (992)	0	0	0	0	0	0	0
Pedestrian Crossing Pole (993)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Substation Fences	0	0	0	0	0	0	0
Fence (995)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Transmission	0	0	0	0	0	0	0
Lattice Tower (931)	0	0	0	0	0	0	0
Pole (930)	0	0	0	0	0	0	0
Ground (933)	0	0	0	0	0	0	0
Guy (934)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Miscellaneous Facilities	0	0	0	0	0	0	0
Sidewalk	0	0	0	0	0	0	0
Gate/Fence/Awning*	0	0	0	0	0	0	0
Control Box	0	0	0	0	0	0	0
Scaffolding	0	0	0	0	0	0	0
Bus Shelter	0	0	0	0	0	0	0
Fire Hydrant	0	0	0	0	0	0	0
Phone Booth	0	0	0	0	0	0	0
Water Pipe	0	0	0	0	0	0	0
Riser	0	0	0	0	0	0	0
Other**	0	0	0	0	0	0	0
Totals	332	62	7	401	401	0	0

*Includes railing

**Including but not limited to manhole cover, sewer cover, no parking sign, parking meter, private sign, stop sign, storm grate.

Appendix E

Summary of Energized Objects - Mobile Testing - City of Buffalo Scan 2

nationalgrid
Data as of November 20, 2020

	Initial Readings				Readings After Mitigation		
	1 - 4.4 V	4.5 - 24.9 V	> 25 V	Total	< 1 V	1 - 4.4 V	> 4.5 V
Distribution Facilities	0	0	0	0	0	0	0
Pole (910)	0	0	0	0	0	0	0
Ground (914)	0	0	0	0	0	0	0
Guy (915)	0	0	0	0	0	0	0
Riser (916)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Underground Facilities	0	0	0	0	0	0	0
Handhole / Pull box (950)	0	0	0	0	0	0	0
Manhole (951)	0	0	0	0	0	0	0
Padmount Switchgear (952)	0	0	0	0	0	0	0
Padmount Transformer (953)	0	0	0	0	0	0	0
Vault – Cover/Door (954)	0	0	0	0	0	0	0
Pedestal	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Street Lights / Traffic Signals	435	65	14	514	385	4	2
Metal Street Light Pole (971/981)	435	65	14	514	385	4	2
Traffic Signal Pole (991)	0	0	0	0	0	0	0
Control Box (992)	0	0	0	0	0	0	0
Pedestrian Crossing Pole (993)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Substation Fences	0	0	0	0	0	0	0
Fence (995)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Transmission	0	0	0	0	0	0	0
Lattice Tower (931)	0	0	0	0	0	0	0
Pole (930)	0	0	0	0	0	0	0
Ground (933)	0	0	0	0	0	0	0
Guy (934)	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Miscellaneous Facilities	0	0	0	0	0	0	0
Sidewalk	0	0	0	0	0	0	0
Gate/Fence/Awning*	0	0	0	0	0	0	0
Control Box	0	0	0	0	0	0	0
Scaffolding	0	0	0	0	0	0	0
Bus Shelter	0	0	0	0	0	0	0
Fire Hydrant	0	0	0	0	0	0	0
Phone Booth	0	0	0	0	0	0	0
Water Pipe	0	0	0	0	0	0	0
Riser	0	0	0	0	0	0	0
Other**	0	0	0	0	0	0	0
Totals	435	65	14	514	385	4	2

*Includes railing

**Including but not limited to manhole cover, sewer cover, no parking sign, parking meter, private sign, stop sign, storm grate.

Appendix 9

NG-USA EOP G016 Equipment Elevated Voltage Testing

INTRODUCTION

The purpose of this procedure is to outline the requirements for the equipment elevated voltage testing on National Grid Facilities in New York, Massachusetts and Rhode Island as required by:

1. New York Public Service Commission's "Electric Safety Standards" issued on January 5, 2005, the New York Public Service Commission's "Order Adopting Changes to Electric Safety Standards issued and effective on December 15, 2008.
2. New York Public Service Commission's "Order Requiring Additional Mobile Stray Voltage Testing" issued and effective on July 21, 2010 and the New York's Public Service Commission "Order Granting Petition In Part and Modifying Electric Safety Standards" issued and effective on March 22, 2013.
3. Rhode Island Public Utilities Commission in Docket 4237 "Order to Establish a Contact Voltage Detection, Repair and Reporting Program" issued on November 9, 2012, and the subsequent order issued on February 1, 2013.
4. Massachusetts Department of Telecommunications and Energy provided a series of recommendations on December 9, 2005, that have been included in this procedure.

While there are variances in requirements between New York, Massachusetts, and Rhode Island driven by particular regulatory requirements in each State, the minimum requirements are based on sound utility practice.

PURPOSE

This procedure applies to all personnel involved (employees or contractors) with or responsible for the testing, mitigation/repair and reporting of facilities designated by this EOP for equipment elevated voltage testing. It should be noted that the term "Contact Voltage" has been adopted and is used in the EOP (refer to EOP-DEF).

ACCOUNTABILITY

1. T&D Work Methods, Electrical Material & Design Standards
    a. Update Procedure as Necessary
    b. Provide personnel guidance and assistance as requested.
2. Operations – Inspection & Maintenance
    a. Ensure the program as outlined in this EOP is implemented properly and timely.
    b. Ensure that the program as outlined in the EOP is completed each year.
    c. Provide qualified personnel to complete equipment elevated voltage testing.
    d. Ensure all qualified personal have been trained on performing equipment elevated voltage testing.

3. Quality Assurance Quality Control
    a. Ensure a QAQC program has been implemented as part of the mandatory requirements for New York and Massachusetts Regulators.
    b. QAQC Inspector shall randomly audit elevated voltage testing performed to ensure testing completeness and accuracy.
4. Equipment Elevated Voltage Inspector
    a. Demonstrate the ability to perform equipment elevated voltage testing per this procedure
    b. Demonstrate the ability to become proficient in the use of the appropriate database.
    c. Perform walking patrols, collect information, edit data, and guard unsafe facilities.
    d. Attend the equipment elevated voltage training program and demonstrate competency with the equipment.
5. Learning & Development
    a. Provide training upon request
6. Distribution Asset Management
    a. Provide input into program revisions.
    b. Ensure the equipment elevated voltage program as outlined in this EOP is implemented, budgeted, and sanctioned properly and timely.

REFERENCES

NYPSC Order 04-M-0159
NYPSC Order Adopting Changes to Electric Safety Standards
NYPSC Order Requiring Additional Mobile Stray Voltage Testing
RIPUC Docket 4237 Order 20871 (November 9, 2012) and Order 20950 (February 1, 2013)
Proposed Rhode Island Electric Contact Voltage Program, Revised October 2, 2012 (Docket 4237)
NYSPSC Order Granting Petition in Part and Modifying Electric Safety Standards
Applicable National Grid Safety Rules & Procedures
Testing Equipment Operation Instructions
NG EOP-DEF – EOP Definitions

DOCUMENT CONTENTS

Table of Contents

1.0 SAFETY REQUIREMENTS 4

2.0 FACILITIES WHERE EQUIPMENT ELEVATED VOLTAGE TESTING/DOCUMENTATION IS REQUIRED – NEW YORK 4

3.0 FACILITIES WHERE EQUIPMENT ELEVATED VOLTAGE TESTING/DOCUMENTATION IS REQUIRED – RHODE ISLAND 7

4.0 FACILITIES WHERE EQUIPMENT ELEVATED VOLTAGE TESTING/DOCUMENTATION IS REQUIRED – MASSACHUSETTS 8

5.0 TEST EQUIPMENT 9

6.0 TEST PROCEDURE 10

7.0 CORRECTIVE ACTION REQUIREMENTS FOR EQUIPMENT ELEVATED VOLTAGE FINDINGS 12

8.0 EQUIPMENT ELEVATED VOLTAGE DATABASE 15

9.0 NEW YORK ANNUAL REPORTING AND CERTIFICATION REQUIREMENTS 16

10.0 MASSACHUSETTS REPORTING REQUIREMENTS 18

11.0 RHODE ISLAND REPORTING REQUIREMENTS 19

12.0 TYPE OF EQUIPMENT - APPENDIX A 20

13.0 EXCEPTION APPROVALS 21

14.0 REVISION HISTORY 22

1.0 SAFETY REQUIREMENTS

1.1 All work shall be performed in accordance with:

1.1.1 National Grid Employee Safety Handbook

1.1.2 Applicable National Grid EOP's

1.2 All applicable and appropriate Personal Protective Equipment (PPE) shall be worn.

1.3 The employee in charge of the work shall conduct a written pre-job brief with the employees involved prior to the start of each job. Using the Job Brief Form as an aide, discussions for performing the work should include:

1.4 Minimum Approach Distances (MAD) to energized lines or exposed live parts shall be maintained.

1.5 Identify if a Process Hazard Assessment (PHA) is required. Refer to NG-EOP G037 "Process Hazard Analysis".

1.6 Identify if an ARC flash assessment is required. Refer to NG-EOP G035 "ARC Flash Awareness and Mitigation" and Work Methods Infonet site for Arc Flash Table to determine working distance and energy levels – see link below:

http://us3infonet/sites/eng_delivery_svcs/Pages/ArcFlashMitigation.aspx

2.0 FACILITIES WHERE EQUIPMENT ELEVATED VOLTAGE TESTING/DOCUMENTATION IS REQUIRED – NEW YORK

2.1 Street Lights and Municipally Owned Facilities

2.1.1 Company owned metallic street lighting standards shall be one hundred percent (100%) tested for equipment elevated voltage annually.

a. This test is to be performed while the light is operating.

2.1.2 Municipally owned street light systems that National Grid directly provides energy to shall be one hundred percent (100%) tested for equipment elevated voltage annually.

a. National Grid is responsible to complete this testing unless assurances of the completion of required testing and transfer of such test data are made by the appropriate municipality.

b. This test is to be performed while the light is operating.

2.1.3 Municipally owned metallic traffic signal standards and accessible devices shall be one hundred percent (100%) tested annually for equipment elevated voltage.

2.1.4 All street lights identified on public thoroughfares regardless of ownership shall be one hundred percent (100%) tested annually for equipment elevated voltage.

2.1.5 All street lights under a maintenance contract shall be one hundred percent (100%) tested annually for equipment elevated voltage.

a. Exceptions not requiring equipment elevated voltage testing:

i. Private lighting, park associations, parking lots, fiberglass (or other non-conductive) street light standards.

ii. Locations where street light standards are not publicly accessible, such as facilities located in the center of highways that cannot be accessed without stopping traffic or creating potentially hazardous situations for the worker and/or public.

2.2 National Grid Electric Substation Fences

2.2.1 Metallic fencing surrounding substations with National Grid Facilities shall be tested for equipment elevated voltage annually. This fencing can be customer owned for customer stations, if a National Grid facility is part of the station.

2.3 Overhead Distribution Facilities

2.3.1 Towers and/or metallic poles with distribution facilities shall be tested for equipment elevated voltage at an annual rate of twenty percent (20%) in conjunction with field inspections on a five-year cycle.

2.3.2 The following equipment on wood distribution poles requires equipment elevated voltage testing at an annual rate of twenty percent (20%) in conjunction with field inspections on a five-year cycle:

a. Metallic riser guard or conduit (company or non-company).

b. Uncovered or uninsulated down ground (company or non-company).

c. Down guy wire (company or non-company).

d. Any other publicly accessible conductive piece of equipment (company or non-company) on the pole within reach from the ground.

2.3.3 Exceptions: Customer meters and customer meter poles are excluded.

2.4 Overhead Transmission Facilities

2.4.1 Towers and/or metallic poles with transmission facilities shall be tested for equipment elevated voltage at an annual rate of twenty-percent (20%) in conjunction with field inspections on a five-year cycle.

2.4.2 The following equipment on wood transmission poles or structures require equipment elevated voltage testing at an annual rate of twenty-percent (20%) in conjunction with field inspections on a five-year cycle:

a. Metallic riser guard or conduit (company or non-company).

b. Uncovered or uninsulated down ground (company or non-company).

c. Down guy wire (company or non-company).

d. Any other publicly accessible conductive piece of equipment (company or non-company) on the pole or structure within reach from the ground.

2.5 Underground Facilities

2.5.1 Equipment elevated voltage testing is required on all of the following equipment where accessible to the public.

a. All metallic manhole covers, vault covers and grates, junction box covers, and handhole covers at an annual rate of one hundred percent (100%).

2.5.2 Pad-mounted transformers and switchgear are tested at an annual rate of twenty percent (20%) in conjunction with field inspections on a five-year cycle.

2.5.3 Starting in 2010 and continuing thereafter, unless changed by subsequent order of the NY Public Service Commission:

a. Two (2) mobile stray voltage surveys shall be conducted at an annual rate of one hundred percent (100%) in Buffalo

b. One (1) mobile stray voltage survey is required to be conducted at an annual rate of one hundred percent (100%) in Albany and Niagara Falls.

2.5.4 Exceptions: Non-metallic concrete or fiberglass pads, handholes or pull/splice boxes are not required to be tested.

2.6 Daily Job Site Test Requirements

2.6.1 Each job site where National Grid personnel or its contractors complete a work assignment, they shall perform the following:

a. Perform an equipment elevated voltage test at the start and at the end of the work day or at the start and at the completion of the assignment. This testing requirement is considered good utility practice and does not require specific documentation.

2.6.2 Exceptions:

a. Electric substation fencing will not require equipment elevated voltage testing unless scheduled as part of the inspection program or if work was done on the fencing.

b. In a storm situation, where mutual aid is required, testing by other than National Grid personnel will not be required.

2.7 Exemptions

2.7.1 No testing is required inside a completely fenced in area where access is denied to the general public and where access is only achieved by climbing a fence. Good judgment is required by the tester in these scenarios.

3.0 FACILITIES WHERE EQUIPMENT ELEVATED VOLTAGE TESTING/DOCUMENTATION IS REQUIRED – RHODE ISLAND

3.1 Company Owned Street Lights

3.1.1 Company owned metallic street lighting standards are required to be tested for equipment elevated voltage on a three-year cycle.

3.1.2 Exceptions: Testing shall not be completed at locations where street light standards are not publicly accessible, such as facilities located in the center of highways that cannot be accessed without stopping traffic or creating potentially hazardous situations for the worker and/or the public.

3.2 Overhead Distribution Facilities

3.2.1 Towers and/or metallic poles with distribution facilities shall be tested for equipment elevated voltage at an annual rate of twenty-percent (20%) in conjunction with field inspections on a five-year cycle.

3.2.2 The following equipment on wood distribution poles or structures require equipment elevated voltage testing at an annual rate of twenty-percent (20%) in conjunction with field inspections on a five-year cycle:

a. Metallic riser guard or conduit (company or non-company).

b. Uncovered or uninsulated down ground (company or non-company).

c. Down guy wire (company or non-company).

d. Any other publicly accessible conductive piece of equipment (company or non-company) on the pole or structure within reach from the ground.

3.3 Underground Facilities

3.3.1 Equipment elevated voltage testing at an annual rate of twenty-percent (20%), to be completed on a five-year cycle:

a. Metallic manhole covers, vault covers and grates, junction box covers, handhole covers

b. Pad-mounted transformers, secondary pedestals, and pad-mounted switchgears.

3.3.2 Starting in Fiscal Year 2013 and continuing thereafter, unless changed by subsequent order of the Rhode Island Public Utilities Commission, mobile contact voltage surveys will be performed in designated Contact Voltage Areas (CVA).

3.3.3 The mobile surveys will be performed at an annual rate of twenty-percent (20%), to be completed on a five-year cycle

Exceptions: Non-metallic concrete or fiberglass pads, handholes or pull/splice boxes are not required to be tested.

3.4 Daily Job Site Test Requirements

3.4.1 Each job site where National Grid personnel or its contractors complete a work assignment:

a. An equipment elevated voltage test shall be taken at the start and at the end of the work day or at start and at the completion of the assignment. This testing requirement is considered good utility practice and does not require specific documentation.

3.4.2 Exceptions

a. Electric substation fencing will not require equipment elevated voltage testing unless scheduled as part of the inspection program or if work was done on the fencing.

b. In a storm situation, where mutual aid is required, testing by other than National Grid personnel will not be required.

3.5 Exemptions

3.5.1 See Section 2.7.1

4.0 FACILITIES WHERE EQUIPMENT ELEVATED VOLTAGE TESTING/DOCUMENTATION IS REQUIRED – MASSACHUSETTS

4.1 Company Owned Street Lights

4.1.1 Company owned metallic street lighting standards are required to be tested for equipment elevated voltage at an annual rate of twenty-percent (20%) on a five year cycle.

4.1.2 Exceptions: Testing shall not be completed at locations where street light standards are not publicly accessible, such as facilities located in the center of highways that cannot be accessed without stopping traffic or creating potentially hazardous situations for the worker and/or public.

4.2 Overhead Distribution Facilities

4.2.1 Towers and/or metallic poles with distribution facilities shall be tested for equipment elevated voltage at an annual rate of twenty-percent (20%) in conjunction with field inspections on a five-year cycle.

4.2.2 The following equipment on wood distribution poles or structures require equipment elevated voltage testing at an annual rate of twenty-percent (20%) in conjunction with field inspections on a five-year cycle:

a. Metallic riser guard or conduit (company or non-company).

b. Uncovered or uninsulated down ground (company or non-company).

c. Down guy wire (company or non-company).

d. Any other publicly accessible conductive piece of equipment (company or non-company) on the pole within reach from the ground.

4.3 Underground Facilities

4.3.1 Equipment elevated voltage testing at an annual rate of twenty-percent (20%), to be completed on a five-year cycle:

a. All metallic manhole covers, vault covers and grates, junction box covers, handhole covers

b. Pad-mounted transformers, secondary pedestals, and pad-mounted switchgears.

4.3.2 Exceptions: Non-metallic concrete or fiberglass pads or handholes or pull/splice boxes are not required to be tested.

4.4 Daily Job Site Test Requirements

4.4.1 Each job site where National Grid personnel or its contractors complete a work assignment:

a. An equipment elevated voltage test shall be taken at the start and at the end of the work day or at the start and at the completion of the assignment. This testing requirement is considered good utility practice and does not require specific documentation.

b. In a storm situation, where mutual aid is required, testing by other than National Grid personnel will not be required.

4.4.2 Exceptions

a. Substation fencing will not require equipment elevated voltage testing unless scheduled as part of the inspection program or if work was done on the fencing.

b. In a storm situation, where mutual aid is required, testing by other than National Grid personnel will not be required.

4.5 Exemptions

4.5.1 See Section 2.7.1

5.0 TEST EQUIPMENT

5.1 A hand held device (proximity detection unit) that is capable of detecting voltage from 5 to 600 VAC.

5.2 A portable AC digital high impedance volt meter must have the ability to take readings with and without an input load impedance of 500 ohms.

5.3 The handheld devices utilized shall be certified by an independent test laboratory as being able to reliably detect voltages from 5-600 VAC. The following units have been certified:

5.3.1 HD Electric Stray Voltage Detector model LV-5

5.3.2 Fluke 85

5.3.3 Fluke 87

5.3.4 Fluke 170 series or equivalent

5.3.5 Fluke 175

5.3.6 Fluke 177

5.3.7 Fluke 179

5.3.8 Fluke 187

5.3.9 Fluke 189

5.4 Mobile Contact Voltage Detection Equipment:

5.4.1 Narda 8950/10 Stray Voltage System

5.4.2 SVD2000 Stray Voltage Mobile Detector

6.0 TEST PROCEDURE

6.1 Job Safety Requirements

6.1.1 At minimum, the following information shall be communicated to all personnel at the beginning of each shift for equipment elevated voltage testing:

a. Structures are never to be touched with a bare hand while performing the tests, only the proximity detector or meter probe is to be used to make contact with the facilities.

b. Appropriate PPE shall be worn.

c. Each individual needs to be aware of his/her surroundings at all times.

d. Make sure to observe all traffic before entering a street.

e. Traffic safety vest (DOT Compliant Class III) shall be worn at all times when exposed to traffic. Be aware that when bending down, the visibility benefits of the traffic safety vest are diminished.

f. Obey all traffic control devices.

g. When working in the street, face oncoming traffic whenever possible.

6.2 Measurements for detecting elevated voltages will be performed in accordance with the following:

6.2.1 Initial measurements for the presence of voltage shall be made using a certified proximity detection unit, refer to Section 5.3

a. To verify the proper operation of the proximity detector, follow operating instructions for the particular unit being utilized, this is to be done daily.

b. After verification that the detection unit is working, approach the area/equipment to be tested. The proximity detector will illuminate prior to touching the area/equipment being tested if voltage is present. If the proximity detector does not illuminate in close proximity to the area/equipment touch the area/equipment to be tested with the probe of the unit.

6.2.2 If voltage is detected, re-test using a portable AC voltmeter (The 500 ohm resistor is NOT used in this initial test):

a. Measurements with a portable AC voltmeter shall be taken on clean bare metallic surface (structure, ground wire, etc.)

b. When using a portable AC voltmeter, connection shall be made to suitable neutral or ground source with the common (black) lead.

1. In locations where the neutral or ground point is at a distance in excess of the voltmeter lead length

i. The connection to the neutral/ground shall be made with up to 25’ of # 16 stranded copper lead wire (covered).

ii. The other end of which shall be securely connected to the common (black) probe of the meter.

iii. When using such “extension leads” appropriate care shall be taken in the placement of such leads so as to not create a physical hazard to workers, pedestrian or vehicular traffic.

2. In locations where a system ground is not available, or the existing ground registered voltage upon the proximity test

i. A metal rod shall be firmly embedded into the earth to a minimum depth of 6” to create a ground reference point for the measurement to be taken.

ii. An alternate method is available for obtaining a ground reference point utilizing an aluminum plate in lieu of driving a ground rod. The reference point should be as close as practicable to the facility being tested to simulate an equipment elevated voltage touch potential situation (3’ to 4’.) On occasion longer leads may be necessary to find undisturbed earth (up to 25’.)

c. The “live” meter (red) probe lead shall then be placed into contact with the structure under inspection to determine the voltage.

1. Voltage readings greater than 30 volts AC shall be recorded in the database for the site.
2. For voltage readings less than 30 volts, install a 500 ohm input load impedance resistor on the volt meter. Take another voltage measurement and record this voltage in the database for the site.

6.2.3 Measurements for elevated voltages/contact voltage using mobile technology will be performed in accordance with the following:

a. Mobile testing is performed by contract crews driving pre-determined routes in Contact Voltage Areas searching for elevated voltage levels.

b. The equipment used is mounted to vehicles and detects contact voltage levels greater than 1 volt while driving at speeds of up to 25 mph near underground facilities.

c. Once elevated voltages are detected the crew stops and performs a thorough check with certified manual testing equipment to determine if there is contact voltage present.

6.2.4 Any positive indications by either mobile testing or hand held tools shall be followed up with voltage measurements on the target structures.

a. Voltage measurements shall be taken in accordance with Section 6.2.2 above.

b. The investigators shall verify that a suitable ground (i.e. a ground that is not energized) is used as a reference. Ground source location shall be marked with tape, paint or flag for future testing of repair work.

6.2.5 A Total Harmonic Distortion (THD) test method will be implemented as a pilot for Rhode Island mobile elevated voltage testing. THD will be determined by the use of a Fluke Power Quality clamp meter or a Fluke scope meter both of which have the ability to measure THD.

7.0 CORRECTIVE ACTION REQUIREMENTS FOR EQUIPMENT ELEVATED VOLTAGE FINDINGS

7.1 Manual Testing

7.1.1 New York

If equipment elevated voltage condition is found and verified by the Test Procedure in Section 6.0, the site is to be guarded by a person or a protective barrier until made safe by Company personnel or if municipally owned, made safe by the owner or company.

a. If the voltage measures less than 1 volt and is found to be consistent with system operation design (no visual evidence of a problem upon review) **No further action is required.**

b. If the voltage measures greater than or equal to 1 volts and less than 4.5 volts:

   i. The asset can either be guarded in person or by a protective barrier that prevents public contact.

   ii. Contact your supervisor for required action. Sound judgment shall be utilized in this application.

c. If the voltage measures greater than or equal to 4.5 volts:

   i. It shall be guarded by an equipment elevated voltage inspector or a Company employee that has been trained to stand by on energized facilities.

   ii. Immediate response is required using the notification in Section 7.3.

7.1.2 Massachusetts and Rhode Island

If equipment elevated voltage condition is found and verified by the Test Procedure in Section 6.0, the site is to be guarded by a person or a protective barrier until made safe by Company personnel or if municipally owned, made safe by the owner or company.

a. If the voltage measures less than 4.5 volts and is found to be consistent with system operation design (no visual evidence of a problem upon review) **No further action is required**.

b. If the voltage measures greater than 4.5 volts and less than 8 volts:

   i. The asset shall be guarded in person or by a protective barrier that prevents public contact.

   ii. Contact your supervisor for required action. Sound judgment shall be utilized in this application.

c. If the voltage measurement is greater than 8 volts:

   i. It shall be guarded by an equipment elevated voltage inspector or a Company employee who has been trained to stand by on energized facilities.

   ii. Immediate response is required using the notification in Section 7.3.

7.2 Mobile Testing

7.2.1 Rhode Island Total Harmonic Distortion Pilot

Under the Total Harmonic Distortion (THD) pilot in Section 6.2.5, if during mobile testing of the Contact Voltage Area the voltage measures greater than 1 volt and less than 4.5 volts and has a total harmonic distortion of less than 10% the voltage will be considered contact voltage.

a. These areas will be safeguarded from the public and permanent repairs will be made.

b. If the total harmonic distortion is greater than 10% (no visual evidence of a problem upon review) **No further action is required.**

7.2.2 New York and Rhode Island

In the event of an elevated/contact voltage finding on an electric facility or a street light, all publicly accessible structures and sidewalks within a minimum 30 foot radius of the electric facility or street light must be tested for stray voltage.

7.3 The following notification process for personnel to respond shall be utilized.

7.3.1 Notification by location:

a. New York Regional Control Center 1-877-716-4996

b. New England Regional Control Center, North

1. Western, Central, North & Granite 1-508-421-7879

c. New England Regional Control Center, South

1. Southeast, South Shore & Ocean State (RI) 1-508-421-7885

7.3.2 Inform the System operator that this is an equipment elevated voltage call, and provide the following information:

a. Inspector name, Company (if not National Grid)

b. Address where the problem is identified; include facility number, circuit number, ownership, type of equipment and unique ID.

c. Voltage found and whether they are physically guarding or leaving the site after flagging and installing a protective barrier. National Grid personnel or designee will be assigned to respond.

7.4 Temporary repairs may be used to mitigate the equipment elevated voltage thereby removing the need to guard the site.

7.5 Permanent repairs to the equipment shall be made within 45 days of the occurrence, except as noted in Section 7.6

7.6 If permanent repairs cannot be made within 45 days due to extraordinary circumstances, the company shall periodically perform site visits to monitor the condition of the temporary repair. For New York, all exceptions shall be identified and justified in the annual reporting of the program to the NYPSC.

7.7 The contractor and/or equipment elevated voltage Inspector may detect a minimal voltage level that is attributable to the design of the facility and not the result of an improper condition, no corrective action is required in this instance.

7.8 Angel Guards

7.8.1 Individuals conducting the equipment elevated voltage tests on street light standards shall have a supply of "Angel guards" available for installation if the cover is missing or wires are found to be exposed to the public at the time of testing.

7.8.2 Angel guards shall only be installed after the testing of the street light standard is complete and there is no indication of equipment elevated voltage above 1 volt (NY) and 4.5 volts (RI and MA)

7.8.3 Repairs have been completed to correct the equipment elevated voltage.

7.9 The equipment elevated voltage inspector shall report any potentially hazardous conditions found on National Grid facilities seen visually during the survey process.

7.10 Customer Owned Equipment

7.10.1 Where the Company finds equipment elevated voltage above the allowable thresholds and identifies its source as customer-owned equipment:

a. The Company shall guard the site and notify the customer or a responsible person, as appropriate, that a potentially hazardous situation exists.

b. The Company shall advise the customer or responsible person that the cause of the equipment elevated voltage shall be immediately remedied.

7.10.2 Company personnel are encouraged to work with the customer to determine and rectify the problem. If the customer agrees to accept the Company's assistance, the Company may charge a reasonable cost for this effort.

a. The Company may temporarily remove a customer's meter or take such other actions as are appropriate and necessary to protect the public.

8.0 EQUIPMENT ELEVATED VOLTAGE DATABASE

8.1 The equipment elevated voltage database will be populated with information that is collected by the inspector using a hand-held device. The database shall be easily searchable for information and reporting.

8.2 The equipment elevated voltage inspector shall populate the following Information fields for manual testing:

Survey Date	Inspectors Name
Region	GPS Taken
District	Pre-load Match
Contractor	Equipment EV Test Required
GIS ID/Asset # (Unique ID)	Voltage Found Y/N
Facility Type	Voltage Measurement
Owner	Type of Equipment (Appendix A)
Feeder/Circuit	Immediate Action Taken
Line #	Person Notified
Tax District	Permanent Repair Date
Pole/Structure/Equipment ID	Type of Repair
Street Name	Person Responsible for repair (Employee ID)

8.3 Information fields required to be completed for facilities for mobile testing

Survey Date	Street Name
Region	GPS taken
District	Voltage Found Y/N
Contractor	Voltage Measurements
Facility Type	Type of Equipment (see Appendix A)
Owner	Immediate Action Taken
Pole/Structure/Equipment ID	Person Notified
Permanent Repair Date	Type of Repair

9.0 NEW YORK ANNUAL REPORTING AND CERTIFICATION REQUIREMENTS

9.1 Each Regional program supervisor shall provide certification to the program manager that the Region they supervise has complied with the equipment elevated voltage testing and inspection program as ordered by the PSC.

9.2 The program manager shall provide certification to the Vice President Distribution Network Strategy and the Senior Vice President of Customer Operations & Maintenance that the organization has complied with the equipment elevated voltage testing and inspection program as ordered by the PSC.

9.3 Written certification of the completion and results of every equipment elevated voltage test and inspection shall be completed, as well as a certification that all unsafe conditions identified have been remediated by appropriate company personnel.

9.4 The President or officer with direct responsibility for overseeing the equipment elevated voltage testing and inspection shall provide an annual certification to the NYPSC that the Company has tested all of its publicly accessible conductive surface electric facilities and all street lights, as well as completed all required inspections.

9.5 The President or officer with direct responsibility for overseeing facility inspections shall provide an annual certification to the Commission that the utility is in compliance with its inspection program and has inspected the requisite number of electric facilities. Additionally, at the end of the five-year inspection cycle, the officer shall certify that all of the utility's electric facilities have been inspected at least once.

9.6 The annual reporting and certification is required by February 15 of each year. In addition to certifications, it shall address the following:

9.6.1 Details the results of equipment elevated voltage test results and inspections conducted over the 12-month period ending December 31 of the prior calendar year.

9.6.2 Addresses the performance mechanism contained in Section 10 of the PSC Order Adopting Changes to Electric Safety Standard effective December 15, 2008 (December 15, 2008 Order).

9.6.3 Contain certification described in 9.3, 9.4 and 9.5 of this section.

9.6.4 Contain a breakdown of the voltage findings in a tabular format as detailed in Attachment 1 of the December 15, 2008 Order; for all findings that result in a reading of 1 V or more after completion of mitigation efforts, a detail report of company efforts shall be provided.

9.6.5 Contain a breakdown of the shock reports received from the public as detailed in Attachment 2 of the December 15, 2008 Order.

9.6.6 Discussion of the analysis undertaken on the causes of the stray voltage within the Company's electric system, the conclusions drawn there from, the preventative and remedial measures identified, and the Company's plan to implement those measures.

9.6.7 Description of the priority levels used to gauge the severity of a deficiency, including repair timeframes, and details the requirements for training personnel to properly identify and categorize the deficiencies.

9.6.8 Contain a breakdown of facilities to be inspected, unique inspection conducted per year, and the cumulative number of unique inspections conducted to meet the five year requirement.

9.6.9 Contain a breakdown of the deficiencies found, permanent repair actions taken by year, whether a repair was completed within the required timeframe, and the number of deficiencies awaiting repair. This information should be provided on a yearly basis by priority level and by equipment groupings as detailed in Attachment 3 of the December 15, 2008 Order.

9.6.10 Contain a review and analysis of the inspection results. The review should identify areas of concern along with remedial actions or future plans to alleviate inadequacies in current program assets.

9.6.11 Description of the quality assurance program along with the results from quality assurance activities conducted during the year.

9.6.12 Any additional information that is pertinent to the issues addressed by the safety standards should also be included.

9.7 The Company shall file reports on their mobile stray voltage testing with the Secretary of the New York PSC within 45 days after completion of the mobile testing or February 15, of each year. The filing shall include the historic results and costs associated with the manual test program in each area listed in Section 2.5 of this procedure.

9.8 The Company is required by the December 15, 2008 Order to have independence in the quality assurance program required by the order. The management and personnel performing the quality assurance activities shall be separate from those performing the required stray voltage testing and inspection activities.

9.9 The Company shall maintain its written certification and other documentary proof of its testing at its' Albany, Buffalo, and Syracuse office facilities. These documents shall be made available to the public for review upon request.

10.0 MASSACHUSETTS REPORTING REQUIREMENTS

10.1 National Grid shall submit an annual report that includes the following:

10.1.1 Annual reports that list inspection and testing data, including number of inspections conducted by equipment type.

10.1.2 Number of equipment elevated voltage events detected by inspection personnel versus call-ins or notification by third parties.

10.1.3 Variance reports on current year inspection targets.

10.1.4 Equipment elevated voltage events detected on equipment that is not included in equipment elevated voltage equipment inspection schedules (which will enable the Massachusetts DPU to determine if the company is inspecting and testing the correct equipment).

10.1.5 Number of exceptional or non-routine events that required reporting to OSHA or other government organizations due to injuries or other substantive impacts

10.1.6 Description of the quality assurance program along with the results from quality assurance activities conducted during the year.

11.0 Rhode Island Reporting Requirements

11.1 National Grid shall submit an annual Contact Voltage Compliance report that includes the following in a searchable form:

11.1.1 Event record number

11.1.2 Location of testing

11.1.3 Date and time of testing

11.1.4 Company or customer asset

11.1.5 Failed equipment type

11.1.6 Voltage recorded

11.1.7 Personal injuries to members of the public, pets or property damage

11.1.8 Any other equipment involved and age

11.1.9 Prior incidents at this location in the past five years

11.1.10 Corrective actions taken at the location and date taken

11.1.11 Number of customers if service is interrupted while making repairs

11.1.12 Duration of interruption

11.1.13 Summary of investigation into cause of the incident

11.1.14 Number of calls to the company “shock” line

11.1.15 Total repair costs by Contact Voltage Area

11.1.16 All information as provided for in Section 8.3

The Company will provide a summary of the above information as part of the report. In addition, the Company will include a recommendation for which specific CVAs will be tested the following year, whether there are any recommended changes to the CVAs and whether there are any advances in technology for detection of elevated voltages.

12.0 TYPE OF EQUIPMENT - APPENDIX A

TYPE	CODE	EQUIPMENT DESCRIPTION
Distribution	910	Pole
	911	Regulator
	912	Sectionalizer
	913	Recloser
	914	Ground
	915	Guy
	916	Riser
	917	Switch Handle Mechanical Operated
	929	Distribution – Other (use comments)
Transmission	930	Pole
	931	Tower
	932	Guy
	933	Ground
	934	Riser
	935	Switch Hand Mechanical Operator
	949	Transmission – Other (use comments)
Underground	950	Handhole
	951	Manhole
	952	Switchgear
	953	Transformer
	954	Vault – Cover/Door
	969	Underground – Other (use comments)
Street Light	970	Handhole
	971	Standard
	979	Street light – Other (use comments)
Customer Street Light/Other	980	Handhole
	981	Standard
	989	Customer SL/Other – Other (use comments)
Traffic Control	990	Handhole
	991	Standard
	992	Control Box
	993	Pedestrian Crossing Pole
	999	Traffic control – Other (use comments)

13.0 EXCEPTION APPROVAL

13.1 It is recognized that situations may arise that are not covered by this procedure

13.2 When this occurs, an exception may be approved

13.3 The person in charge of the work shall

13.3.1 Develop a work plan detailing

a. The need for an exception to the EOP

b. Additional safeguards to be employed

13.3.2 Provide the work plan to and obtain approval from all of:

a. The manager in charge of the work

b. The manager of T&D Work Methods

c. A manager from Safety

13.3.3 Alternatively approval may be obtained from a designee of any of the above

13.4 If agreement cannot be obtained at the manager level

13.4.1 The request shall be forwarded to the Director levels

a. Director's may assign a designee

13.5 After approval is obtained.

13.5.1 The work plan shall be reviewed with all workers who will participate in the job

a. All workers need to agree on the work plan

b. Document the exception on the job brief

13.6 T&D Work Methods shall publish a Memorandum documenting the approval

13.6.1 A copy of the work plan shall be included

13.6.2 Such memorandum shall be sent to all stakeholders and approvers

13.6.3 The memo shall be stored for the record

14.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	04/01/11	This document supersedes document dated 08/17/09.
2.0	09/30/13	This document supersedes document date 04/01/11.
3.0	04/19/18	Revised the following: Formatting changes, broke paragraphs into subsections Accountability Section, Added “Quality Assurance Quality Control” group and removed “Network Strategy” and replaced with “Asset Management” Removed the Definitions Section Section 1 Added new “Safety Requirements” section 2.0 Renumbered section to revised listing 2.1.1 – 2.14 Revised language to include the percent rate of 100% 3.3.1 Added percent rate of 20% for underground testing in Rhode Island 4.11 Added percent rate of 20% for street light testing in Massachusetts 4.3.1 Added percent rate of 20% for underground testing in Massachusetts 7.3.1b.c Revised phone numbers for Northborough control center 7.8 Added “Angel Guard” Tittle and revised subsections 8.0 Database requirements, added language and formatted facilities list 13.0 7. Added new Exception Approval Section

Appendix 10

NG-USA EOP D004 Distribution Line Patrol and Maintenance

INTRODUCTION

The purpose of this procedure is to outline the requirements for the patrol and maintenance activities associated with National Grid Distribution feeders.

The inspection procedures shall be dictated by the individual state's regulatory agency. If the regulatory agency in a specific state (MA & RI) does not require inspection procedures the inspections can still be performed in those states per this EOP but are not required.

The Distribution Maintenance Program was designed to provide for a patrol and inspection of each distribution feeder once every five (5) years. The patrols are conducted by a Distribution Inspector identifying all required maintenance on a *Windows*® based hand-held computer. The maintenance items identified through this patrol are separated into five priority levels 1, 2, 3, 4 and 9. The maintenance codes identified default to the appropriate priority level. The default priority level can be adjusted by the individual performing the inspection based on actual field conditions. These priority levels are defined as follows:

Level 1 - An identified facility/component or tree condition that shall be repaired/replaced within 30 days for (NE) and 7 days for (NY).

Level 2 - Identified facility/component condition that shall be repaired/replaced within 1 year or as scheduled by Program Management for NE.

Level 3 – Identified facility/component condition that shall be repaired/replaced within 3 years or as scheduled by Program Management for NE.

Level 4 – This priority category is to collect inventory information on actual field conditions to be used by Investment Strategy and Work Planning.

Level 9 – This priority category is to collect inventory information for temporary repairs made by operations to restore service or maintain public safety until permanent repairs can be made.

All Level 1 priority conditions identified in the field shall be called in by the Distribution Inspector as follows:

1. Notification by location:
   New York: System Operations Dispatch 1-877-716-4996
   NE North: Bay State West & Central: Northborough Control Center 1-508-421-7879
   NE North: North & Granite: Northborough Control Center 1-508-421-7879
   NE South: Bay State South & Ocean State (RI): Northborough Control Center 1-508-421-7885

2. Detailed information provided to the regional notification location:
   a. Identify yourself as a Company Distribution Inspector and your work reporting area.
   b. Details of the Level 1 Priority Condition:
      i. Problem found.
      ii. District, Feeder No., Line No., Tax District and Pole No.

iii. Street address and any additional information that would assist in finding the location of the problem.

iv. If you are standing by or have secured the location.

3. Notify area Inspections Supervisor for follow-up.

PURPOSE

This procedure applies to all personnel involved with or responsible for the inspection and repair of Overhead (OH) Distribution and Sub Transmission facilities, Underground Residential Developments (URDs) and Underground Commercial Developments (UCDs).

ACCOUNTABILITY

1. Electric Work Methods
   A. Update procedure as necessary
2. Electric Operations
   A. Ensure the work generated by the Distribution Maintenance Program and assigned by Asset Strategy and Investment Planning is completed in the appropriate time frame.
   B. Request assistance from Distribution Line Contracting when necessary to complete work assigned in the appropriate time frame.
3. Distribution Line Contracting
   A. At the request of Operations obtain, schedule and manage contractors to perform inspections and required maintenance.
   B. Provide input into program revisions.
4. Distribution Inspector
   A. Demonstrate the ability to identify maintenance concerns and the aptitude to become proficient in the use of a hand-held computer and desktop computer.
   B. Demonstrate the understanding and requirements of this NG EOP D004.
   C. Possess the ability to do walking patrols, collect information on a hand held, download to a desk top computer, edit data, provide requested information/reports/work tickets to supervision, and track/close out work completed in the database system.
5. Distribution Network Strategy
   A. Select program codes/circuits to be scheduled for maintenance repair work using data collected through Distribution Maintenance Program.
   B. Approve changes to the maintenance code table.
   C. Select circuits to be patrolled for a running five-year cycle.
   D. Provide input into program revisions.
6. Inspections and Maintenance
   A. Ensure circuits scheduled for patrol are completed each year.
   B. Provide qualified personnel as inspectors to provide consistent and accurate identified maintenance concerns/problems.
   C. Provide program management.
   D. Report System Maintenance progress monthly by Division.
7. Process and Systems.
   A. Provide and support database.

REFERENCES

National Grid Safety Procedures
National Grid Employee Safety Handbook
NY PSC Order 04-M-0159
NY PSC Order Adopting Changes to Electric Safety Standard, December 2008
Elevated Equipment Voltage Testing NG-EOP G016
Underground Inspection NG-EOP UG006
Work Methods Bulletin 11-14 Voltage Regulation Limits
Massachusetts DTE Directive 12/9/05

TRAINING

Provided by appropriate National Grid training program.

DOCUMENT CONTENTS

Table of Contents

1.0 SAFETY REQUIREMENTS 4

2.0 DISTRIBUTION PATROL 4

3.0 EQUIPMENT TO BE INSPECTED AND MAINTENANCE CODES 6

4.0 DISTRIBUTION MAINTENANCE DATABASE 7

5.0 MAINTENANCE SCHEDULE 7

6.0 COMPLETION OF MAINTENANCE CODES 8

7.0 REVISION HISTORY 11

1.0 SAFETY REQUIREMENTS

1.1 All work shall be performed in accordance with:

- 1.1.1. National Grid Employee Safety Handbook
- 1.1.2. Applicable National Grid Electric Operating Procedures (EOP)
- 1.1.3. Applicable National Grid Safety and Health Procedures (SHP)

1.2. All applicable and appropriate Personal Protective Equipment (PPE) shall be worn.

1.3. The employee in charge of the work shall conduct a written pre-job brief with the employees involved prior to the start of each job. Using the Job Brief Form as an aide, discussions for performing the work should include:

- 1.3.1. Traffic control devices – Work Area Protection (WAP)
- 1.3.2. Emergency Events: communication methods (code blue), first responders, and closest hospital.

1.4. Minimum Approach Distances (MAD) to energized lines or exposed live parts shall be maintained (refer to Employee Safety Handbook Tables 2A, 2B and Appendix A for distances).

- 1.4.1. Use of DI Foot wear if MAD will be broken, according to NG-EOP G026 “Mechanized Equipment Grounding”

1.5 Identify if a Process Hazard Assessment (PHA) is required. Refer to NG-EOP G037 “Process Hazard Analysis”

1.6 Identify if an ARC flash assessment is required. Refer to NG-EOP G035 “ARC Flash Awareness and Mitigation” and Work Methods Infonet site for Arc Flash Table to determine working distance and energy levels – see link below:

Arc Flash Mitigation Tables

2.0 DISTRIBUTION PATROL

2.1 New York

2.1.1 Distribution Patrols are conducted by a Distribution Inspector that has been trained to identify deficiencies or non-standard construction conditions on National Grid facilities.

2.1.2 Distribution patrols are scheduled in such a manner that each distribution feeder is examined in the field once every five (5) years. In NY, the patrols shall be completed by December 31 due to regulatory reporting.

2.1.3 New Distribution Feeders added to the system will be incorporated through our Geographic Information System (GIS) system and added to the appropriate inspection cycle.

2.1.4 If the Distribution Inspector finds unmapped facilities from the information supplied from GIS, the inspector shall add the information into the *Windows*® based hand-held computer for maintenance tracking purposes. NG-EOP G011,

Preparation and Distribution of Electric Facilities Records, identifies the correct procedure for updating GIS records, if needed.

2.2 Rhode Island

2.2.1 Distribution Patrols are conducted by a Distribution Inspector that has been trained to identify deficiencies or non-standard construction conditions on National Grid facilities.

2.2.2 Distribution patrols are scheduled in such a manner that each distribution feeder is examined in the field once every five (5) years. In RI the patrols shall be completed by March 31. The most current Distribution Patrol schedule can be found in the Distribution Maintenance Program data base (RPT 1310 Feeder Patrol Status).

2.2.3 New Distribution Feeders added to the system will be incorporated through our Geographic Information System (GIS) system and added to the appropriate inspection cycle.

2.2.4 If the Distribution Inspector finds unmapped facilities from the information supplied from GIS, the inspector shall add the information into the *Windows*® based hand-held computer for maintenance tracking purposes. NG-EOP G011, Preparation and Distribution of Electric Facilities Records, identifies the correct procedure for updating GIS records, if needed.

2.3 Massachusetts

2.3.1 Distribution Patrols are conducted by a Distribution Inspector that has been trained to identify deficiencies or non-standard construction conditions on National Grid facilities.

2.3.2 Distribution patrols are scheduled in such a manner that each distribution feeder is examined in the field once every five (5) years. In MA, the patrols shall be completed by December 31 due to regulatory reporting. The most current Distribution Patrol schedule can be found in the Distribution Maintenance Program data base (RPT 1310 Feeder Patrol Status).

2.3.3 New Distribution Feeders added to the system will be incorporated through our Geographic Information System (GIS) system and added to the appropriate inspection cycle.

2.3.4 If the Distribution Inspector finds unmapped facilities from the information supplied from GIS, the inspector shall add the information into the *Windows*® based hand-held computer for maintenance tracking purposes. NG-EOP G011, Preparation and Distribution of Electric Facilities Records, identifies the correct procedure for updating GIS records, if needed.

2.4 Records

2.4.1 Distribution Patrol data is recorded by the Distribution Inspector on a *Windows*® based hand-held computer and downloaded to the Distribution Maintenance Program.

2.4.2 The Distribution Inspector should also complete maintenance code 118 - stencil installed and maintenance code 220 - guy wire marker, maintenance code 660 - switchgear missing nomenclature, maintenance code 681- transformer missing nomenclature, and maintenance code 745 - enclosure missing nomenclature if found deficient upon inspection while at the site or enter the appropriate code as a Level 4 maintenance item including a comment.

2.4.3 Maintenance Codes are shown on the Distribution Field Survey Worksheet #NG0236 (Page 8). The Distribution Field Survey Worksheet can be used by the field to record maintenance items and is used for informational purposes only.

2.4.4 The latest distribution maintenance codes are downloaded to the hand-held computer each time there is a change that affects the maintenance code table contained in the Distribution Maintenance Database. Printed copies of the latest maintenance code tables may be obtained by running a report on the look up tables from the Distribution Maintenance Database.

2.5 The *Windows*® based hand-held computer is to be used as the primary vehicle for recording maintenance problems in the field. There may be times where it is not practicable to use the hand-held computer. In these cases, the person performing the inspection should record the information on the Distribution Field Survey Worksheet (#NG0236).

https://teams.nationalgrid.com/sites/Syracuse/SitePages/Home.aspx

Once complete, the Distribution Field Survey Worksheet information shall be input into the Distribution Maintenance Database by the inspector, clerk, or supervisor or their designee.

3.0 EQUIPMENT TO BE INSPECTED AND MAINTENANCE CODES

3.1 This EOP requires the visual inspection of the following facilities as designated above for New York, Rhode Island or Massachusetts:

a. Wood Pole Mounted Street Light
b. Poles
c. Crossarms
d. Insulators
e. Primary
f. Transformers
g. Capacitor
h. Regulator
i. Sectionalizer
j. Recloser
k. Switches
l. Ground
m. Guy
n. Anchor
o. Secondary
p. Service
q. ROW
r. GIS
s. Spacer Cable
t. Cutout
u. Risers
v. Switchgear
w. Padmount Transformers
x. Enclosures

4.0 DISTRIBUTION MAINTENANCE DATABASE

4.1 The Distribution Maintenance Database consists of information collected in the field downloaded from the *Windows*® based hand-held computer and data gathered from other sources entered from the desktop computer. The *Windows*® based hand-held computer can be downloaded to any National Grid desk top computer that is connected to the network by an employee that has been authorized to perform this function. The Distribution Maintenance Database is used by various departments throughout National Grid to generate maintenance reports and cost estimates.

4.2 The Distribution Maintenance Database contains information to be used by Asset Strategy and Investment Planning to track maintenance codes that may affect reliability (R), affect reliability that have a specific program in place to address (RP), or may not directly affect reliability (NR):

5.0 MAINTENANCE SCHEDULE

5.1 Maintenance activities are scheduled by maintenance codes. Maintenance codes are given a priority level to aide in the scheduling of work assuring a safe and reliable distribution system.

5.2 All “Level 1 Priority” conditions identified shall be repaired/corrected within:

5.2.1 New England – 30 days

5.2.2 New York – 7 days.

5.3 NY Only - all “Level 2 Priority” conditions identified shall be repaired/corrected within 1 year. In NE, work will be reviewed, prioritized and scheduled according to the Annual Work Plan

5.4 NY Only - All “Level 3 Priority” conditions shall be repaired within 3 years. In NE, work will be reviewed, prioritized and scheduled according to the Annual Work Plan

5.5 All Level 4 Priority is for inventory purposes only.

5.6 All Level 9 priority conditions should be completed within 90 days. Level 9 priority conditions not completed within 90 days, the company shall periodically perform site visits to monitor the condition of the temporary repair. Refer to NG-EOP G029 – Tracking Temporary Repairs to Electric System for details on Level 9 priority conditions.

5.7 NY Only - Once the Distribution Feeder is completed in the Distribution Maintenance Database or 21 days have elapsed since the inspection, the Level 2 and Level 3 Priority maintenance codes are downloaded into STORMS. Expense maintenance work goes straight to scheduling while the capital work goes to Distribution Design. Level 1 Priority maintenance codes are communicated by the Distribution Inspector directly to the field operations group for the area where the feeder is located.

6.0 COMPLETION OF MAINTENANCE CODES

6.1 Level 1 priority maintenance codes completion process:

6.1.1 Distribution Inspector contacts System Operations Dispatch (SOD) providing information on the Level 1 maintenance item and fills out a Level 1 Priority Report Form (page 11).

6.1.2 SOD generates an ABB OMS order for Regional Control

6.1.3 Inspections Supervisor captures ABB OMS ID # and details for Level 1 maintenance item status. Inspections Supervisor tracks Level 1 maintenance status with operations ensuring that the Level 1 item is completed within 30 days (NE) and 7 days (NY). Inspection Supervisor closes out the Level 1 maintenance item in the Distribution Maintenance Database by adding the ABB OMS ID # number to maintenance record.

6.2 NY Only - Level 2 and Level 3 priority maintenance codes are completed in the Distribution Maintenance database once the 699 requirement is completed in STORMS for the work request associated with the maintenance code.

ALL MAINTENANCE WORK IS TO BE COMPLETED PER NATIONAL GRID DISTRIBUTION STANDARDS.

ALL MAINTENANCE WORK PERFORMED THAT WAS IDENTIFIED ON THE WORK ORDER OR DISCOVERED DURING THE REPLACEMENT/REPAIR/CORRECTION OF THE ORIGINAL MAINTENANCE PROBLEM SHALL BE LISTED ON THE DATABASE AND THEN CLOSED OUT WHEN COMPLETE.

Reference Only

DISTRIBUTION FIELD SURVEY WORKSHEET

nationalgrid

REGION	DISTRICT	EMPLOYEE ID	DATE
FEEDER	TAX DISTRICT/TOWN	MAP #	
LINE # / ROUTE #	POLE #/SUFFIX #		
LOCATION			
# MAIN LINE CATV ATTACHMENT 1 2 3 4 5	# MAIN LINE TELEPHONE ATTACHMENT 1 2 3 4 5	STREET LIGHT ATTACHED ☐ Yes ☐ No	

WOOD POLE MOUNTED STREET LIGHT	P/Q	REGULATOR	P/Q	SPACER CABLE	P/Q
098 1,2 (NR) ☐ Street Light Hazard Cond.	/	170 1,2 (NR) ☐ Oil Weeping	/	270 1,2,3,9 (R) ☐ Damaged/Missing Spacer	/
099 2 (NR) ☐ Not Bonded	/	171 1,2 (R) ☐ Bushings Broken/Cracked	/	271 1,2,3,9 (R) ☐ Bracket Damage	/
POLE		172 2 (R) ☐ Missing Ground Wire	/	272 3 (R) ☐ Bracket Not Bonded	/
106 3,9 (NR) ☐ Dbl Wood-NG Trnsf Req'd	/	174 4 (NR) ☐ Control Cab Height/Ground	/	273 3 (R) ☐ Messenger Not Bonded	/
107 4 (NR) ☐ Dbl Wood-Tel Trnsf Req'd	/	175 3 (R) ☐ Improper/Missing Bond	/	274 3 (R) ☐ Messenger Guard Missing	/
108 4 (NR) ☐ Dbl Wood-CATV Trnsf Req'd	/	176 3 (R) ☐ Animal Guard Missing	/	276 3 (R) ☐ Uncovered Splice	/
110 1,2,9 (R) ☐ Broken/severely damaged	/	177 3 (R) ☐ LA Blown/Missing/Improper	/	**CUTOUT**	
111 1,2,3,4 (RP) ☐ Visual Rotting Grd Line	/			280 2 (R) ☐ Defective Cutout	/
112 1,2,3 (RP) ☐ Woodpecker Holes - Replace	/	**SECTIONALIZER**		281 2 (R) ☐ Potted Porcelain	/
113 3 (NR) ☐ CuNap Treated Bthmark Yr	/	180 1,2 (NR) ☐ Oil Weeping	/	287 4 (NR) ☐ 3 Phase Equip Mount	/
114 2 (R) ☐ Woodpecker Holes	/	181 2 (R) ☐ Bushings Broken/Cracked	/	288 3 (NR) ☐ S&C SMD - 20 Power Fuse	/
115 1,2,3,9 (NR) ☐ Riser Guard Req'd	/	182 2 (R) ☐ Missing Ground Wire	/	**RISER**	
116 1,2,3,9 (RP) ☐ Visual Rotting Pole Top	/	183 4 (NR) ☐ Control Cab Height/Ground	/	290 1,2,3,9 (NR) ☐ Improp Cable Supp/Term	/
117 1,2 (NR) ☐ Leaning Pole	/	184 3 (R) ☐ Improper/Missing Bond	/	291 2 (R) ☐ Improper/Missing Bond	/
118 4 P (NR) ☐ Stencil / Correction Req'd	/	185 3 (R) ☐ Animal Guard Missing	/	292 3 (R) ☐ Animal Guard Missing	/
119 4 (NR) ☐ Bird's Nest	/	186 3 (R) ☐ LA Blown/Missing/Improper	/	293 2,3 (R) ☐ LA Blown/Missing/Improper	/
CROSSARM		**RECLOSER**		**CONDUCTOR**	
120 1,2,4,9 (R) ☐ Damage Arm	/	190 1,2 (R) ☐ Oil Weeping	/	300 4 (NR) ☐ Pool Clearance	/
121 1,2,4,9 (NR) ☐ Loose/Defective Pins	/	191 1,2 (R) ☐ Bushings Broken/Cracked	/	**HANDHOLES**	
122 3 (NR) ☐ Wooden Pine 13.2kv	/	192 2(R) ☐ Missing Ground Wire	/	600 1,2,9 (NR) ☐ Broken/Damaged/Unsecured	/
123 1,2,4,9 (R) ☐ Loose Brace, Hrdwr	/	193 4 (NR) ☐ Control Cab Height/Ground	/	601 4 (NR) ☐ Improper Grade	/
124 1,2,4,9 (R) ☐ Damage Dbl Crossarm	/	194 3(R) ☐ Improper/Missing Bond	/	602 P (NR) ☐ Missing Nomenclature	/
125 1,2,4,9 (R) ☐ Damage Alley Arm	/	195 3 (R) ☐ Animal Guard Missing	/	603 1 (R) ☐ Secondary Needs Repair	/
127 1,2 (R) ☐ Primary On Arm	/	196 2,3 (R) ☐ LA Blown/Missing/Improper	/	604 4 (NR) ☐ Other (use comments)	/
128 3,9 (R) ☐ Loose Ridge Pin	/	197 2 (R) ☐ TripSaver - Light On	/	605 4 (NR) ☐ Excessive Vegetation	/
INSULATOR		**SWITCH**		**SWITCHGEAR**	
130 1,2 (R) ☐ Broken/Cracked/Flashed	/	203 1,2 (R) ☐ Gang Oper'd Defective	/	651 1,2,3 (R) ☐ Barrier Brkn/Dmgd/Unsec	/
131 1,2,9 (R) ☐ Floating	/	204 1,2,3 (R) ☐ Single Phase Defective	/	652 1,2 (NR) ☐ Base Broken/Damaged	/
132 4 (NR) ☐ I7 Aluminum Capped	/	205 3 (R) ☐ Improper/Missing Bond	/	656 1,2,9 (R) ☐ Door Broken/Damaged	/
133 3 (R) ☐ Non-Standard Voltage	/	207 3,4 (R) ☐ LA Blown/Missing/Improper	/	657 1 (NR) ☐ Excessive Vegetation	/
134 4 (NR) ☐ AL Cap Assoc w/Switch/Fuse	/	208 2 (NR) ☐ Handle Not Bonded	/	660 P (NR) ☐ Missing Nomenclature	/
PRIMARY		**GROUND**		661 4 (NR) ☐ Other	/
140 1,2,9 (R) ☐ Insuff. Grnd Clearance	/	210 1,2,9 (R) Wire Broken/Loose	/	662 4 (NR) ☐ Rusted/Paint Peeling	/
141 1,2,3 ☐ Damaged Cond/Brkn Strands	/	211 1,2 (R) ☐ Hazard Condition	/	**PAD TRANSFORMER**	
142 1 (NR) ☐ Limbs on Primary	/	212 3 (NR) ☐ Guard Req'd	/	673 1,2 (R) ☐ Door Broken/Damaged	/
145 1,2,3 (R) ☐ Dmg'd Stirups/Connector	/	213 3,4 (NR) ☐ Non Standard	/	676 4 (NR) ☐ Excessive Vegetation	/
146 1,2,3 (R) ☐ Improper Sag	/	214 3,9 (NR) ☐ Not Bonded to Neutral	/	681 4,P (NR) ☐ Missing Nomenclature	/
147 3 (R) ☐ LA Missing Transition	/	**GUY**		684 1,2 (NR) ☐ Oil Weeping	/
148 3 (R) ☐ LA Missing End of Line	/	215 3(NR) ☐ Guy-Span Not In Compliance w/Code	/	685 1,2,3,4,9 (NR) ☐ Pad Broken/Damaged	/
149 3 (R) ☐ LA Blown	/			686 4 (NR) ☐ Protection (Ballards)	/
TRANSFORMER		220 4,P (NR) ☐ Guy Wire Marker	/	687 4 (NR) ☐ Rusted/Paint Peeling	/
150 1,2 (NR) ☐ Oil Weeping	/	221 3 (NR) ☐ Not in Compliance w/Code	/	688 1,2,9 (NR) ☐ Pushed Off Base	/
151 1,2 (R) ☐ Bushings Broken/Cracked	/	222 3,9 (NR) ☐ Excessive Slack	/	**ENCLOSURES**	
152 2 (R) ☐ Missing Ground Wire	/	223 1,2,3,9 (R) ☐ Broken Wire	/	740 1,2,3,4 (R) ☐ Base Broken/Cracked	/
153 2,3,4 (R) ☐ LA Blown/Missing/Improper	/	**ANCHOR**		741 1,2,3,9 P (R) ☐ Door Brkn/Dmgd/Unsec	/
154 3,4 (NR) ☐ Not in Use	/	226 1,2,3,9 (NR) ☐ Req'd - Jt. Owned	/	743 4 (NR) ☐ Excessive Vegetation	/
155 3,4 (R) ☐ Animal guards required	/	227 1,2,3,9 (NR) ☐ Req'd - Sole NG	/	745 4 P (R) ☐ Missing Nomenclature	/
156 3 (NR) ☐ Non Std Install of Gap	/	**SECONDARY**		746 4 (NR) ☐ Rusted/Paint Peeling	/
157 2 (R) ☐ Improper/Missing Bond	/	231 1 (NR) ☐ Limb on Secondary	/	**POLE INSPECTION**	
CAPACITOR		232 1,2,9 (NR) ☐ Improper Sag	/	801 1,2,3,4 (R) ☐ Identified Priority Pole	/
160 1,2 (NR) ☐ Oil Weeping	/	234 1,2,3,9 (NR) ☐ Floating	/	802 1,2,3,4 (R) ☐ Identified Reject Pole	/
161 1,2 (R) ☐ Bulging	/	**SERVICE**		803 4 (NR) ☐ Excessive Checking	/
162 1,2 (R) ☐ Bushings Broken/Cracked	/	240 1 (NR) ☐ Ins. Loose from House	/	804 4 (NR) ☐ Climbing Inspection	/
163 2 (R) ☐ Missing Ground Wire	/	241 1 (NR) ☐ Limb on Service	/		
164 2 (NR) ☐ Blown Fuse	/	243 1,9 (NR) ☐ Non Std/Unsecured	/		
165 3 (NR) ☐ Improper/Missing Bond	/	**ROW**			
166 3 (R) ☐ Animal Guard Missing	/	250 4 (NR) ☐ Brush/Tree/Washout	/		
167 3 (R) ☐ LA Blown/Missing/Improper	/	**GIS**			
168 4 (NR) ☐ Control Cab Heigh/Ground	/	260 4(NR) ☐ Map Doesn't Match Field	/		
169 4 (NR) ☐ Capacitor Out of Service	/	261 4(NR) ☐ Pole/Line Numbering Error	/		
		262 4(NR) ☐ Equip/Hardware/Missing	/		
		263 4(NR) ☐ Equip Removed in Field, Remove From GIS	/		
		264 4(NR) ☐ Misc.-Transmission Overbuilt	/		
		269 4 (NR) ☐ Other GPS/GIS Errors	/		

Comments:

KEY

P/Q = Priority / Quantity
NR = Maint. Code May Not Direct Affect Reliability
R = Maint. Code May Affect Reliability
RP = Maint. Code May Affect Reilability and Has Speci?c Program to Place to Address

NG0236 (02.15)

Level "1" & Elevated Voltage Priority Report Form

Any Level "1" Priority or Elevated Voltage condition found must be called into Dispatch.

Feeder:_____

Line #:_____

Pole #:_____

Closest Meter #:_____

Street Address: _____

City/Town: _____

Level "1" Priority/Elevated Voltage condition found.

_____

_____

Call Dispatch to inform that this is either an Elevated Voltage call or an Inspection issue.

Dispatcher notified: _____

Date/Time: _____

Inspector: _____

7.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	04/01/11	This document supersedes document dated 08/17/09.
2.0	04/27/15	This document supersedes document dated 12/03/14
3.0	04/25/17	Four-year revision, separated by state and removed priority levels 2 & 3 for MA & RI, NY Remains the same, Aligned with UG 006 for uniformity.
4.0	10/01/20	Updated Accountability section to reflect department name changes, Section 1: Added Safety Section, Introduction, Section 5.2, 6.1.3: Updated Repair time for New England.

Appendix 11

NG-USA EOP UG006 Underground Inspection and Maintenance

INTRODUCTION

The purpose of this procedure is to outline the requirements for the patrol and maintenance activities associated with National Grid's Underground Transmission and Distribution facilities.

The inspection procedures shall be dictated by the individual states' regulatory agency. If the regulatory agency in a specific state (MA & RI) does not require inspection procedures the inspections can still be performed in those states per this EOP but are not required.

This program is designed for the patrol and designated maintenance of underground facilities on a five (5) year schedule for New York only. Massachusetts and Rhode Island will perform working inspections on underground facilities each time work is performed. The Inspector or crew member will record all required maintenance on an approved National Grid database.

The underground distribution facility maintenance items identified through this patrol or working inspection are separated into four priority levels 1, 2, 3, and 4. The maintenance codes identified default to the appropriate priority level. The default priority level can be adjusted by the individual performing the inspection based on actual field conditions. These priority Levels are defined as follows:

Level 1 - All "Level 1 Priority" conditions identified shall be repaired / corrected within 7 days.

Level 2
New York - All "Level 2 Priority" conditions identified shall be repaired / corrected within 1 year.

New England (RI/MA) -working inspections will be reviewed, prioritized and scheduled according to the Annual Work Plan

Level 3
New York - All "Level 3 Priority" conditions shall be repaired within 3 years.

New England (RI/MA) -working inspections will be reviewed, prioritized and scheduled according to the Annual Work Plan

Level 4 – All "Level 4 Priority" conditions are for inventory purposes only.

All Level 1 priority conditions identified in the field by a contractor shall notify their PMCC contact. The PMCC contact shall notify dispatch and local underground supervision.

Any Level 1 priority conditions identified in the field by National Grid crews shall notify dispatch and their local supervision.

All Level 1 priority conditions identified in the field by the Underground Inspector shall be called in as follows:

1. Notification by location:
   New York: System Operations Dispatch 1-877-716-4996
   NE North: Bay State West & Central: Northborough Control Center 1-508-421-7879
   NE North: North & Granite: Northborough Control Center 1-508-421-7879

NE South: Bay State South & Ocean State (RI): Northborough Control Center 1-508-421-7885

2. Detailed information provided to the regional notification location:
    a. Identify yourself as a Company Underground Inspector, Crew Member, Supervisor or PMCC contact and your work reporting area.
    b. Details of the Level 1 Priority Condition:
        i. Problem found.
        ii. District, Circuit/Feeder No., Line No., Tax District and Manhole/Vault No.
        iii. Street address and any additional information that would assist in finding the location of the problem.
        iv. If you are standing by or have secured the location.

PURPOSE

This procedure applies to all personnel involved with or responsible for the inspection or maintenance of Underground Transmission and Distribution facilities.

ACCOUNTABILITY

1. Electric Work Methods
    A. Update procedure as necessary.
    B. Provide personal guidance and assistance as requested.
2. Operations
    A. Ensure the components of the procedure are implemented.
    B. Ensure workers are trained in this procedure.
    C. Provide revision input as necessary.
    D. Ensure the work generated by the Distribution Maintenance Program and assigned by Asset Strategy and Investment Planning is completed in the appropriate time frame.
    E. Request assistance from Distribution Line Contracting when necessary to complete work assigned in the appropriate time frame.
3. Distribution Line Contracting
    A. At the request of Operations, obtain schedule and manage contractors to perform inspections and required maintenance.
    B. Provide input into program revisions.
4. Distribution Network Strategy
    A. Select program codes/circuits to be scheduled for maintenance repair work using data collected through Distribution Maintenance Program.
    B. Approve changes to the maintenance code table.
    C. Select circuits to be patrolled for a running five-year cycle.
    D. Provide input into program revisions.
5. Inspections
    A. Ensure circuits scheduled for patrol are completed each year.
6. Employees
    A. Demonstrate the understanding of the procedure.
    B. Comply with the requirements of the procedure.

REFERENCES

NY PSC Order 04-M-0159
NY PSC Order Adopting Changes to Electric Safety Standard, December 2008
National Grid Safety Procedures
National Grid Employee Safety Handbook
NG-EOP D004 Distribution Line Patrol and Maintenance
NG-EOP G011 Preparation and Distribution of Electric Facilities Records
NG-EOP G016 Elevated Equipment Voltage Testing
NG-EOP UG001 Infrared Non-Contact Thermometer Inspection Requirement for Underground Equipment
NG-EOP T007 Transmission Line Patrol and Maintenance
Massachusetts DTE Directive 12/9/05
US Sanction Paper, MA FY15 Distribution Inspection and Maintenance (I&M) Program USSC-14-080 Signed by Lee S. Eckert 4/7/14

TRAINING

Provided by appropriate National Grid training program.

DOCUMENT CONTENTS

Table of Contents

1.0 SAFETY REQUIREMENTS 4

2.0 PATROLS 4

3.0 EQUIPMENT TO BE INSPECTED AND MAINTENANCE CODES 7

4.0 MAINTENANCE DATABASE 10

5.0 MAINTENANCE SCHEDULE 10

6.0 COMPLETION OF MAINTENANCE CODES 10

7.0 MANHOLE INSPECTION SHEET – FORM NG0453 11

8.0 REVISION HISTORY 17

1.0 SAFETY REQUIREMENTS

1.1 All work shall be performed in accordance with:

- 1.1.1 National Grid Employee Safety Handbook
- 1.1.2 Applicable National Grid Electric Operating Procedures (EOP)
- 1.1.3 Applicable National Grid Safety and Health Procedures (SHP)
- 1.1.4 All applicable and appropriate Personal Protective Equipment (PPE) shall be worn.

1.2 The employee in charge of the work shall conduct a written pre-job brief with the employees involved prior to the start of each job. Using the Job Brief Form as an aide, discussions for performing the work should include:

- 1.2.1 Traffic control devices – Work Area Protection (WAP)
- 1.2.2 Emergency Events: communication methods (code blue), first responders, and closest hospital.

1.3 Minimum Approach Distances (MAD) to energized lines or exposed live parts shall be maintained (refer to Employee Safety Handbook Tables 2A, 2B and Appendix A for distances).

- 1.3.1 Use of EH Overshoes if MAD will be broken, according to NG-EOP-26 “Mechanized Equipment Grounding”

1.4 Identify if a Process Hazard Assessment (PHA) is required. Refer to NG-EOP-G037 “Process Hazard Analysis”

1.5 Identify if an ARC flash assessment is required. Refer to NG-EOP G035 “ARC Flash Awareness and Mitigation” and Work Methods Infonet site for Arc Flash Table to determine working distance and energy levels – see link below:

Arc Flash Table

2.0 PATROLS

2.1 New York

- 2.1.1 Inspection of underground equipment will be scheduled in such a manner that each underground facility listed in section 3, will be examined once every five years. These patrols shall be completed by December 31st of the schedule year.
- 2.1.2 One-fifth (20%) of all underground utility components should be inspected each year.
  - a. URD and UCD facilities shall be inspected in accordance with NG-EOP D004 existing overhead distribution circuit schedule

b. All riser poles are inspected in accordance with NG-EOP T007 and NG-EOP D004.

c. Refer to NG-EOP UG001 for infrared, non-contact thermometer inspections of separable connectors.

d. An elevated equipment voltage test shall be completed at each location, refer to NG-EOP G016.

e. Customer owned manholes and vaults that enclose National Grid equipment shall require the inspection of these National Grid facilities.

f. A manhole inspection sheet shall be completed per the patrol intervals as stated in section 6.0. Manhole inspection form NG0453, shall be filled out at the same time the patrols are completed.

2.1.3 The Inspection group is responsible to create the patrol schedule for their respective Areas for the remainder of underground facilities.

a. The Inspector uses a Windows® based hand-held computer to record information pertaining to the asset being inspected.

b. The Inspector shall capture the region, district, employee ID, feeder number, structure ID number, GPS location, tax zone, line number, comments and maintenance problem codes.

c. The Inspector while patrolling should also record missing nomenclature codes for the various UG facilities per form NG0244 – “Inspection program and maintenance codes.”

d. The Inspector will input the code into the Windows® based handheld as required, as well as completing the work unit in the handheld upon field completion while at the site.

e. If the Inspector finds unmapped facilities from the information supplied from the Geographic Information System (GIS), refer to NG-EOP G011.

2.2 Rhode Island

2.2.1 A working inspection on underground facilities is required each time a crew performs work at one of those facilities listed in section 3.

a. Refer to NG-EOP UG001 for infrared, non-contact thermometer inspections of separable connectors.

b. An elevated equipment voltage test shall be completed at each location, refer to NG-EOP G016.

c. Customer owned manholes and vaults that enclose National Grid equipment shall require a working inspection of National Grid facilities.

d. A manhole inspection sheet shall be completed per the patrol intervals as stated in section 6.0. Manhole inspection form NG0453, shall be filled out at the same time the working inspections are completed.

2.2.2 The crew shall record the following

a. Region, district, employee ID, feeder number, structure ID number, GPS location, line number, comments and maintenance problem codes.

b. The crew while inspecting, should also record missing nomenclature codes for the various UG facilities, if found deficient upon inspection.

c. The crew will input the code into the Windows® based handheld as required, as well as completing the work unit in the handheld upon field completion while at the site.

d. If the crew finds unmapped facilities from the information supplied from GIS, refer to NG-EOP G011, for required procedure for corrections.

e. Crews shall perform working inspections by using either a handheld data entry unit or paper inspection logs requiring data entry by clerical support.

2.3 Massachusetts

2.3.1 A working inspection on underground facilities is required each time a crew performs work at one of these facilities listed in section 3.

a. Refer to NG-EOP UG001 for infrared, non-contact thermometer inspections of separable connectors.

b. An elevated equipment voltage test shall be completed at each location, refer to NG-EOP G016.

c. Customer owned manholes and vaults that enclose National Grid equipment shall require a working inspection of National Grid facilities.

d. A manhole inspection sheet shall be completed per the patrol intervals as stated in section 6.0. Manhole inspection form NG0453, shall be filled out at the same time the working inspections are completed.

2.3.2 The crew shall record the following

a. Region, district, employee ID, feeder number, structure ID number, GPS location, line number, comments and maintenance problem codes.

b. The crew while inspecting, should also record missing nomenclature codes for the various UG facilities, if found deficient upon inspection.

c. The crew will input the code into the Windows® based handheld as required, as well as completing the work unit in the handheld upon field completion while at the site.

d. If the crew finds unmapped facilities from the information supplied from GIS, refer to NG-EOP G011, for required procedure for corrections.

e. Crews shall perform working inspections by using either a handheld data entry unit or paper inspection logs requiring data entry by clerical support.

3.0 EQUIPMENT TO BE INSPECTED AND MAINTENANCE CODES

3.1 This EOP requires the visual inspection of the following facilities as designated above for New York, Rhode Island or Massachusetts and may require manhole pumping to assure a proper inspection:

a. Manholes
b. Vaults
c. Handholes: non-fiberglass
d. Splice boxes: non-fiberglass
e. Junction boxes: non-fiberglass
f. Pad-mounted transformers
g. Pad-mounted switchgears
h. Submersible equipment
i. Handholes*
j. Splice boxes*
k. Junction boxes*

** Fiberglass Enclosures do not require opening*

3.2 Maintenance Codes are shown on the Underground Field Survey Worksheet (Form NG-0244). The Underground Field Survey Worksheet should be used by the field to record maintenance items. Printed copies of the latest maintenance code tables may be obtained by running a report on the look up tables from the Underground Maintenance Database.

INSPECTION PROGRAM AND MAINTENANCE CODES - FORM NG0244

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UNDERGROUND FIELD SURVEY WORKSHEET

DATE:	INSPECTOR NAME:	EMPLOYEE ID
DIVISION	DISTRICT	FEEDER:

TOWN:	STREET:	POLE, MANHOLE, VAULT #	SUFFIX #

Handhole		Manhole		Net Protect		Net XFMR's		Switchgear		Transformer			
Vault		Trench		Submersible		Pull Box		Other		Equipment #			

MANHOLES, HANDHOLES, VAULT STRUCTURES
Water (in hole) ¬Yes ¬No

EV Test Required: ¬Yes ¬ No Voltage Action Taken: ¬ Repaired ¬De-energized
EV Found Voltage: ¬Yes ¬No

Gas Monitor Readings		Alarm Setting
Lower Explosive Limit (LEL)		10% or above
Oxygen (0_2)		% below 19.5, above
Carbon Monoxide (CO)		33 ppm
Hydrogen Sulfide (H_2S)		10 ppm

GIS	P/Q
260 **4** (NR) ¬GIS map doesn't match field	/
261 **4** (NR) ¬GIs Pole/line numbering in error on GIS	/
262 **4** (NR) ¬GIS equip/hardware missing in GIS	/
263 **4** (NR) ¬GIS equip removed in field, remove from GIS	/
269 **4** (NR) ¬GIS Other GPS/GIS Errors	/
HANDHOLES	
600 **2** (NR) ¬ Broken/damaged/unsecured	/
602 **P** (NR) ¬ Missing nomenclature	/
603 **1** (R) ¬ Secondary needs repair	/
604 **4** (NR) ¬ Other (use comments)	/
MANHOLE	
610 **2** (NR) ¬ Ground rods missing	/
611 **2** (R) ¬ Cable/Joint leaking	/
612 **2** (NR) ¬ Cables bonded/grid defective	/
614 1,2,3,**4** (NR) ¬ Cracked/broken	/
615 **3** (R) ¬ Fire proofing	/
616 **4** (NR) ¬ Improper grade	/
617 **P** (NR) ¬ Missing nomenclature	/
620 **2** (NR) ¬ Rerack	/
621 1,2,**3**,**4** (NR) ¬ Ring/cover repair/replace	/
622 1,**4** (NR) ¬ Roof condition – use comments	/
623 1,**4** (NR) ¬ Chimney Condition – comments	/
624 **4** (NR) ¬ Manhole needs cleaning	/
625 **1** (R) ¬ Secondary needs repair	/
626 4 (NR) ¬ No Holes in Manhole Cover	/
NETWORK PROTECTOR	
630 **2** (R)¬ Barriers broken/damage	/
632 **1** (R) ¬ Oil leak	/
633 **2** (NR) ¬ Worn/damaged gasket	/
NETWORK TRANSFORMER	
635 **2** (R) ¬ Bushing Broken/cracked	/
637 **2** (R) ¬ Low oil	/
638 **1** (NR) ¬ Missing ground	/
639 **P** (NR) ¬ Missing nomenclature	/
642 1, **2** (R) ¬ Oil Weeping	/
643 **4** (NR) ¬ Rusted/paint peel	/
SWITCHGEAR	
651 1,**2**,3 (R) ¬ Barrier broken/damaged/unsecure	/
652 1,2,**3** (NR) ¬ Base broken/damaged	/
654 **2** (R) ¬ Cable not bonded	/
656 1,2,3 (R) ¬ Door Broken/Damaged	/

SWITCHGEAR	P/Q
657 **F** (NR) ¬ Excessive vegetation	/
659 **2** (R) ¬ Missing ground	/
660 **P** (NR) ¬ Missing nomenclature	/
661 **4** (NR) ¬ Other	/
662 **4** (NR) ¬ Rusted/Paint Peeling	/
TRANSFORMER	
672 1,2,**3** (R) ¬ Bushing Broken/Cracked	/
673 1,**2**,3 (R) ¬ Door Broken/damaged/unsecure	/
675 1,2,**3** (R) ¬ Elbows/tracking/burned	/
676 **F** (NR) ¬ Excessive vegetation	/
680 **1** (R) ¬Missing Ground	/
681 **P** (NR) ¬Missing nomenclature	/
682 **4** (NR) ¬ Mud/debris	/
684 1,**2** (NR) ¬ Oil Weeping	/
685 1,2,**3**,4 (NR) ¬ Pad broken/damaged	/
686 **4** (NR) ¬ Protection (ballards) damage	/
687 **4** (NR) ¬ Rusted/Paint peeling	/
688 1,**2** (NR) ¬ Pad Pushed Off Base	/
TRENCH	
690 **1** (R) ¬ Exposed Cable	/
692 **4** (NR) ¬ Path – Sunken	/
VAULTS	
700 **2** (NR) ¬ Cable missing bond	/
702 1,2,3,**4** (NR) ¬ Cracked/broken	/
703 1,2,**4** (NR) ¬ Damaged/broken cover	/
704 1,2,**4** (NR) ¬ Damaged/broken door	/
705 1,**2**,4 (NR) ¬ Damaged/broken ladder	/
706 1,2,**3**,4,P (NR) ¬ Improper grade	/
707 4,**P** (NR) ¬Improper nomenclature	/
708 **4** (NR) ¬ Light not working	/
712 **4** (NR) ¬ Sump pump broken	/
713 **1** (R) ¬ Secondary needs repair	/
SUBMERSIBLE EQUIPMENT	
720 1,2,3,**4** (R) ¬ Excess Corrosion	/
721 1,2,3,**4** (R) ¬ Physical damage	/
722 1,**2** (R) ¬ Leaking	/
ANODES	
730 **3** (R) ¬ Missing	/
731 **3** (NR) ¬ Need replacement	/

KEY

PQ = Priority Quantity
NR = Maint.Code May Not Directly Affect Reliab.
R = Maint. Code May Affect Reliability
RP = Maint. Code May Affect Reliab. and Has Specific Program to Place to Address

Comments:

NG-0244 7/09

4.0 MAINTENANCE DATABASE

4.1 The Maintenance Database consists of data downloaded from the Windows® based hand -held and data entered from the desktop computer. The Windows® based hand-held used in the field, can be downloaded to any National Grid desk top computer that is connected to the network and the inspector or crew member is logged on as a valid user of the UG Maintenance program.

4.2 The National Grid desktop computer is also used to generate various reports and work tickets depending on the user's need. These reports are utilized to schedule and accomplish distribution maintenance work.

5.0 MAINTENANCE SCHEDULE

5.1 Maintenance activities are identified by maintenance codes. Maintenance codes are given a priority level to aide in the scheduling of work assuring a safe and reliable underground system.

5.2 Level 1 Priority Conditions All "Level 1 Priority" conditions identified shall be repaired/corrected within 7 days.

5.3 Level 2 Priority Conditions

5.3.1 New York - All "Level 2 Priority" conditions identified shall be repaired/corrected within 1 year.

5.3.2 New England (RI/MA) -working inspections will be reviewed, prioritized and scheduled according to the Annual Work Plan.

5.4 Level 3 Priority Conditions

5.4.1 New York - All "Level 3 Priority" conditions shall be repaired within 3 years.

5.4.2 New England (RI/MA) -working inspections will be reviewed, prioritized and scheduled according to the Annual Work Plan.

5.5 All "Level 4 Priority" conditions are for inventory purposes only.

5.6 NY Only - Once the Underground sequence is completed in the Underground Maintenance Database,

5.6.1 Level 2 and Level 3 Priority maintenance codes are downloaded into STORMS.

a. Expense maintenance work goes straight to scheduling

b. Capital work is sent to Underground Engineering/Design.

6.0 COMPLETION OF MAINTENANCE CODES

6.1 The completion of Level 1 priority maintenance codes is performed by the field operations Supervisor or their designee.

6.2 Level 2 and Level 3 priority maintenance codes are completed in the Underground Maintenance database once the 699 requirement is completed in STORMS for the work request associated with the maintenance code.

ALL MAINTENANCE WORK IS TO BE COMPLETED PER NATIONAL GRID UNDERGROUND CONSTRUCTION STANDARDS.

7.0 MANHOLE INSPECTION SHEET – FORM NG0453

7.1 The Manhole Inspection Sheet (Form NG0453) shall be filled out for every manhole, heavy duty handhole, primary pull-box or network secondary or radial secondary handhole. The sheet can be filled out on a paper form or an electronic device.

7.2 A manhole inspection sheet shall be completed per the patrol intervals or during a working inspection as stated in section 2.0. The manhole inspection sheet shall be filled out at the same time the patrols or working inspections are completed.

7.3 Operations will determine who will complete the manhole inspections sheets. If the individual completing the manhole inspection sheet finds unmapped facilities or incorrectly mapped facilities, refer to NG-EOP G011, Preparation and Distribution of Electric Facilities Records, for the required procedure for corrections.

7.4 The integrity of the secondary cables is critical to the proper operation of the network secondary system. It is possible that any secondary cable is either burned open or has a limiter which has operated, thus the affected cable will not be carrying any current.

7.4.1 When working in a manhole, heavy duty handhole, primary pull-box or network secondary or radial secondary handhole with network secondary conductors:

a. Visually inspect secondary conductors looking for any burned, overheated or otherwise damaged insulation.

b. Check temperature of secondary conductors using the heat gun. Extremes of temperature or differences between sets going in the same direction are of interest.

c. Take current readings on each phase in each set. All cables should have some current. Cables with no current are of interest as they are likely burned off or have an open limiter. This information should be logged on the manhole inspection sheet.

d. If an open limiter is found during the inspection the open limiter shall be reported to Operations. Operations shall replace the open limiters expeditiously.

7.5 The manhole inspection sheets shall be given to the local engineering department for that respective region.

7.6 The local engineering department shall review the details of the manhole inspection sheets and determine the status and/or corrective action needed for their regional system.

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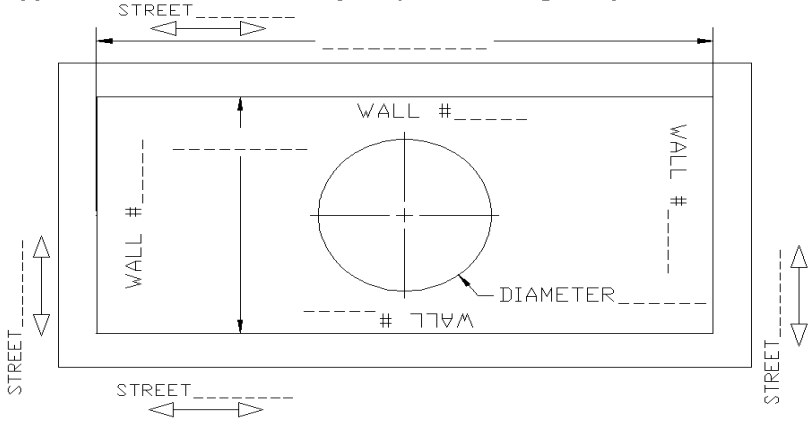
Manhole Inspection Sheet

Survey Date: _____ Manhole / Pullbox / Handhole Number_____

City / Town: _____ Streets / Intersect_____

Manhole / Pullbox / Handhole Construction (circle one): Brick Concrete Block Pre-cast

Approximate Dimensions / Layout (If not rectangular, please draw or note).



Manhole Cover:

Standard "NM"?

☐ **Yes**
☐ **No**

Standard Two - Piece?

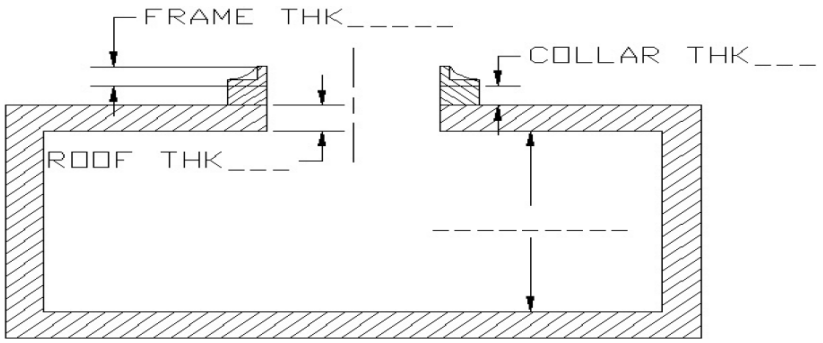
☐ **Yes**
☐ **No**

Flat Steel Covers?

☐ **Yes**
☐ **No**

If Yes, # of Covers?___

Collar Material (circle one): Concrete Brick Other_____



NG0453 (08/14)

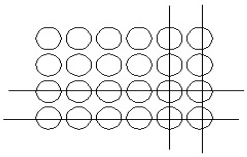
Wall #____ Conduit Material (Circle One): Fiber Tile Steel PVC Conduit Sizes____

Wall #____ Conduit Material (Circle One): Fiber Tile Steel PVC Conduit Sizes____

Wall #____ Conduit Material (Circle One): Fiber Tile Steel PVC Conduit Sizes____

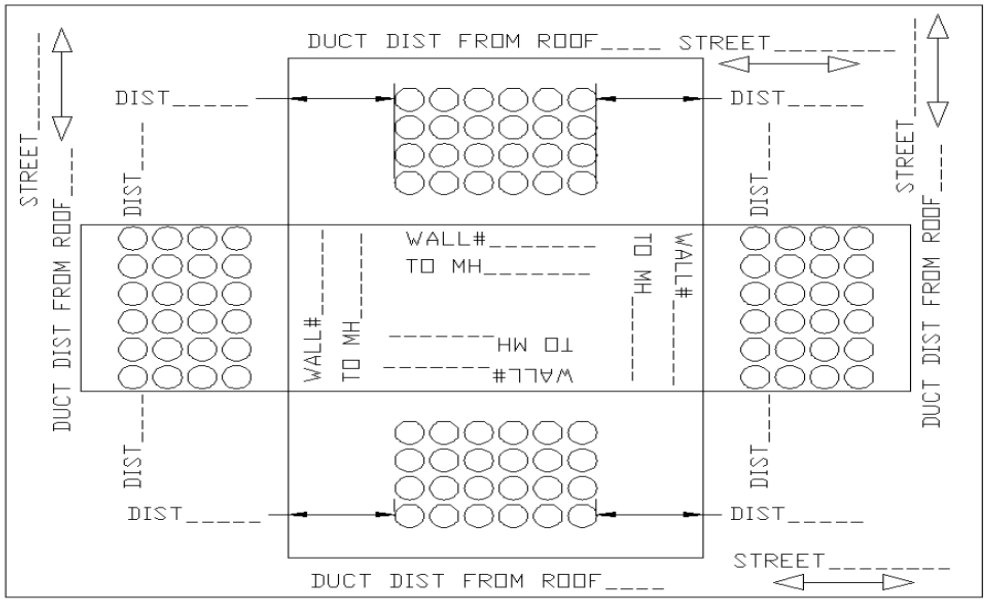
Wall #____ Conduit Material (Circle One): Fiber Tile Steel PVC Conduit Sizes____

Duct-line Configuration: Cross-out conduits in image below to illustrate configuration on each wall (2H4W example below). Additionally please fill in approximately measurements from duct-lines to roofs and walls. For multiple duct-lines, draw and note as appropriate.



Duct-line Occupancy Key:
A – Abandon Cable
E – Empty
P – Primary
S – Secondary
SL – Street Light
SV – Service Conductor
F – Fiber / Communications

When possible please note empty conduits, circuit #'s, and cable sizes.



NG0453 (08/14)

Wall # _____

Secondary Sets:

PILC: # Sets_____ Conductor Size_____ Neutral Size_____

Lead Sheathed Rubber: # Sets_____ Conductor Size_____ Neutral Size_____

EPR / Rubber: # Sets_____ Conductor Size_____ Neutral Size_____

Customer / Building Services:

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size ___

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size ___

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size ___

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size ___

Additional Comments / Other Work Required:_____

_____

Wall # _____

Secondary Sets:

PILC: # Sets_____ Conductor Size_____ Neutral Size_____

Lead Sheathed Rubber: # Sets_____ Conductor Size_____ Neutral Size _____

EPR / Rubber: # Sets_____ Conductor Size_____ Neutral Size _____

Customer / Building Services:

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size___

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size___

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size___

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size___

Additional Comments / Other Work Required:_____

_____

_____

NG0453 (08/14)

Wall # _____

Secondary Sets:

PILC: # Sets_____ Conductor Size_____ Neutral Size _____

Lead Sheathed Rubber: # Sets_____ Conductor Size_____ Neutral Size _____

EPR / Rubber: # Sets_____ Conductor Size_____ Neutral Size _____

Customer / Building Services:

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size___

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size___

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size___

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size___

Additional Comments / Other Work Required:_____

_____

Wall # _____

Secondary Sets:

PILC: # Sets_____ Conductor Size_____ Neutral Size_____

Lead Sheathed Rubber: # Sets_____ Conductor Size_____ Neutral Size_____

EPR / Rubber: # Sets_____ Conductor Size_____ Neutral Size_____

Customer / Building Services:

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size___

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size___

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size___

Address:_____ # Sets_____ Conductor Size / Type_____ Neutral Size___

Additional Comments / Other Work Required:_____

_____

_____

NG0453 (08/14)

Secondary Bus Type:

Lead Wiped Secondary Splices: ☐ No ☐ Yes; if Yes # sets?_____

Crabs: ☐ No ☐ Yes

If Yes, Open Positions? ☐ No ☐ Yes # Open Positions_____

Moles: ☐ No ☐ Yes

If Yes; Open Positions? ☐ No ☐ Yes # Open Positions_____

Is there currently adequate space for Cable Limiters? ☐ Yes ☐ No

If there is not adequate space for Cable Limiters please note required work to accommodate installation (Mole Relocation, Civil Work, etc):_____

_____

Is there Cathodic Protection currently installed? ☐ Yes ☐ No

Rack Insulators Required? (Broke or Missing) ☐ Yes ☐ No If Yes, How many?_____

Environmental Cleaning Required? ☐ Yes ☐ No

Amp Measurements Per Secondary Cable:

Phase		Phase		Phase	

NG0453 (08/14)

8.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	11/25/14	This document supersedes document dated 08/17/09.
2.0	10/01/20	Revised Introduction Section, updated contact phone numbers Revised Accountability, revised group tittles, Deleted Definitions Section 1, Added Safety Template All Section broke up paragraphs to subsets

Appendix 12

NG-USA EOP T007.01 Transmission and Sub Transmission Ground Level Visual Inspection

INTRODUCTION

This document applies to all National Grid Transmission and Sub-Transmission assets as defined by NG-EOP T007.00. It also applies to anyone performing inspection and maintenance activities on these assets. This procedure shall be executed by qualified personnel as determined by training specific to the task.

PURPOSE

This procedure defines the requirements for the ground level visual inspection of Transmission and Sub-Transmission assets.

ACCOUNTABILITY

Specific planned work performed under this procedure will be coordinated by the following work groups via a work plan document to be released prior to the start of each fiscal year. The accountability does not apply if the EOP function is not performed by the work group.

1 Transmission Work Methods

- A Update procedure as necessary
- B Provide personnel guidance and assistance as requested

2 Transmission and Distribution Asset Management

- A Evaluate the overall conditions of Transmission and Distribution assets for the purpose of developing the annual work plan
- B Create the inspection schedule, taking into account budget, resource availability and stakeholder input
- C Analyze and develop work plan to address off cycle, walk-in or critical issues

3 US Capital Delivery / Electric Operations / Transmission Inspection & Maintenance

- A Schedule and coordinate resources for transmission and distribution (above 15kV) asset inspections
- B Ensure inspections as outlined in the fiscal year work plan are safely executed according to the stated procedures and performed in a timely manner
- C Ensure worker understanding and comprehension of the requirements of this EOP

4 Worker

- A Demonstrate the understanding of this procedure
- B Comply with the requirements of this procedure

COORDINATION

Specific planned inspections performed under this procedure will be coordinated by the following work groups via a work plan document to be released prior to the start of each fiscal year.

US Capital Delivery
Transmission Inspection & Maintenance
Electric Operations

REFERENCES

National Grid Employee Safety Handbook
NG-EOP G016 Elevated Equipment Voltage Testing
NG-EOP T007.00 Line Inspections and Maintenance Activities
NG-EOP T007.02 Aerial Visual Inspection
NG-EOP T007.04 Steel Structure Foundation/Footer Inspection and Repair
NG-EOP T007.05 Wood Pole Inspection and Treatment
NY PSC Order 04-M-0159
NY PSC Order Adopting Changes to Electric Safety Standard, December 2008
MA General Law #220 CMR 125, Section 20

TRAINING

Provided by L&D upon request by user department

DOCUMENT CONTENTS

Table of Contents

1.0 SAFETY 4

2.0 GENERAL 4

3.0 INSPECT STEEL CONDITION 5

4.0 INSPECT STEEL GRILLAGE FOUNDATION 6

5.0 INSPECT CONCRETE FOUNDATION 6

6.0 INSPECT WOOD POLE AND STRUCTURE - OVERALL 6

7.0 INSPECT WOOD POLE – INDIVIDUAL 7

8.0 INSPECT STEEL POLE AND STRUCTURE 8

9.0 INSPECT CONDUCTOR 8

10.0 INSPECT INSULATORS / HARDWARE 9

11.0 INSPECT FOUNDATION: 9

12.0 INSPECT RIGHT OF WAY: 9

13.0 INSPECT MISCELLANEOUS: 10

14.0 INSPECT SWITCH: 10

15.0 DOCUMENT GIS DATA ISSUES 12

16.0 ENGINEERING-SPECIFIC INSPECTION 12

17.0 TEMPORARY REPAIRS 14

18.0 EXCEPTION APPROVALS 14

19.0 REVISION HISTORY 15

APPENDIX A – TRANSMISSION FIELD SURVEY WORKSHEET 16

APPENDIX B – STEEL EVALUATION RATINGS 17

APPENDIX C – CONCRETE EVALUATION RATINGS & MATRIX 18

APPENDIX D – WOOD STRUCTURE EVALUATION 20

APPENDIX E – INDIVIDUAL WOOD POLE EVALUATION 26

APPENDIX F – STEEL POLE AND STRUCTURE EVALUATION 27

APPENDIX G – CONDUCTOR AND LINE HARDWARE EVALUATION 29

APPENDIX H – FOUNDATION EVALUATION 33

APPENDIX I – ROW / MISC. / SWITCH / GIS EVALUATION 34

1.0 SAFETY

1.1 All work shall be performed in accordance with:

1.1.1 National Grid Employee Safety Handbook

1.1.2 Applicable National Grid Electric Operating Procedures (EOP)

1.1.3 Applicable National Grid Safety and Health Procedures (SHP)

1.2 All applicable and appropriate Personal Protective Equipment (PPE) shall be worn.

1.3 The employee in charge of the work shall conduct a written pre-job brief with the employees involved prior to the start of each job. Using the Job Brief Form as an aide, discussions for performing the work should include:

1.3.1 Traffic control devices – Work Area Protection (WAP)

1.3.2 Emergency Events: communication methods (code blue), first responders, and closest hospital.

1.4 Minimum Approach Distances (MAD) to energized lines or exposed live parts shall be maintained (refer to Employee Safety Handbook Tables 2A, 2B and Appendix A for distances).

1.5 Identify if a Process Hazard Assessment (PHA) is required. Refer to NG-EOP-G037 “Process Hazard Analysis”

1.6 Identify if an ARC flash assessment is required. Refer to NG-EOP G035 “ARC Flash Awareness and Mitigation” and Work Methods Infonet site for Arc Flash Table to determine working distance and energy levels – see link below:

http://us3infonet/sites/eng_delivery_svcs/Pages/ArcFlashMitigation.aspx#2015

2.0 GENERAL

2.1 All assets shall be physically visited and inspected

2.1.1 All potential defects can be identified

2.1.2 Inspected from ground level

a. Use binoculars or scopes as needed

2.1.3 Exceptions must have approval from the appropriate department manager and be documented in the MMS

2.1.4 Inspect structures in the order they exist

a. Use appropriate inspection procedure for the asset

2.2 Inspections recorded in Computapole

2.2.1 This procedure arranged in same order as Computapole priority codes

2.2.2 Some Computapole codes do not apply to this procedure

2.2.3 Refer to Appendix J for a complete list of Computapole codes

a. Including valid levels and STORMS qualifiers

3.0 INSPECT STEEL CONDITION

3.1 Grading Reference:

3.1.1 Appendix B 'Steel Evaluation Ratings' (1-6)

a. Assign a Rating as appropriate

3.2 Inspect the following:

3.2.1 Steel condition

3.2.2 Weathering steel for excessive corrosion of joints

a. Report any excessive corrosion of weathering steel joints to Transmission Maintenance

3.3 Inspection Note:

3.3.1 Grade all steel collectively

a. The overall rating shall be the worst 5% of

1. Members on a tower
2. Discrete area on a steel pole

b. Or the rating of the worst critical members

1. Tower legs
2. Insulator attachment points

3.3.2 Rating of 4 and higher requires additional review

a. Additional photos and notes shall be taken to assist the review

3.3.3 Rating of 6:

a. Used at the discretion of the Inspector

1. Due to special circumstances

2. The reason shall be noted on the report

4.0 INSPECT STEEL GRILLAGE FOUNDATION

4.1 Grading Reference:

4.1.1 Appendix B – 'Steel Evaluation Ratings' (1-6)

a. Assign a Rating as appropriate

4.2 Inspect the following:

4.2.1 Steel condition above grade

5.0 INSPECT CONCRETE FOUNDATION

5.1 Grading Reference:

5.1.1 Appendix C – 'Concrete Evaluation Rating / Matrix' (1-5)

a. Assign a Rating as appropriate

5.2 Inspect for the following:

5.2.1 Poor workmanship, including honeycombing

5.2.2 Cracking, including pattern or solitary cracks

5.2.3 Disintegration and deterioration of concrete

5.2.4 Distortion/movement resulting in change in alignment of structure components

5.2.5 Seepage – movement of water/fluids through pores

5.2.6 Spalling – development of fragments

5.2.7 Delamination

5.2.8 Degradation of steel/concrete interface

5.2.9 Excessive corrosion of reinforcement

5.2.10 Condition of anchor bolts

a. All hardware present and tight

5.3 Rating of 5:

5.3.1 Used at the discretion of the Inspector

a. Due to special circumstances

b. The reason shall be noted on the report

6.0 INSPECT WOOD POLE AND STRUCTURE - OVERALL

6.1 Grading Reference:

6.1.1 Appendix D – 'Wood Structure Evaluation' (Priority 1-4)

a. Use the indicated code

1. Assign a Priority to each item

6.2 Inspect for the following:

6.2.1 Code 510 – Broken

6.2.2 Code 511 – Visual rotting/hollow sounding

a. Level 4 shall be assigned and

1. Scheduled for Wood Pole inspection

b. Unless deemed an immediate failure risk

6.2.3 Code 512 – Leaning

6.2.4 Code 513 – Replace single arm

6.2.5 Code 514 – Replace double arm

6.2.6 Code 515 – Repair brace

6.2.7 Code 516 – Replace brace

6.2.8 Code 517 – Replace anchor

6.2.9 Code 518 – Install anchor

6.2.10 Code 519 – Repair/replace guy wire

6.2.11 Code 521 – Tighten guy wire

6.2.12 Code 522 – Replace guy shield

6.2.13 Code 524 – Guy bonding

6.2.14 Code 525 – Lightning damage

6.2.15 Code 526 – Woodpecker damage

6.2.16 Code 527 – Insects

6.2.17 Code 528 – Aerial number missing

7.0 INSPECT WOOD POLE – INDIVIDUAL

7.1 Grading Reference:

7.1.1 Appendix E - 'Individual Wood Pole Evaluation' (Priority 1-4)

a. Use the indicated code

1. Assign a Priority to each item

7.2 C-Truss

7.2.1 Is considered a permanent repair

7.2.2 Significant deterioration of pole shall be graded as if no C-Truss was installed

7.3 Identify pole inspection / repair

7.3.1 Document tag left after Wood Pole Inspection and Treatment

a. EOP T007.05

7.3.2 Level 4 only

7.4 Inspect for the following:

7.4.1 Code 901 – Identified priority pole

7.4.2 Code 902 – Identified reject pole

7.4.3 Code 903 – Excessive checking

7.4.4 Code 904 – Climbing inspection required

7.4.5 Code 905 – No inspection tag

8.0 INSPECT STEEL POLE AND STRUCTURE

8.1 Grading Reference:

8.1.1 Appendix F – 'Steel Pole and Structure Evaluation' (Priority 1-4)

a. Use the indicated code

1. Assign a Priority to each item

8.2 Inspect for the following:

8.2.1 Code 531 - Broken legs

8.2.2 Code 532 - Aerial number missing

8.2.3 Code 534 - Loose or missing bolts/hardware

8.2.4 Code 535 - Anti climb equipment damaged/missing

8.2.5 Code 536 - Vegetation on tower

8.2.6 Code 537 - Structure damage

8.2.7 Code 538 - Tower needs straightening

8.2.8 Code 539 - Arms damaged

9.0 INSPECT CONDUCTOR

9.1 Grading Reference:

9.1.1 Appendix G – 'Conductor and Line Hardware Evaluation' (Priority 1- 4)

a. Use the indicated code

1. Assign a Priority to each item

9.2 Inspect for the following:

9.2.1 Code 541 - Conductor condition overall

9.2.2 Code 542 - Static wire condition overall

9.2.3 Code 543 - Ground wire condition overall

9.2.4 Code 544 - Sleeve/splice/connector condition

9.2.5 Code 546 - Clearance issues

9.3 Transmission Maintenance may revise Priority for conductor damage

9.3.1 Based on mechanical and electrical loading

10.0 INSPECT INSULATORS / HARDWARE

10.1 Grading Reference:

10.1.1 Appendix G – 'Conductor and Line Hardware Evaluation' (Priority 1- 4)

a. Use the indicated code

1. Assign a Priority to each item

10.2 Multiple insulator strings shall be evaluated individually

10.3 Inspect for the following:

10.3.1 Code 551 – Insulator damage

10.3.2 Code 552 – Insulators out of plumb

10.3.3 Code 553 - Hardware loose or damaged

10.3.4 Code 555 - Lightning arrestor issues

11.0 INSPECT FOUNDATION:

11.1 Grading Reference:

11.1.1 Appendix H – 'Foundation Evaluation' (Priority 1-4)

a. Use the indicated code

1. Assign a Priority to each item

11.2 Inspect for the following:

11.2.1 Code 563 – Erosion

12.0 INSPECT RIGHT OF WAY:

12.1 Grading Reference:

12.1.1 Appendix I – 'ROW / Misc. / Switch / GIS Evaluation' (Priority 1-4 or F)

a. Use the indicated code

1. Assign a Priority to each item

12.1.2 All Code 574 – Danger Trees rated as an "F"

12.2 Inspect for the following:

12.2.1 Code 571 – Erosion

12.2.2 Code 572 – Encroachments

12.2.3 Code 573 – Debris

12.2.4 Code 574 - Danger trees

a. Priority F

12.2.5 Code 575 - Broken gates

12.2.6 Code 576 - Oil/Gas/Hazmat situation

13.0 INSPECT MISCELLANEOUS:

13.1 Grading Reference:

13.1.1 Appendix I – 'ROW / Misc. / Switch / GIS Evaluation' (Priority 1-4 or P)

a. Use the indicated code

1. Assign a Priority to each item

13.2 Visually inspect for the following:

13.2.1 Code 581 - Structure not marked – ground level

13.2.2 Code 582 - Switch damaged (see Section 14)

13.2.3 Code 583 - Switch grounding damaged (see Section 14)

13.2.4 Code 584 - Install warning sign

13.2.5 Code 585 - Replace warning sign

13.2.6 Code 586 - Remove steps

13.2.7 Code 587 - Add dirt and tamp

13.2.8 Code 589 - Bird Nest

13.2.9 Code 590 - Excessive bird perching

14.0 INSPECT SWITCH:

14.1 Grading Reference:

14.1.1 Appendix I – 'ROW / Misc. / Switch / GIS Evaluation' (Priority 1-4)

a. Use the indicated code

1. Assign a Priority to each item

14.1.2 With the switch in service

a. Refer to EOP T006 for further information

14.1.3 Single code is used for most of this inspection

a. Record problem details

14.2 Inspect for the following:

14.2.1 Code 582 Noise

a. Arcing or other abnormal noise

1. Leave the area immediately
2. Contact the appropriate control center

14.2.2 Code 582 Insulators

a. Surface contamination

b. Tracking

c. Damaged porcelain

14.2.3 Code 582 Primary Connections

a. Overheating

1. Discoloration of or heat rising from connections

b. Cracks

c. Loose connections

14.2.4 Code 582 Live Parts

a. Blades properly turned into jaws

b. Damaged, misaligned or missing arcing horns

c. Damaged, misaligned or missing parts

14.2.5 Code 582 Load Break Interrupters

a. Damage

b. Deterioration

14.2.6 Code 582 Operating Mechanism

a. Properly locked

b. Operating pipe / Interphase linkage

1. Broken
2. Bent

c. Manual operating mechanism for

1. Damage
2. Deterioration
3. Missing parts

14.2.7 Code 583 Operating Mechanism Ground

a. Broken

b. Loose

c. Missing

15.0 DOCUMENT GIS DATA ISSUES

15.1 Grading Reference:

15.1.1 Appendix I – 'ROW / Misc. / Switch / GIS Evaluation' (Priority 4 Only)

a. Use the indicated code

b. Include a note describing the problem / correction required

15.2 Document all mismatches between the GIS and the field:

15.2.1 Code 760 - GIS map mismatch

15.2.2 Code 761 - GIS – equipment stencil mismatch

15.2.3 Code 762 - GIS – equipment/hardware missing

15.2.4 Code 763 - GIS – equipment removed in field

15.2.5 Code 769 - GIS – other GPS/GIS errors

16.0 ENGINEERING-SPECIFIC INSPECTION

16.1 Additional guidelines for Inspections related to engineering activities

16.1.1 Not to be included in the regular Ground Level Visual Inspection

16.2 Guidelines below shall be used by engineers

16.2.1 To complete and interpret field Inspection data

16.2.2 As part of preliminary engineering as specified in SP.06.01.101 "Transmission Engineering and Design Services"

16.3 Guidance provided in Sections 16.4 and 16.5 shall be used in completing engineering analysis of lines

16.4 Priority Descriptions

16.4.1 Priority 1 – Reserved for immediate and substantial threats to public safety and/or system reliability. These should generally be very rare.

16.4.2 Priority 2 – Items which require repair due to a near term risk of failure, the repairs should not wait for the normal two-year project life cycle

16.4.3 Priority 3 – Repairs are required, but a more deliberate approach can be taken over a two-year period

16.4.4 Priority 4 – Repairs should be completed if the work is incidental to another project, but the item can wait for the next Inspection cycle for further assessment

16.5 The following information shall be determined and documented:

16.5.1 Asset Information

a. Structure Number
b. Circuit
c. Tower/Pole ID#
    1. Include circuit according to National Grid nomenclature
d. Structure Location Latitude and Longitude
e. Structure Ground line elevation
f. Structure City or Town and State

16.5.2 Inspection

a. Year Installed
b. Tower/Pole Size / Class
c. Structure Height (above grade)
d. Structure Type
e. Structure surface finish:
    1. Painted
    2. Galvanized
    3. Weathered
    4. Foundation type
f. Structure condition and overall rating
g. Steel distress or deterioration
h. Concrete foundation condition and overall rating
i. Concrete foundation distress or deterioration
j. Concrete foundation surface mapping diagram
k. Mechanical or fire damage
l. Broken hardware
    1. Insulators
    2. Adversely impacted structural components
m. Document adjacent roads, railroads, parks, etc

n. Frequently accessible by the general public
o. Unusual conditions or safety hazards
p. Digital photographs
q. Field sketches of foundation condition

17.0 TEMPORARY REPAIRS

17.1 Some defects may have been repaired temporarily
17.1.1 Temporary repairs shall be inspected monthly by Transmission Inspections
17.1.2 Until repairs made permanent
17.2 If an Inspector encounters a temporary repair
17.2.1 Defect shall be reported with a note indicating a temporary repair

18.0 EXCEPTION APPROVALS

18.1 It is recognized that situations may arise that are not covered by this procedure
18.2 When this occurs, an exception may be approved
18.3 The person in charge of the work shall
18.3.1 Develop a work plan detailing
a. The need for an exception to the EOP
b. Additional safeguards to be employed
18.3.2 Provide the work plan to and obtain approval from all of:
a. The manager in charge of the work
b. The manager of T&D Work Methods
c. A manager from Safety
18.3.3 Alternatively approval may be obtained from a designee of any of the above
18.4 If agreement cannot be obtained at the manager level
18.4.1 The request shall be forwarded to the Director levels
a. Director's may assign a designee
18.5 After approval is obtained
18.5.1 The work plan shall be reviewed with all workers who will participate in the job
a. All workers need to agree on the work plan
b. Document the exception on the job brief
18.6 T&D Work Methods shall publish a Memorandum documenting the approval

18.6.1 A copy of the work plan shall be included

18.6.2 Such memorandum shall be sent to all stakeholders and approvers

18.6.3 The memo shall be stored for the record

19.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	06/01/15	Supersedes Transmission Line Maintenance Specification PR 06.01.601.001 dated 4/18/11. Re-number as part of EOP T007. Complete revision to put in EOP format; update department names; move appendices to back of document; change to outline format.
2.0	05/01/19	Update Accountability; Remove Definitions; Add new Safety and Exception Approval Sections; Update Department Names and Sponsor
2.1	10/01/19	Code 551 – Line Hardware – Insulator Damage: Change to counting good insulators rather than counting damaged insulators

APPENDIX A – TRANSMISSION FIELD SURVEY WORKSHEET

TRANSMISSION FIELD SURVEY WORKSHEET

Patrolled Circuit/No.	Unique ID	Pole/Tower No.	Voltage	District
Additional Circuit/No.	Unique ID			
Area	Between _____ Rd. And _____ Rd.	Date	Employee ID	
TYPE	□ A) Single □B) H. Frame □C) 3 Pole □D) 4 Pole □E) 5 Pole □F) 6 Pole □G) Flex-Tower □H) Square-Tower □I) Hairpin □J) Other			
MATERIAL	□ A) Wood (fill in information for each pole, i.e., 2 pole, 3 pole, 4 pole, etc.) Height _____ Class _____ Year Set _____ Manufacturer _____ Year Last Treated _____ Treatment □A) External □B) Internal □C) Both □D) Other □E) Unknown □F) None □ B) Steel □ C) Lattice			
CONFIGURATION	□Deadend □Tangent □Switch Structure □Davit Arm □Stand Off □Other			
STEEL/LATTICE CONDITION	(Circle One) 1 2 3 4 5 6	FOUNDATION: STEEL CONCRETE	(Circle One) 1 2 3 4 5 6 1 2 3 4 5	

POLE * *Enter Sub No. if a Multiple Structure	Sub. No.	Priority Qty
510 1, **2** (R) □Broken		/
511 1,4 (RP) □Visual Rotting		/
512 1,2,3,**4** (R) □Leaning		/
513 1,2,**3** (R) □Replace Single Arms		/
514 1,2,**3** (R) □Replace Double Arm		/
515 1,2,**3** (R) □Repair Braces		/
516 1,2,**3** (R) □Replace Braces		/
517 1,**2** (R) □Replace Anchor		/
518 1,2,**3**,4 (R) □Install Anchor		/
519 1,2,**3** (R) □Repair/Replace Guy Wire		/
521 2,**3** (R) □Tighten Guy Wire		/
522 **P** (NR) □Replace/Install Guy Shield		/
524 **4** (R) □Guy Not Bonded		/
525 1,2,**3**,4 (RP) □Lightning Damage		/
526 2,**3**,4 (RP) □Woodpecker Damage		
527 2,4 (RP) □Insects		
528 **4 (NR)** □Aerial Number Missing		/
TOWER		
531 1,**2** (R) □Tower Legs Broken		/
532 **4** (NR) □Aerial Numbers Missing		/
534 1,2,**3** (R) □Loose Bolts/Hard		/
535 **4** (NR) □Repair Anti-Climb		/
536 **F** (R) □Vegetation On Tower		/
537 1,2,**3** (R) □Structure Damage		/
538 1,2,**3**,4 (R) □Straighten Tower		/
539 1,2,**3**,4 (R) □Arms Damaged		/
POLE INSPECTION		
901 **4** (RP) □Identified Priority Pole		/
902 **4** (RP) □Identified Reject Pole		/
903 **4** (RP) □Excess Checking		/
904 **4** (RP) □Climbing Inspection Req'd		
905 **4** (RP) □No Inspection Tag		/

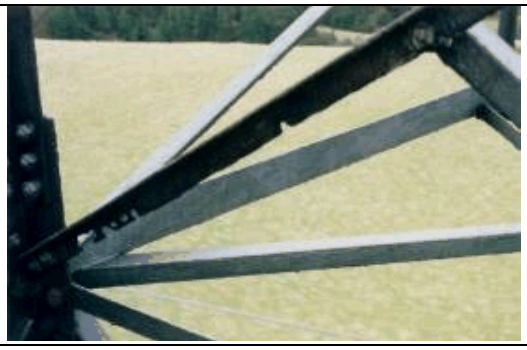
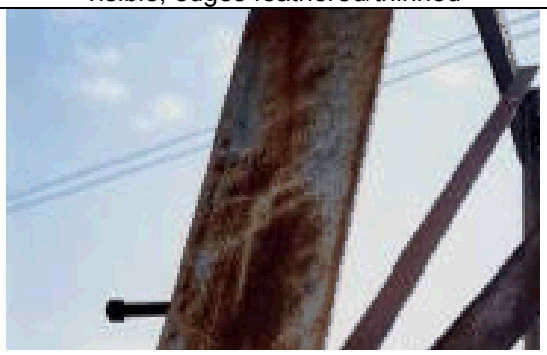
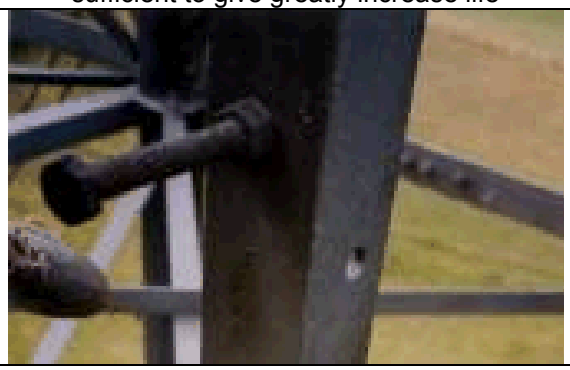
CONDUCTOR ** **Enter Circuit No. if More Than Circuit on Pole	Circuit No.	Priority Qty
541 1,2,**3** (R) □Conductor		/
542 1,2,**3** (R) □Static		/
543 1,2,**3** (R) □Ground Wire		/
544 1,2,**3** (R) □Sleeve/Conn.		/
546 1,**4** (NR) □Under 25 Ft.		/
LINE HARDWARE		
551 1,2,**3**,4 (R) □Insulators/Dam		/
552 **4** (R) □Insulator Plumb		/
553 1,2,**3**,4 (R) □Hardware Dam		/
555 **2** (R) □Lightning Arrestor		/
FOUNDATION – GENERAL		
563 1,2,**3**,4 (R) □Erosion		/
RIGHT OF WAY		
571 1,2,**4** (NR) □Erosion		/
572 **4** (NR) □Encroachments		/
573 **4** (NR) □Debris		/
574 **F** (R) □Danger Tree		/
575 **4** (NR) □Gate Broke		/
576 **4** (NR) □Oil/Gas Leak		/
MISCELLANEOUS		
581 4,P (NR) □Stencil/Line/ Struct No. Ground level		/
582 1,2,**3**,4 (R) □Switch Damaged		/
583 **2** (R) □Damaged Ground		/
584 **4,P** (NR) □Install/Replace Warning Sign		/
586 **4** (NR) □Remove Steps		/
587 **3**,4 (R) □Add Dirt & Tamp		/
589 1,**3**,4 (R) □Bird Nest		/
590 **4** (R) □Bird Perching		/
GIS		
760 **4** (NR) □GIS Map Doesn't Match Field		/
761 **4** (NR) □GIS Equip. Stenciling In Error		/
762 **4** (NR) □GIS Equip/Hardware Missing		/
763 **4** (NR) □GIS Equip. Removed In Field Remove from GIS		/
769 **4** (NR) □GIS Other GPS/GIS Errors		/

NR–Maint. Code may not directly affect reliab.
R–Maint. Code may affect reliability.
RP – Maintenance Code may affect and has specific program in place to address.

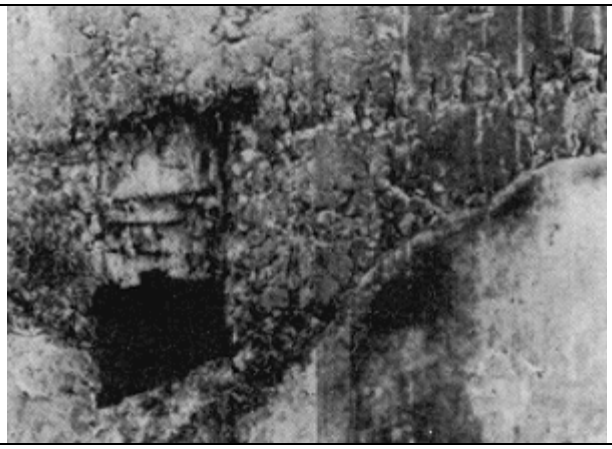
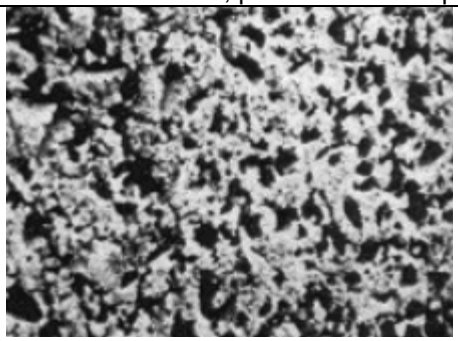
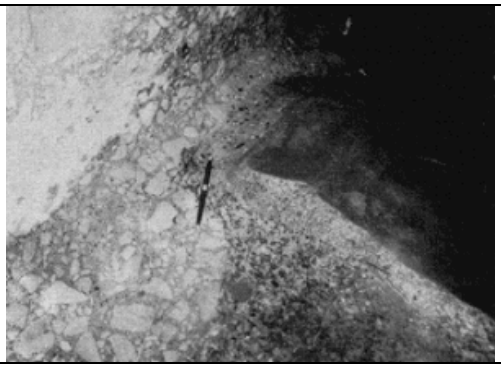
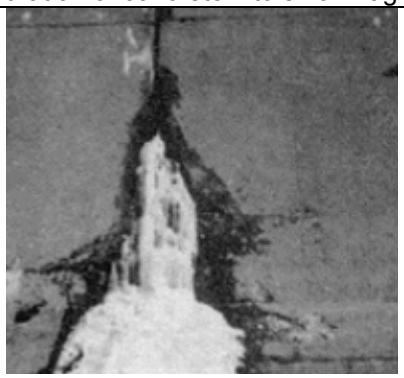
Comments on rear of sheet

NG0237 (12/09)

APPENDIX B – STEEL EVALUATION RATINGS

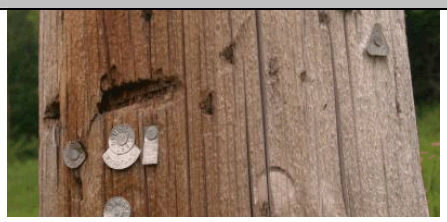
	
Rating 6 – "Very Severe Deterioration" Perforated Element – severe physical damage	Rating 5 – "Significant Pitting" Significant pitting – loss of section clearly visible, edges feathered/thinned
	
Rating 4 – "Light Pitting" Some very light edge roughening. Loss of greater majority of coating and zinc layers. Corroded surface would dominate surface preparation – remedial action using wire brush, scraper and brushed paint not sufficient to give greatly increase life	Rating 3 – "Light Corrosion" Very light surface corrosion, majority of coating intact
	
Rating 2 – "Intact" Paint coating over all surface – overcoat may not be intact and some very small areas (<1%) of light corrosion may be present. Galvanizing intact except for some very small areas (<1%) of light corrosion	Rating 1 – "Serviceable" Fully painted – overcoat and undercoat intact Fully galvanized – coating intact

APPENDIX C – CONCRETE EVALUATION RATINGS & MATRIX

	
Honeycombing Construction faults, poor workmanship	Pattern Cracking
	
Disintegration Deterioration of concrete into small fragments	Erosion/Abrasion
	
Seepage Movement of water or other fluids through pores	Spalling Development of fragments
Distortion or Movement Change in alignment of the components of a structure	Delamination Degradation of steel/concrete interface

		Overall Foundation Rating				
		Very Severe Deterioration 5	Severe Deterioration 4	Medium Deterioration 3	Light Deterioration 2	Serviceable 1
Concrete Foundation Condition Categories	Cracking	Wide cracks (over 0.08" width)	Medium Cracks (between 0.04" and 0.08" width)	Fine Cracks (0.04" width)	Negligible	Negligible
	Disintegration	Very Severe Disintegration (loss of mortar and coarse aggregate at a depth greater than 0.8")	Severe Disintegration (loss or mortar between 0.4" and 0.8" around coarse aggregate)	Medium Disintegration (loss of surface mortar between 0.2" and 0.4" and exposure of coarse aggregate)	Light Disintegration (no exposure of coarse aggregate)	Negligible
	Spalling	Large spall (greater than 0.8" in depth and greater than 6" in any dimension)	Small spall (not greater than 0.8" in depth or greater than 6" in any dimension)	Negligible	Negligible	Negligible

APPENDIX D – WOOD STRUCTURE EVALUATION

Typical Pole Defects		
Bark Inclusion	**Checking (Solitary)**	**Checking (Around Periphery of Pole)**
		
The growth of the main stem around a dead branch	The separation of fibers parallel to the grain and extending towards the center of the pole	Multiple checks around entire pole circumference
Cross Break	**Mechanical Damage**	**Split**
		
The separation of fibers perpendicular or at an angle to the grain	Transportation and erection damage due to machinery such as chainsaws or cranes	The cracking of a pole due to mechanical connections or the intersection of checks
Dead Streak	**Decay**	**Decay Knot**
The growth of the main stem around the dead wood	The softening of the pole due to fungal growth	Knots which have decayed and can extend towards the center of the pole
Pocket		
A Solitary Check, a series of checks at one location, or area of decay at the surface of the wood pole		

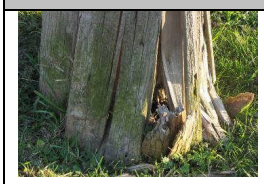
510 Pole – Broken

- Used when pole is broken due to impact, stress etc.

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
			
Damage poses significant risk of imminent failure	Damage is not an immediate threat to the integrity of the network or to public safety	N/A	N/A

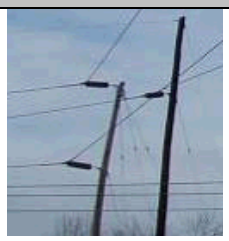
511 Pole – Visual Rotting

Used for physical damage which compromises the strength and/or integrity of the pole (checking, dead streak, bark inclusion, cross break, decay, burning, hollow sounding pole)

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
			
Damage poses significant risk of imminent failure	N/A	N/A	All Others

512 Pole – Leaning

Used when pole/structure is out of plumb(excludes raked angle structures which are intentionally out of plumb due to line angle)

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
			
Leaning pole which in Inspector's judgment poses immediate and substantial threat to public safety and/or system reliability	Pole top deflection in Inspector's judgment poses a near-term risk to structure integrity	Slope > 2" per 10' pole height	All other leaning poles

513 Pole – Replace Single Arm **- Used for damaged single arms. Arm refers to any horizontal member extending out from the main structure generally to support the conductor.**			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Arm damage poses immediate and substantial threat to public safety and/or system reliability	Substantial damage to cross section of arm causing the arm to deflect – failure may occur under non-extreme loading	Appreciable damage – failure may occur under extreme loading	N/A

514 Pole – Replace Double Arm **-** Used for damaged double arms.			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Arm damage poses immediate and substantial threat to public safety and/or system reliability	Substantial damage to cross section of arm causing the arm to deflect – failure may occur under non-extreme loading	Appreciable damage – failure may occur under extreme loading	N/A

515 Pole – Repair Braces - Used for damage to braces. Braces refer to intermediate members that connect parts of the structure.			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Brace damage poses immediate and substantial threat to public safety and/or system reliability	Substantial damage to cross section of brace causing the arm to deflect – failure may occur under non-extreme loading	Appreciable damage – failure may occur under extreme loading	N/A

516 Pole – Replace Braces - Used for damage to braces or missing braces. Braces refer to intermediate members that connect parts of the structure.			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Brace damage or lack of brace poses immediate and substantial threat to public safety and/or system reliability	Substantial damage to cross section of brace or lack of brace causing the arm to deflect – failure may occur under non-extreme loading	Appreciable damage – failure may occur under extreme loading	N/A

517 Pole – Replace Anchor **- Used for damage to anchor rod or head or pull out of the anchor**			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Guy failure poses immediate and substantial threat to public safety and/or system reliability	Anchor rod has corroded substantially or is broken, or anchor has pulled out and is no longer functioning as a structural member, or a guy should be present but is not	Appreciable damage – failure may occur under extreme loading	Superficial damage – but will not fail in 5 years
518 Pole – Install Anchor - Used when necessary anchor is missing			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Damage poses immediate and substantial threat to public safety and/or system reliability	Damage is not an immediate threat to the integrity of the network or to public safety	N/A	N/A
519 Pole – Repair/Replace Guy Wire - Used when a guy wire or its associated hardware, included fiberglass or wood rods, are in need of repair or replacement			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Guy failure poses immediate and substantial threat to public safety and/or system reliability	Guy is broken or seriously compromised (e.g. broken strands)	Guy is currently structurally sound, but has been compromised by corrosion, damage, etc.	N/A
521 Pole – Tighten Guy Wire - Used when a guy wire has gone slack, as from anchor pull out, structure movement, etc.			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
			
N/A	Slack guy is causing excessive structure deflection or overstress of other guys	Slack guy is not causing excessive structure deflection or overstress of other guys or the structure	N/A

522 Pole – Replace Guy Shield

- Used when guy shield is damaged. Inspector should install a new one.

All Priority Level "P" Perform

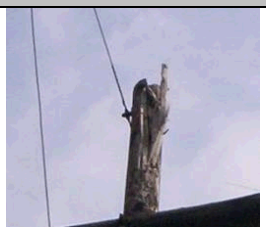
524 Pole – Guy Not Bonded

- Used when guy bond is inadequate or missing

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Guy not bonded

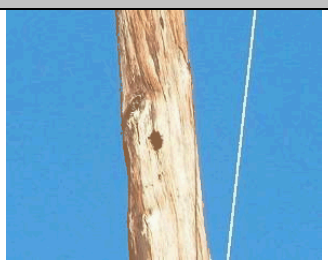
525 Pole – Lightning Damage

- Used when pole is damaged due to lightning.

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
			
Damage in Inspector's judgment poses immediate and substantial threat to public safety and/or system reliability	Non-serviceable Damage	Serviceable Damage	Superficial Damage

526 Pole – Woodpecker Damage

- Used when pole is damaged by woodpeckers creating nests in pole

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
			
N/A	Several Large (>5") Diameter Holes	Single Large (>5") Diameter Holes	Several Small (<5") Diameter Holes

527 Pole – Insects **- Used when pole is damaged by insects**			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Damage poses significant risk of imminent failure	N/A	N/A	All other noticeable damage
528 Pole – Aerial Number Missing - Used when aerial numbers are not installed where required			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	N/A	N/A	Aerial numbers are required at all road crossing, all structures ending in zero, and the first and last structures of a line.

APPENDIX E – INDIVIDUAL WOOD POLE EVALUATION

901 Osmose – Identified Priority Pole **- Used to document pole identified as a priority reject on Wood Pole Groundline Inspection**			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	N/A	N/A	All
902 Osmose – Identified Reject Pole - Used to document pole identified as a reject on Wood Pole Groundline Inspection			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	N/A	N/A	All
903 Osmose – Inspect Excessive Check (not reject) - Used to document pole identified as having excessive checking on Wood Pole Ground Line Inspection			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	N/A	N/A	All
904 Osmose – Climbing Inspection Required (not reject) - Used to document pole identified as needing a climbing inspection on Wood Pole Ground Line Inspection			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	N/A	N/A	All
905 Osmose – No Inspection Tag - Used to document pole that has no evidence of prior Wood Pole Inspections. Not required for poles under 10 years old.			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	N/A	N/A	All

APPENDIX F – STEEL POLE AND STRUCTURE EVALUATION

531 Tower – Tower Legs Broken- Used when tower legs are broken			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Leg damage which in Inspector's judgment poses immediate and substantial threat to public safety and/or system reliability	Leg damage which in Inspector's judgment poses a near-term risk to structure integrity	N/A	N/A
532 Tower – Aerial Number Missing- Used when aerial numbers are not installed where required			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	N/A	N/A	Aerial numbers are required at all road crossing, all structures ending in zero, and the first and last structures of a line
534 Tower – Loose Bolts/Hardware- Used loose or missing connections on hardware			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
			
Missing connections on members in judgment of Inspector pose an immediate and substantial threat to public safety and/or system reliability	Missing connections	Loose Connections	N/A
535 Tower – Repair Anti-Climb- Used to repair anti-climb device			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	N/A	N/A	Anti-climbing device needs repair
536 Tower – Vegetation on Tower -Used when vegetation needs to be cleared from tower			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
All Priority Level "F" - Forestry			

537 Tower – Structure Damage **- Used for broken, bent or missing members on tower**			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
			
Damage in judgment of Inspector poses and immediate and substantial threat to public safety and/or system reliability	Broken or nearly broken members	Damage/Excessive bending on minor members	N/A
538 Tower – Straighten Tower - Used when tower is out of alignment			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Leaning tower in judgment of Inspector poses immediate and substantial threat to public safety and/or system reliability	Substantial deflection, near-term risk to structural stability	Appreciable deflection, ability of tower to sustain extreme loading conditions may be compromised	Aesthetic only
539 Tower – Arms Damaged - Used when the arms on a tower are damaged			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Damaged arms in Inspector's judgment pose an immediate and substantial threat to public safety and/or system reliability	Arm damage poses a risk of failure under routine loading e.g. a near term risk of failure	Arm damage poses a risk of failure under heavy loading	Superficial damage only

APPENDIX G – CONDUCTOR AND LINE HARDWARE EVALUATION

541 Conductor – Bird Caging (Add comment – Bird Caging)

- Used to rate conductor bird caging.

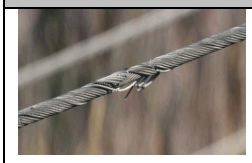
Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	 Bird Caging

541 Conductor – Broken (Add comment – Broken Conductor)

- Used to rate conductor damage.

Note: TransLOME may revise priority levels based on an engineering evaluation of factors such as mechanical and electrical loading.

230kV and Above

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
 Any broken conductors	N/A	N/A	N/A

115kV and Below

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
 Significant percentage of broken strands	 Small percentage of broken strands	N/A	N/A

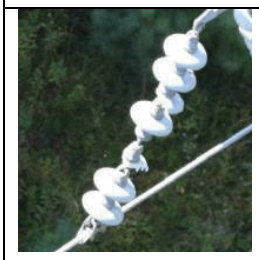
543 Conductor – Ground Wire **- Used for any damage to the ground leads on the structure**			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Ground wire damage in judgment of Inspector poses an immediate and substantial threat to public safety and/or system reliability; this includes a loose ground wire near the top of the pole which may be a risk to contact the conductor	Ground wire missing or disconnected/broken on 3 or more adjacent structures	Ground wire missing or disconnected/broken on isolated structures only, or ground wire is loose near the base of the pole where there is no risk of contacting the conductor	N/A
544 Conductor – Sleeve/Connector - Used for damage to splices or connectors on the shield/static wire or conductors			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Failure in judgment of Inspector poses an immediate and substantial threat to public safety and/or system reliability	Visible physical damage to connector/splice/conductor	Visible corrosion at splice/connector	N/A
546 Conductor – Under 25 Feet - Used for substandard clearances and conductors with excessive sag.			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Conductor poses significant risk of danger to the public	N/A	N/A	General Guidelines by Voltage: • 69kV – 115kV 25 ft • 230kV – 345kV 30 ft Clearances must meet requirements of latest National Electric Safety Code, as well as local requirements (e.g. MA CMR

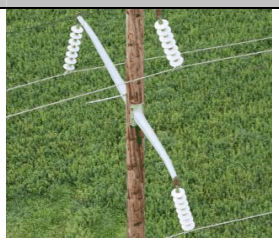
551 Line Hardware – Insulator Damage

- Used for chipped or broken insulators

*Insulators that are physically separated are Priority Level 1

- NOTE: A chipped or cracked insulator (porcelain damage does not reach more than ½ way to the center of the insulator) is not be counted as a damaged insulator if damage is not severe. This is up to the inspector's discretion.

Nominal System Voltage kV	Number of Good Insulators per String			
	Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
69	Separated	4 or less	5	6 & up
115	Separated	4 or less	5	6 & up
230	Separated	7 or less	8-9	10 & up
345	Separated	10 or less	11-12	13 & up
450DC	Separated	16 or less	17-18	19 & up
Broken Insulators			Separated Insulators	
				

552 Line Hardware – Insulator Plumb **- Used for insulators unintentionally out of plumb**			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
			
N/A	N/A	N/A	Usually a sign of high amplitude conductor movement, galloping.
553 Line Hardware – Hardware Damage Used for any damage to other line hardware			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Hardware damage in Inspector's judgment poses and immediate and substantial risk to public safety and/or system reliability	Structural Hardware damage which poses a near-term risk to structural integrity	Structural Hardware damage, e.g. damaged connections	Cosmetic Damage
555 Line Hardware – Lightning Arrestor Used when a lightning arrestor is damaged or has failed			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	Arrestor has failed. Lightning arrestors fail by disconnecting and falling away from the conductor	N/A	N/A

APPENDIX H – FOUNDATION EVALUATION

563 Foundation – Erosion **Used for any erosion around foundations**			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Erosion in Inspector's judgment poses and immediate and substantial risk to public safety and/or system reliability	Erosion is compromising structural integrity	Structure not yet at risk, but erosion appears to be progressing at a significant rate	Small erosion, may eventually become significant

APPENDIX I – ROW / MISC. / SWITCH / GIS EVALUATION

571 Right of Way – Erosion
Used for any overall erosion in ROW

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
Erosion exposes counterpoise and presents a significant danger to public and/or vehicular traffic	Erosion exposes counterpoise and presents a danger to public	N/A	Any other ROW erosion, i.e. washed out road or culverts

572 Right of Way - Encroachments
Used for any unapproved use of ROW or things too close to lines

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	 Any encroachments

573 Right of Way – Debris
Used for any debris in ROW

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Any debris in ROW blocking access

574 Right of Way – Danger Tree
Used for any danger trees adjacent to lines
REPORT ALL TO TRANSMISSION FORESTRY

Voltage	Vertical or Lateral Clearance	
23 – 46 kV 69 kV 115 kV 230 kV 345 kV		**All Priority Level "F" - Forestry**

575 Right of Way – Gate Broken
Used for broken ROW gates

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Broken Gate

576 Right of Way – Oil/Gas Leak **-Used for any oil, gas leaks or other foreign substances in ROW. Notify System Delivery immediately**			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
			Oil/Gas found in ROW
581 Misc – Stencil Line/Structure Number at Ground - Used when line/structure number is missing. Inspector to stencil structure			
Priority Level 1	**Priority Level 2**	**Priority Level P**	**Priority Level 4**
N/A	N/A	Inspector stencils number	Inspector cannot stencil number
582 Misc – Switch Damaged Used when switch is damaged			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
Visible arcing is present or condition could result in immediate failure.	Switch may fail, burning and other evidence of arcing	Switch may not be able to be operated, but likely won't fail and put the line out of service	Insignificant damage
583 Misc – Damaged Switch Ground Used for damaged switch grounds			
Priority Level 1	**Priority Level 2**	**Priority Level 3**	**Priority Level 4**
N/A	Ground grid is exposed or lead is damaged	N/A	N/A
584 Misc – Install/Replace Warning Sign Used for damaged or missing warning signs. Warning signs required on both sides of all structures (2 signs total).			
Priority Level 1	**Priority Level 2**	**Priority Level P**	**Priority Level 4**
N/A	Install warning signs at all structures that are adjacent to roads, regularly traveled pedestrian thoroughfares, or places where persons frequently gather (such as schools or public playgrounds)	Sign installed/replaced by Inspector	Install/replace signs at a low risk location where public interaction is not likely.

585 Misc – Replace Signs
Used for missing aerial structure signs. Aerial circuit and structure ID is required on all structures at road crossings, the first and last structures of a line, and all structures ending in zero.

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Install/replace signs

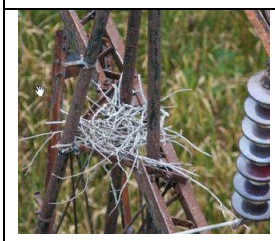
586 Misc – Remove Steps
Steps must be removed at least 10' from the ground line

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Remove steps

587 Misc – Add Dirt and Tamp
Used on poles when fill dirt is insufficient

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4

589 Misc – Bird Nest
Used when bird nests are found on line

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
 Bird nest in Inspector's judgment poses and immediate and substantial risk to public safety and/or system reliability	N/A	 Limited risk of bird contact but nest should be removed	No risk of contact such as very small nests or those at bottom of structure.

589 Misc – Bird Perching
Used when bird perching could lead to problems

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	 Birds perching on line or evidence of bird perching on line.

760 GIS – Map Does Not Match Field
Used when GIS map does not match field

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Note error

761 GIS – Equipment Stenciling in Error in GIS
Used when equipment labels do not match GIS

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Note error

762 GIS – Equipment/Hardware Missing in GIS
Used when equipment is missing in GIS

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Note error

763 GIS – Equipment Removed in field, Remove from GIS
Used when equipment has been removed from the field but not in GIS

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Note error

769 GIS – Other GPS/GIS Errors
Used for all other GIS errors

Priority Level 1	Priority Level 2	Priority Level 3	Priority Level 4
N/A	N/A	N/A	Note error

Appendix J – COMPUTAPOLE CODES / PRIORITY LEVEL

Code	Description	Funding Notes: 6 & 7	Default Level Notes: 1 thru 5	Valid Levels Notes: 1 thru 5
501	Osmose – identified priority pole	C	3	2
502	Osmose – identified reject pole	C	3	3
503	Osmose – Insp excessive check (not reject)	C	4	4
504	Osmose – Climbing Insp req'd (not reject)	C	4	4
901	Osmose – identified priority pole	E	4	4
902	Osmose – identified reject pole	E	4	4
903	Osmose – Insp excessive check (not reject)	E	4	4
904	Osmose – Climbing Insp req'd (not reject)	E	4	4
510	Pole – Broken	C	2	1 2
511	Pole – Visual Rotting	C	3	1 4
512	Pole – Leaning	E	4	1 2 3 4
513	Pole – Replace Single Arm	C	3	1 2 3
514	Pole – Replace Double Arms	C	3	1 2 3
515	Pole – Repair Braces	E	3	1 2 3
516	Pole – Replace Braces	E	3	1 2 3
517	Pole - Replace Anchor	E	2	1 2
518	Pole – Install Anchor	C	3	1 2 3 4
519	Pole – Repair/Replace Guy Wire	E	3	1 2 3
521	Pole – Tighten Guy Wire	E	3	2 3
522	Pole – Replace/Install Guy Wire	E	P	P
524	Pole – Guy Not Bonded	E	4	4
525	Pole – Lightning Damage	C	3	1 2 3 4
526	Pole – Woodpecker Damage	E	3	2 3 4
527	Pole – Insects	E	3	1 4
528	Pole – Aerial Number Missing	E	4	4
531	Tower – Tower Legs Broken	E	2	1 2
532	Tower – Aerial Number Missing	E	4	4

Code	Description	Funding Notes: 6 & 7	Default Level Notes: 1 thru 5	Valid Levels Notes: 1 thru 5
534	Tower – Loose Bolts/Hardware	E	3	1 2 3
535	Tower – Repair Anti-Climb	E	4	4
536	Tower – Vegetation on Tower	E	F	F
537	Tower – Structure Damage	E	3	1 2 3
538	Tower – Straighten Tower	E	3	1 2 3 4
539	Tower – Arms Damaged	E	3	1 2 3 4
540	Conductor – Infrared Problem	E	3	1 2 3
541	Conductor – Conductor	E	3	1 2 3
542	Conductor – Static	E	3	1 2 3
543	Conductor – Ground Wire	E	3	1 2 3
544	Conductor – Sleeve/Connector	E	3	1 2 3
546	Conductor – Under 25 ft.	E	4	1 4
547	Infrared Problem Identified	E	2	1 2 4
551	Line HDW – Insulator Damaged	E	3	1 2 3 4
552	Line HDW – Insulator Plumb	E	4	4
553	Line HDW – Hardware Damaged	E	3	1 2 3 4
555	Line HDW – Lightning Arrestor	C	2	2
556	Line HDW – Infrared Problem	C	3	1 2 3
563	Foundation – Erosion	E	3	1 2 3 4
571	Right of Way – Erosion	E	4	1 2 4
572	Right of Way – Encroachments	E	4	4
573	Right of Way – Debris	E	4	4
574	Right of Way – Danger Tree	E	F	F
575	Right of Way – Gate Broke	E	4	4
576	Right of Way – Oil/Gas Leak	E	4	4
581	Misc – Stencil Line/Structure Number at Ground	E	P	4 P
582	Misc – Switch Damaged	E	3	1 2 3 4
583	Misc – Damaged Switch Ground	E	2	2

Code	Description	Funding Notes: 6 & 7	Default Level Notes: 1 thru 5	Valid Levels Notes: 1 thru 5
584	Misc – Install/Replace Warning Sign	E	4	4 P
585	Misc – Replace Signs	E	4	4
586	Misc – Remove Steps	E	4	4
587	Misc – Add Dirt and Tamp	E	3	3 4
588	Switch – Infrared Problem	E	3	1 2 3
589	Misc – Bird Nest	E	3	1 3 4
590	Misc – Bird Perching	E	4	4
760	GIS – Map Doesn't Match Field	E	4	4
761	GIS – Equip. Stenciling In Error	E	4	4
762	GIS – Equip/Hardware Missing	E	4	4
763	GIS – Equip. Removed in Field	E	4	4
764	Remove from GIS	E	4	4
769	GIS- Other GPS/GIS Errors	E	4	4

NOTES

1. Level 1 code:
   Do not enter STORMS
   The defect shall be reported immediately
   The work shall be completed within a week
   A confirming work order shall be used to track costs
2. Level 2 and 3 codes:
   Pass through STORMS and Design
   Level 4 code:
   Are for notation only
   Do not enter STORMS
4. Level P code:
   Defect corrected by the inspector
5. Level F code:
   Go to Forestry
6. E is Expense
7. C is Capex

Appendix 13

NG-USA EOP G017 Street Light Standard Inspection Program

INTRODUCTION

The purpose of this procedure is to outline the requirements for the inspection cycle for Street Light Standard facilities owned by National Grid. The inspection shall include identifying and reporting the physical condition of street lighting equipment on street light pole standards. Street lights attached to wood poles are inspected as part of the Overhead Distribution Inspection Patrol covered by NG-EOP D004.

All street lighting equipment will be inspected for physical damage, potentially hazardous conditions or obvious deterioration.

Inspections will be recorded on a Windows® based hand-held computer. The maintenance items identified during this inspection will be separated into four priority levels 1, 2, 3, and 4. The maintenance codes identified will default to the appropriate priority level. The default level can be adjusted by the individual performing the inspection based on actual field conditions.
These priority levels are defined as follows:

Level 1- An identified facility/component that shall be repaired/replaced within 1 week.

Level 2 - Identified facility/component condition that shall be repaired/replaced within 1 year.

Level 3 – Identified facility/component condition that shall be repaired/replaced within 3 years.

Level 4 – This priority category is to collect inventory information on actual field conditions to be used by Investment Strategy and Work Planning.

All Level 1 priority conditions identified in the field shall be called in by the Inspector as follows:

1. Notification by location
   New York: System Operations Dispatch 1-877-716-4996.
   NE North: Bay State West & Central: Northborough Control Center 1-508-421-7879
   NE North: North & Granite: Northborough Control Center 1-508-421-7879.
   NE South: Bay State South & Ocean State (RI): Northborough Control Center 1-508-421-7885

2. Detailed information provided to the regional notification location
   a. Identify yourself as a Company Inspector and your work reporting area.

   b. Details of the Level 1 Priority Condition
      i. Describe the facility/component condition found.
      ii. Street Address, District, Feeder No., Line No., Tax District and Pole No.
      iii. If you are standing by or have secured the location.
      iv. Any additional information that would assist in finding the location of the problem.

3. Notify area Inspection Supervisor for follow-up.

PURPOSE

This procedure applies to all personnel involved with or responsible for the inspection and maintenance of street lighting pole standards and associated facilities owned by National Grid throughout the service territory.

ACCOUNTABILITY

1. T&D Services
    A. Update procedure as necessary
    B. Provide personnel guidance and assistance as requested.

2. Electric Operations – Inspection & Maintenance
    A. Provide qualified and trained personnel as the distribution inspectors, to provide consistent and accurate data.

    B. Request assistance from Distribution Line Contracting when necessary to complete work assigned in the appropriate time frame.

3. Distribution Line Contracting
    A. At the request of Operations/Distribution Asset Management obtain, schedule and manage contractors to perform inspections and perform required maintenance.

4. Distribution Inspector
    A. Demonstrate the ability to identify streetlight maintenance items and the aptitude to become proficient in the use of a hand-held computer and desktop computer.

    B. Demonstrate the understanding and requirements of NG-EOP-G017.

    C. Possess the ability to do walking patrols, collect information on a hand held, download to a desk top computer, edit data, provide requested information/reports/work tickets to supervision, and track/close out work completed in the database system.

5. Distribution Asset Management
    A. Provide input into program revisions.
    B. Ensure the program as outlined in this EOP is completed each year.
    C. Develop and/or revise a five-year inspection schedule of all facilities covered by this EOP.
    D. Develop Outdoor Lighting Asset Strategy.

6. Process and Systems
    A. Provide and support database.

REFERENCES

National Grid Safety Procedures
National Grid Employee Safety Handbook
NY PSC Order 04-M-0159
NY PSC Order Adopting Changes to Electric Safety Standard, December 2008
Elevated Equipment Voltage NG- EOP G016

TRAINING

Provided by appropriate National Grid training program.

DOCUMENT CONTENTS

Table of Contents

1.0 SAFETY REQUIREMENTS 3
2.0 STREET LIGHT INSPECTION PATROLS 4
3.0 EQUIPMENT TO BE INSPECTED AND MAINTENANCE CODES 4
4.0 STREET LIGHT MAINTENANCE DATABASE/REPORTS 6
5.0 MAINTENANCE SCHEDULE 6
6.0 COMPLETION 6
7.0 EXCEPTION APPROVALS 7
8.0 REVISION HISTORY 8

1.0 SAFETY REQUIREMENTS

1.1 **All work shall be performed in accordance with:**

National Grid Employee Safety Handbook
Applicable National Grid Electric Operating Procedures (EOP).
Applicable National Grid Safety and Health Procedures (SHP).

1.2 **All applicable and appropriate Personal Protective Equipment (PPE) shall be worn.**

2.0 STREET LIGHT INSPECTIONS

2.1 Street Lighting inspections will be performed as foot patrols and are conducted by a street light qualified worker or contractor.

2.2 The foot patrols are scheduled in such a manner that street lighting facilities are inspected once every five years for both New York and New England.

a. In New York & Massachusetts, the street light standards inspections scheduled for the year shall be completed by December 31.

b. In Rhode Island, the street light standards inspections scheduled for the year shall be completed by March 31.

2.3 The Outdoor Lighting group is responsible for creating and/or revising this schedule for the respective geographic areas.

2.4 The Inspector or qualified contractor uses a Windows® based hand-held computer to record the following

a. Employee ID, region, district, street lighting installation standard number, GPS location,

b. Priority Level 1, 2, 3 and 4 maintenance items, and comments.

2.5 Outdoor Lighting maintenance codes shown in Table I.

2.6 The inspector shall place the CSS-OL street light standard number on the facility if not found numbered during the foot patrol.

3.0 EQUIPMENT TO BE INSPECTED AND MAINTENANCE CODES

3.1 Luminaires

A complete lighting unit consisting of a housing, auxiliary electrical, components, reflector/refractor and lamp socket.

3.2 Luminaire Arm

A device used on Metal or Fiberglass pole to extend and hold the luminaire out over the roadway surface.

3.3 Pole Standards

Metal or fiberglass pole for post style luminaries

3.4 Foundations

A supporting structure for an anchor base pole – usually precast concrete.

TABLE I

PRIORITY 1, 2 and 3 MAINTENANCE ITEMS FOR OUTDOOR LIGHTING

Category	CODE	Default Priority	Description
Luminaire	300	2	Light "ON" Day
	301	2	Replace Lens
	302	4	Clean
	303	4	Paint
	304	4	Replace Wattage Label
	305	2	Wires Exposed
	306	2	Damaged - Replace
	307	4	Missing
	308	4	Other - Comments
Arm	320	2	Damaged - Replace
	321	4	Damaged - Repair
	322	4	Rust - Paint
	323	4	Other - Comments
Pole Standard	330	4	Structure Damage - Replace
	331	4	Damaged/Leaning - Repair
	332	4	Paint/Maintenance
	333	P	Access Cover - Replace
	334	4	Bad Wiring - Repair
	335	4	Stencil Required
	336	2	Temporary Overhead *
	337	2	Ground - Repair
	338	4	Knockdown/Missing
	339	4	Other – Comments
	344	P	Standard Repair 1 Patch
	345	P	Standard Repair 2 Patches
	346	P	Standard Repair 3 Patches
	347	P	Standard Repair Wrap material applied
	348	P	Standard Repair Angel Guard
	349	P	Knockdown Box/Cone Installed
Foundation	350	4	Damaged/Leaning - Repair
	351	4	Anchor Bolts Damaged
	352	4	Elevated - Repair
	353	4	Other - Comments

Note: The default priority of Level 4 for missing luminaries and street light standards is utilized for informational use only. If the street light standard is missing or missing a luminaire, the item shall be reviewed with records, if found to be a required and an active asset it shall be changed to a Level 1 priority.

***Refer to EOP NG-EOP G029 (Tracking Temporary Repairs to Electric System) for tracking and reporting of temporary repairs.**

4.0 STREET LIGHT MAINTENANCE DATABASE/REPORTS

4.1 The Street Light Maintenance Data Base consists of records downloaded from the hand-held computers and information entered from the desktop computers.

4.2 The records can be downloaded to the database through any desktop computer that is connected to the network and the inspector is logged on as a valid user of the Street Light Standard Inspection program.

4.3 The desktop computer is also used to generate various reports and work tickets, depending on the user's need. These reports/work tickets are utilized to schedule and accomplish distribution maintenance work.

5.0 MAINTENANCE SCHEDULE

5.1 Maintenance activities are scheduled by priority Levels.

a. All "Level 1 Priority" conditions identified shall be repaired/corrected within 1 week.

b. All "Level 2 Priority" conditions identified shall be repaired/corrected within 1 year.

c. All "Level 3 Priority" conditions must be repaired within 3 years. Level 4 Priority is for inventory purposes only.

5.2 Once the Street Light Patrol is completed in the Street Light Maintenance Database or 21 days have elapsed since the inspection, the Level 2 and Level 3 Priority maintenance codes are downloaded into STORMS.

a. Expense maintenance work goes straight to scheduling.

b. Capital work goes to Distribution Design and then scheduled.

c. Level 1 Priority maintenance codes are communicated by the Distribution Inspector directly to the field operations group for the area where the feeder is located.

6.0 COMPLETION

6.1 The completion of Level 1 priority maintenance codes is performed by the field operations Supervisor or their designee.

6.2 Level 2 & 3 priority maintenance codes are tracked in the Street Light Maintenance database and placed into STORMS.

a. STORMS work order initiated for level 2 &3 work to be scheduled.

b. CSS-OL database is updated once the associated STORMS orders are complete for the work request associated with the maintenance code from the Street Light Database.

6.3 All maintenance work is to be completed per Nationalgrid Distribution Standards.

6.4 All maintenance work performed that was identified on the STORMS work order or discovered during the replacement/repair/correction of the original maintenance problem shall be listed in the Street Light Maintenance database and closed out when complete.

7.0 EXCEPTION APPROVALS

7.1 It is recognized that situations may arise that are not covered by this procedure

7.2 When this occurs, an exception may be approved

7.3 The person in charge of the work shall

- a. Develop a work plan detailing
  - a. The need for an exception to the EOP
  - b. Additional safeguards to be employed
- b. Provide the work plan to and obtain approval from all:
  - a. The manager in charge of the work
  - b. The manager of T&D Work Methods
  - c. A manager from Safety
- c. Alternatively, approval may be obtained from a designee of any of the above

7.4 If agreement cannot be obtained at the manager level

- a. The request shall be forwarded to the Director levels
  - a. Director's may assign a designee

7.5 After approval is obtained

- a. The work plan shall be reviewed with all workers who will participate in the job
  - a. All workers need to agree on the work plan
  - b. Document the exception on the job brief

7.6 T&D Work Methods shall publish a Memorandum documenting the approval

- a. A copy of the work plan shall be included
- b. Such memorandum shall be sent to all stakeholders and approvers
- c. The memo shall be stored for the record

8.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	02/16/10	This document supercedes document dated 07/25/05.
2.0	08/07/15	This document supercedes document dated 02/16/10.
3.0	06/10/19	Formatting changes, broke paragraphs into subsections Accountability Section, Updated group roles/responsibilities Updated Copyright Information Sections: 1.0 New section “Safety Requirements” added 3.0 Revised “Equipment to be tested” 7.0 New section: “Exception Approvals” added

Appendix 14

NG-USA EOP G004 Shock Complaints

INTRODUCTION

This procedure describes the requirements for investigating and reporting on a customer's shock complaint. A shock complaint is a customer call that states a person has received an electric shock. When investigating a shock complaint, Company field personnel shall determine if the shock was caused by faulty customer equipment, a neutral-to-earth voltage associated with the Company's distribution system, or an external DC voltage source. Regardless of the cause, a shock complaint is considered an emergency and shall be dispatched and investigated as soon as possible. The appropriate Dispatch or Control Center shall be notified of all shock incidents by the field. Shocks that involve injury, require medical attention or are fatal, all communications shall be completed as required by National Grid Electric Operating Procedure NG-EOP G009 Personal Injury Accident/Newsworthy Event Reports.

PURPOSE

This document details specific steps that shall be followed when National Grid receives a shock complaint call.

ACCOUNTABILITY

1. Distribution Work Methods
    A. Update procedure as necessary.

2. Management & Supervision
    A. Ensure the components of the procedure are implemented.
    B. Ensure workers are trained in this procedure.
    C. Provide procedure revision input as necessary.

3. Employees
    A. Demonstrate an understanding of this procedure.
    B. Comply with the requirements of this procedure.

REFERENCES

National Grid Employee Safety Handbook
National Grid Safety and Health Policies & Procedures
NG-EOP G003 Neutral-to-Earth Voltage Complaint
NG-EOP G009 Personal Injury Accidents/Newsworthy Event Reports
Metering Services Department Procedure MS505 Shock Complaint
Metering Services Department Procedure MS508 Warning Tag Electric
National Grid OH Construction Standards

Forms Ordering: https://teams.nationalgrid.com/sites/Syracuse

TRAINING

Provided by the employee's supervisor or department head and appropriate National Grid Training Program.

DOCUMENT CONTENTS

Table of Contents

1.0 ORDER PROCESSING 3

2.0 INVESTIGATION 3

3.0 REVISION HISTORY 7

1. SAFETY

1.1. All work shall be performed in accordance with:
- 1.1.1. National Grid Employee Safety Handbook
- 1.1.2. Applicable National Grid Electric Operating Procedures (EOP)
- 1.1.3. Applicable National Grid Safety and Health Procedures (SHP)

1.2. All applicable and appropriate Personal Protective Equipment (PPE) shall be worn.
- 1.2.1. Including but not limited to: (***default is not to list core PPE***)

1.3. The employee in charge of the work shall conduct a written pre-job brief with the employees involved prior to the start of each job. Using the Job Brief Form as an aide, discussions for performing the work should include:
- 1.3.1. Traffic control devices – Work Area Protection (WAP)
- 1.3.2. Emergency Events: communication methods (code blue), first responders, and closest hospital.
- 1.3.3. Add other specific topics to be discussed.

1.4. Minimum Approach Distances (MAD) to energized lines or exposed live parts shall be maintained (refer to Employee Safety Handbook Tables 2A, 2B and Appendix A for distances).

1.5. Identify if a Process Hazard Assessment (PHA) is required. Refer to NG-EOP-G037 "Process Hazard Analysis"

1.6. Identify if an ARC flash assessment is required. Refer to NG-EOP G035 "ARC Flash Awareness and Mitigation" and Work Methods Infonet site for Arc Flash Table to determine working distance and energy levels – see link below:

http://us3infonet/sites/eng_delivery_svcs/Pages/ArcFlashMitigation.aspx#2015

1.0 ORDER PROCESSING

1.1 Regardless of the cause, all shock complaints are considered an emergency order type that requires immediate dispatch. When the Customer Contact Center (CCC) receives a call from a customer stating that a person has received a shock, the CCC:

1.1.1 Immediately transfers to Dispatch any calls from 911 officials with an associated emergency or life-threatening situation.

1.1.2 Retrieves the customer's account information and verifies the customer's account information on the Account window.

1.1.3 Informs the customer that someone needs to be present at the premise in order for the shock complaint to be investigated and Informs the customer that their service may be disconnected if no one is present at the premise and a problem is detected.

1.1.4 Completes the Issue Investigation Order for Account or a Service Order Form (paper copy) in its entirety and faxes the completed form to the appropriate dispatch office when the Customer Service System is down.

1.1.5 Calls Dispatch office to verify receipt of the Issue Investigation Order for Account or the faxed Service Order Form.

2.0 INVESTIGATION

2.1 The individual investigating a shock complaint (generally a field service representative) shall:

2.1.1 Initiate Shock and/or Neutral to Earth Voltage Complaint Investigation Form NG0024 (Exhibit 1) http://infonetus/formscatalogweb/forms/NG0024.pdf

2.1.2 Use this form on **every** shock complaint order, even when the individual conducting the investigation resolves the problem without involving outside departments.

2.1.3 Make the first check with a National Grid approved testing device between a known ground source and the origin of the shock.

2.1.4 If the test between the ground and the shock source indicates higher than secondary voltages:

a. Safely evacuate customer(s) from the premise.

b. Contact Customer Meter Services Supervisor and System Operations Dispatch from a remote location and request Electric Operations assistance.

c. Safeguard and keep the hazardous area clear until Electric Operations provides relief.

2.1.5 If the test between ground and the source of the shock indicates secondary or lower voltages:

a. Connect an AC multi-range voltmeter (such as Fluke 87) that provides true RMS at the same location and observe the readings. Leave the voltmeter connected at this location.

b. Check for proper bonding. If additional bonding is required, assist or advise the customer accordingly.

c. Open the customer's main breaker(s)/fuse(s), remove the meter and observe the voltmeter.

1. If voltage drops to zero, the problem is within the customer's equipment.

i. Reinstall meter and close main breaker(s)/fuse(s).

ii. Isolate the trouble circuit by opening each breaker/fuse one at a time until the voltage reading on the voltmeter drops to zero.

iii. Identify equipment and wiring on troubled circuit.

iv. Isolate and disconnect troubled equipment or wiring and issue an Electric Warning Tag Form NG0023 (Exhibit 2). http://infonetus/formscatalogweb/forms/NG0023.pdf

v. The individual conducting the investigation shall inform the customer to contact a licensed electrician or appliance repair person to check out internal wiring or appliances.

vi. Record this information on the Shock and/or Neutral to Earth Voltage Complaint Investigation Form NG0024 (Exhibit 1).

2. If the voltage does not drop to zero, each customer on the same secondary shall be disconnected in the same manner as above. Any other customers in close proximity and with a common water supply may also have to be checked. In each case, the voltmeter should remain connected at the original complaint's premise.

3. If voltage is still present after steps 1 & 2 have been completed, it will be necessary to determine if the condition is the result of a neutral-to-earth AC source or a DC voltage. Connect the AC-DC multi-range voltmeter that provides true RMS and use the DC scale to observe readings:

i. If DC voltage is measured, the problem is with a DC source (i.e., cable TV, telephone). Inform the customer that the problem is with a source that National Grid cannot correct or check.

ii. Record this information on the Shock and/or Neutral to Earth Voltage Complaint Investigation Form NG0024 (Exhibit 1).

iii. Notify Communications Companies.

4. If voltage is still present after steps 1 & 2 have been completed and the voltage is AC:

i. Further investigation is required by the Engineering Lab in NE or the Meter and Test Department in NY per NG-EOP G003 – Shock and/or Neutral-to-Earth Voltage Complaint.

ii. Record this information on the Shock and/or Neutral to Earth Voltage Complaint Investigation Form NG0024 (Exhibit 1) and forward to the Engineering Lab in NE or the Meter and Test Department in NY.

EXHIBIT 1

"Shock and/or Neutral-to-Earth Voltage Complaint Investigation Report" (Form #NG0024)

http://infonetus/formscatalogweb/forms/NG0024.pdf

SHOCK AND/OR NEUTRAL TO EARTH VOLTAGE COMPLAINT INVESTIGATION REPORT

nationalgrid

Customers's Name		Phone
Street, Road, Etc.	Circuit	Pole or Enclosure
City, Town, Village		

TEST LOCATION SKETCH

VOLTAGE READINGS

CIRCUIT CONFIGURATION	A.C. Volts		D.C. Volts		CORRECTIVE ACTION
	As Found	As Left	As Found	As Left	
Normal					
Meter Removed					

REMARKS

DATE:	BY:

NG0024 (11.06)

EXHIBIT 2
"Warning Notice" Form #NG0023
http://infonetus/formscatalogweb/forms/NG0023.pdf

WARNING NOTICE

TO OUR CUSTOMER

M _____

_____

In response to your request we have inspected your electrical installation and found the cause of your service failure to be as follows:

_____ Short in _____
_____ Defective _____
_____ Overloaded Branch Circuit
_____ General Overload
_____ Over-fused Branch Circuits
_____ _____
_____

NOTE: Replacing of blown fuses will not correct the trouble listed above.

We recommend that you call your:

_____ Electrical Contractor
_____ Appliance Repairman

to make the necessary repairs.

nationalgrid

SERVICE REP _____
DATE _____
NG0023(01.06)

3.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	07/14/11	This document supersedes document dated 02/01/07.
2.0	04/27/15	This document supersedes document dated 07/14/11.
3.0	10/01/19	This documnet supersedes document dated 04/27/15 Added section 1.0 Safety Template

Appendix 15

NG-USA SMP 400.13.2 Substation Maintenance Visual and Operational (V&O) Inspection

INTRODUCTION

This procedure describes the methods used to perform Visual and Operational (V&O) Inspections of electrical substations used in the transmission and distribution of electricity.

PURPOSE

V&O Inspections, are performed with the apparatus in service, and are used to:

Verify the security of fences, gates etc. that prevent entry of the public, and provide a legal record of their inspection.

Detect any hazards to company employees or the public.

Verify that animal protection measures are present and in good condition.

Detect abnormal conditions before the apparatus is damaged or a customer outage occurs.

Collect data (counter readings, fault operations etc.) used to prioritize individual apparatus inspections.

Collect data (regulator travels, load readings, relay targets etc.) used for system operation purposes.

Not all equipment is listed in CMMS such as bus & line surge arrestors, distribution PTs/CTs, etc. which are considered consumables and found in stock. Any problems with such devices shall be noted in the mobile device under station general and supervision advised of these conditions.

ACCOUNTABILITY

Functional Groups engaged in performing Substation Inspections.

Substation and other Supervisors supervising inspection and maintenance activities.

Substation and other Workers performing inspection and maintenance activities.

COORDINATION

Substation Management who schedule, review, and follow up on reported V&O observations.

REFERENCES

National Grid USA Safety Handbook

SMS 400.21.1 Oil Leak Reporting Procedure

SMS 400.15.1 Trouble Reporting Procedure

EP-14 Oil Filled Electrical Equipment Management

Manufacturer's Installation, Operating, and Maintenance manuals for the specific equipment to be inspected.

Manufacturer's operating manuals for the specific test equipment to be used.

DEFINITIONS

CMMS - Computerized Maintenance Management System

TRAINING

Included as part of the L&D Training Modules.

DOCUMENT CONTENTS

Table of Contents

1.0 TEST EQUIPMENT REQUIRED 3
2.0 MATERIALS REQUIRED 3
3.0 INITIAL SUBSTATION ENTRY 3
4.0 INSPECT YARD 3
5.0 NOTIFY THE SYSTEM OPERATOR 4
6.0 REPORTING AND CORRECTING PROBLEMS AND DISCREPANCIES 4
7.0 CONTROL HOUSE 4
8.0 YARD INSPECTION 9
9.0 OIL LEAK REPORTING 12
10.0 APPARATUS INSPECTIONS 13
11.0 FINAL CHECKLIST 14
12.0 APPENDIX A - ADDITIONAL MATERIALS 15
13.0 APPENDIX B – TROUBLE REPORTING 18
14.0 REVISION HISTORY 20

1.0 TEST EQUIPMENT REQUIRED

1.1 Digital Multi-meter, IEC 1010-1 Cat. IV
- 1.1.1 Spare battery

1.2 Recloser Battery test meter with load test feature.
- 1.2.1 For Form 3 Recloser battery tests.

1.3 AB Chance Digital Phasor
- 1.3.1 For testing Delta Bus grounds

2.0 MATERIALS REQUIRED

2.1 Mobile Device with National Grid V&O software installed.
2.2 Clipboard
2.3 Binoculars
2.4 Flashlight
2.5 Magnet for resetting drag hands
2.6 Additional items listed in Appendix A

3.0 INITIAL SUBSTATION ENTRY

3.1 Personal Protective Equipment
- 3.1.1 Minimum requirement is ANSI Z41/EH rated safety footwear, hard hat and safety glasses.

3.2 Vehicles entering substation
- 3.2.1 Lower and/or insure antennas will maintain minimum approach distances to energized conductors and apparatus.
- 3.2.2 Use extreme caution when maneuvering to avoid hitting apparatus or violating Minimum Approach Distances.
- 3.2.3 Verify gate is securely closed after substation entry.

3.3 Station Log Book
- 3.3.1 Enter the date, time and employee names that are performing the V&O Inspection.
- 3.3.2 Check the Station Log Book for abnormal conditions that can be corrected during the V&O Inspection.
  - a. After the V&O Inspection, record all abnormal problems found in the Log Book, with red pen, and whether they were corrected or not.

4.0 INSPECT YARD

4.1 Perform a quick initial inspection for:
- 4.1.1 Alarms.
- 4.1.2 Cut or removed ground grid or ground grid connections.

4.1.3 Obvious damage.

4.1.4 Security of gates, fence and locks.

4.1.5 Unusual noises.

5.0 NOTIFY THE SYSTEM OPERATOR

5.1 Inform them you are in the Station for a V&O Inspection and that you will be testing alarms.

5.2 Ask System Operator if any equipment has been tagged out or relays blocked.

6.0 REPORTING AND CORRECTING PROBLEMS AND DISCREPANCIES

6.1 Severe Trouble shall be reported to the responsible Control Center and the person in charge of the substation immediately.

6.1.1 The employee shall secure the area and warn all personnel in the area or substation to stay clear of the danger.

6.1.2 A severe trouble condition is a situation that is hazardous to the system operation and/or National Grid employees or contractors and the public.

a. See Trouble Reporting Appendix at the end of this document for additional information on trouble reporting.

6.2 See the section Oil Leak Reporting for information on reporting oil leaks.

6.3 Document all paint and preservation problems.

6.3.1 Rust, corrosion, or fading to the point where primer, or bare metal shows.

6.4 Problems and discrepancies found should be repaired during the V&O Inspection whenever possible.

6.5 Problems and discrepancies not corrected during the V&O Inspection shall be recorded in the mobile device during the Substation V&O Inspection or as a note on the equipment Inspection Card when conducting equipment maintenance activities.

6.5.1 Must inform Supervisor of noted problems.

6.5.2 The Supervisor reviewing the mobile device inspection report or the equipment Inspection Cards shall generate follow-up work orders in CMMS to document the required work.

6.6 Record findings in the Mobile Device

6.6.1 Record other readings or problems as Notes in the Mobile Device

6.6.2 If performing an apparatus inspection record the V&O Inspection portion in the V&O section of the equipment Inspection Card.

7.0 CONTROL HOUSE

7.1 Check control house door locks working and in good condition

7.1.1 Ensure all applicable signs are installed for the facility as required following **SMP 400.103.2 Substation Signs**. Contact Substation O&M Services for guidance as necessary.

7.2 Check control house first floor windows closed, locked and in good condition

7.2.2 When equipped with security grates ensure that they are properly secured to the building.

7.3 SPCC - SPCC locations only.

7.3.1 Verify SPCC Plan is available at the substation.

7.3.2 Verify SPCC notification list posted.

7.3.3 Check oil spill containment kits complete and in good condition.

7.4 Control Panels

7.4.1 Indicating Lights

a. Check that the indicating lights on the control board are working.

b. Check the available stock of spare bulbs; restock as necessary.

c. Inspect rear of Control boards for any signs of overheating, burned wiring, moisture, etc.

7.5 Noises - Listen for any unusual noises from relays, modules, RAPRs, timer circuits etc.

7.6 Relay targets and alarms.

7.6.1 Record targets and alarms on the V&O Report and in the station log book.

a. List the apparatus affected indicating circuit designation, phase and type of relay or alarm.

7.6.2 Reset and report relay targets and alarms to the System Operator and your supervisor.

7.7 Reclosing Relays

7.7.1 Check that reclosing relays are in service.

a. Record any reclosing relays that are off and tagged.

b. Report any reclosing relays that are off and not tagged to the System Operator.

7.7.2 Verify mechanical reclosing relays are in the start or zero position.

7.8 Ground Trip Switches (cutouts)

7.8.1 Check that all ground trip relays are in service (ON).

a. Record any ground trip switches that are off and tagged.

b. Report any ground trip switches that are off and not tagged to the System Operator.

7.9 Bus Transfer Schemes

7.9.1 Check both buses alive (load ammeters, bus voltmeters bus alive lights).

7.9.2 Check timers reset

7.9.3 Check that the sequence timers in normal position

7.9.4 Check transfer scheme auto

a. Record any auto transfer switches that are manual or off and tagged.

b. Report any auto transfer switches that are manual or off and not tagged to the System Operator.

7.9.5 Check tie breakers properly setup (setup varies by station scheme).

7.10 High Side Transfer Schemes

7.10.1 Check both lines alive (load ammeters, line alive lights).

7.10.2 Check timers reset

7.10.3 Check that the sequence timers in normal position

7.10.4 Check transfer scheme auto

a. Record any auto transfer switches that are manual or off, and tagged.

b. Report any auto transfer switches that are manual or off, and not tagged to the System Operator.

7.10.5 Check air break/circuit breaker/circuit switcher status (open or closed).

7.11 Annunciator and Alarm Test Switches

7.11.1 Annunciator panel

a. Move toggle switches, that are not tagged, to the TEST position to check lights. This will send an alarm to the Control Center.

b. To clear trouble condition, turn the toggle switch to the reset position, then back to ON.

c. Check with supervisor before testing any switches that are in the off position.

d. Verify the System Operator received the alarms.

7.11.2 Test Switches

a. If the alarm light is on perform steps b) through f).

b. Verify the System Operator received the alarm.

c. Open knife blades one by one and leave open until the light goes out and the alarm clears.

d. Close the knife switches opened one at a time, checking for alarm indications.

e. When the alarm light comes on reopen the last switch closed and continue closing the rest. This will find multiple alarms, if present.

f. Operating the knife switches does not reset this type of alarm system. The light only stays out when the trouble condition has cleared.

7.11.3 Repair of alarm conditions.

a. Alarm conditions should be corrected during the V&O Inspection.

b. If the alarm condition can not be corrected during the V&O:

1. The alarm should be cleared by opening the test twitch or turning the annunciator switch to OFF.

2. The switch should be tagged with the date, reason and inspectors name.

3. Both the System Operator and your supervisor should be notified that the alarm condition exists and the alarm point is off.

7.12 Radio Alarms (if applicable)

7.12.1 Inspect condition of radio system for damage, and proper operation.

7.12.2 If individual alarms have not been sent to the System Operator send a test alarm to from the radio cabinet.

a. Verify the System Operator received the alarm.

7.12.3 Make sure cabinet door is closed so the receiver voice communication is disabled.

7.13 Tags and Clearance and Control switching forms and Supplies

7.13.1 Check the stock of Clearance and Control Tags.

a. Restock as necessary.

7.13.2 Check the stock of Ground Device Identification Tickets (GDIT).

a. Restock as necessary.

7.13.3 Check the stock of Filed Switching Order Pads

a. Restock as necessary.

7.13.4 Check that pens (red and blue/black) and pencils are available.

a. Restock as necessary.

7.14 Control House Heating and Cooling Systems and Lighting

7.14.1 Test control house lighting.

a. Replace any defective bulbs, or ballasts or sockets.

7.14.2 Test Emergency Lighting

a. Replace batteries if needed

b. Replace any defect bulbs or sockets.

7.14.3 Inspect HVAC system:

a. Fans

1. Make sure fans are not broken or bound up and they are in good working order.

b. Heaters

c. Cooling Unit

d. Thermostats for proper operation and proper control settings.

e. Report any operational problems that do not meet manufacture spec.

f. In the absence of HVAC check that building heaters and ventilators are functioning.

7.15 Station Service and Transfer Switch

7.15.1 Check transfer switch on preferred supply

7.15.2 Check transfer switch for damage or overheating.

7.15.3 Test and record preferred and alternate secondary voltages at transfer panel.

7.16 Check AC supply panels for:

7.16.1 Proper labels with voltage and circuit information

7.16.2 Tripped circuit breakers.

7.16.3 Circuit breakers in the proper position.

7.17 Check DC Circuit Breaker / Fuse Panel for:

7.17.1 Proper labels with voltage and circuit information.

7.17.2 Tripped circuit breakers or blown fuses.

7.18 Protective Grounds [if applicable]

7.18.1 Inspect personal protective grounds for current inspection sticker

7.18.2 Check that grounds in station are in sets of 3 and that they are hung up properly.

7.18.3 Check that the phase end and ground clamps are in good working order.

7.18.4 Lubricate as required.

7.18.5 Inspect for the cracked or cut insulation and broken conductor strands.

7.18.6 Replace or repair damaged protective grounds. Do not leave damaged grounds at the station.

7.19 Switch Sticks [if applicable]

7.19.1 Inspect Switch Sticks and Grounding Sticks for current dielectric test date.

a. Send out of date sticks to lab for testing or;

b. Test locally using approved methods, test equipment and competent, trained personnel.

7.19.2 Inspect Switch Sticks and Grounding Sticks for surface contamination, damage and proper operation.

a. Clean if necessary

7.19.3 Insure Switching and Grounding Sticks are stored properly.

7.20 Fire Equipment

7.20.1 Inspect fire extinguishers to be properly secured and in their marked locations.

7.20.2 Update inspection cards.

7.20.3 Record out of date fire extinguishers on the V&O and record for future replacement.

7.20.4 Discharged fire extinguishers shall be reported to the appropriate supervisor for recharging.

7.20.5 Discharged or partially discharged fire extinguisher shall be removed from the substation.

7.20.6 Check that the fire & smoke alarms function & alarm to the RTU if so equipped

7.21 Eyewash Stations

7.21.1 Ensure Battery eyewash station is within 25 feet of the battery installation

a. Verify area immediately beneath eye wash station is clear of obstructions and designated with floor tape markings.

7.21.2 Inspect for leaks and current expiration sticker.

7.21.3 Reference SMS 406.10.1 for further details.

7.22 Phone Lists

7.22.1 Verify local and regional System Operator phone numbers are posted and correct.

7.22.2 Verify that the emergency telephone list is posted and clearly visible at each telephone location.

7.23 Cleanliness and General Condition

7.23.1 Clean control house floors and sanitary facilities, empty wastebaskets and dust as necessary.

7.23.2 Inspect control house for water leaks.

7.23.3 Check for signs of animal entry into control house.

7.24 Intrusion Alarms & Security System

7.24.1 Check that the door switches and alarms function and activate the security system as designed.

8.0 YARD INSPECTION

8.1 Unusual Noises

8.1.1 Be alert for arcing, gurgling and pinging noises which could indicate imminent and violent equipment failure.

8.2 Walk the fence, inspect, and record any findings in the comments section of the inspection card for:

8.2.1 Barbed wire - Strands to be intact and tight.

8.2.2 Fence fabric - Holes or breaks in the chain link.

8.2.3 Fence Ties - Loose or missing fence tie wires.

8.2.4 Fence Erosion - Signs of erosion or digging under the fence.

a. Space below fence should be less than 3 inches. If greater than 3 inches it should be noted for additional grading.

8.2.5 Grounding - For all newly constructed or additions/modifications to existing substations, ground conductor and connections secure and connected at every other fence post. Posts on both sides of gates should be grounded.

8.2.6 Fence Posts - Sound, not rusted through at ground level and not been raised by frost.

8.2.7 Check that there are no available climbing opportunities that would assist access both internal and external to the substation fence within 10 feet.

8.2.8 Check for private abutting fence(s) to the substation fence.

8.3 Gates

8.3.1 Test gates for proper operation.

a. Gates should swing easily out of the way.

8.3.2 When closed, the gates should by chained tightly, or locked, with minimal space.

8.3.3 Verify locking chains, hardware and locks present and in good condition.

8.3.4 Grounding - For all newly constructed or additions/modifications to existing substations, ground conductor and connections secure and connected at every other fence post. Posts on both sides of gates should be grounded.

8.4 Wildlife/Trail Cameras utilized for Company Vehicle Parking or Material Storage

8.4.1 Ensure cameras are secure and operating properly

8.4.2 Replace batteries if needed

8.5 Inspect that the 911 SUBSTATION NAME AND ADDRESS, WARNING KEEP OUT, and NOTICE NO TRESSPASSING signs are properly installed and legible. Inspect and confirm all substation signage conforms to SMP 499.103.2.

8.5.1 Missing or faded signs are to be replaced or make a note in the mobile device for follow up: Refer to SMP 499.103.2 Substation Signage for installation details.

8.6 Substation yard security problems shall be corrected or reported immediately to supervisor.

8.7 Vandalism related problems should be specifically recorded as such, and reported to supervisor.

8.8 Yard Lights

8.8.1 Check that all yard lighting is functioning.

a. Photo control

b. Time clock

c. EMS (if applicable)

d. Ensure proper light distribution

e. Ensure Emergency lighting is functioning (If applicable)

8.8.2 Repair broken bulbs, glass fixtures, spot light heads, or other lighting that needs attention.

a. If work cannot be completed safely and while maintaining safe work clearances or if special equipment such as a bucket truck is needed, note on the V&O report.

8.9 Vegetation

8.9.1 Check for growth of trees or vegetation in fence and gate areas that animals or people could use to climb over the fence. Vegetation should not be allowed to overhang from outside the perimeter fence into the station yard.

a. Cut or record for the Arborist to have removed.

b. Check to ensure local ordinances are not violated for tree plantings before cutting or removing vegetation.

8.9.2 Record live vegetation growth within the substation that requires spraying or removal.

8.10 Bus and structure.

8.10.1 On Delta Buses (2400 V & 4800 V) shall be checked for grounds and noted in the mobile device.

8.10.2 Record missing or damaged animal protection devices.

8.10.3 Inspect insulators for:

a. Broken, chipped or damaged skirts.

b. Carbon tracking or flash over.

c. Surface contamination (dirt, rust, salt spray etc.).

d. Broken or damaged insulators should be recorded on V&O Report.

8.10.4 Broken porcelain should be picked up off the ground.

8.10.5 Visually inspect current and voltage transformers for damage or signs of overheating.

8.10.6 Visually inspect arresters for:

a. Blown or damaged arresters

b. Surface contamination

8.10.7 Visually inspect potheads and cable terminators for:

a. Damage and leaking compound.

b. Surface contamination

8.10.8 Report unusual noises immediately and record them on the V&O Report.

8.11 Structure and apparatus ground connections

8.11.1 Inspect for any cut, broken or missing ground connections to apparatus, structures and guy wires.

8.11.2 Inspect static wires and record any problems.

8.11.3 Inspect that bushings installed in a spare transformer (both high and low side bushings) and surge arresters are bonded together and connected to the transformer tank or system ground.

8.11.4 Visually Inspect Station Service Transformers for:

a. Evidence of oil leaks on transformer tank, and on the ground.

b. Bushing damage or surface contamination.

c. Damaged or improperly closed primary fuses.

d. Output Voltage if not previously measured at station service transfer switch.

8.12 Inspect equipment and structure foundations.

8.12.1 Large cracks.

8.12.2 Settling (not level).

8.12.3 Deterioration (large areas of surface erosion, stone showing).

8.13 Inspect Cableways

8.14 Damage, missing or broken cover sections and deterioration.

8.15 Inspect buildings junction boxes, structures etc. for overall paint condition

8.15.1 Record items needing attention.

8.16 Wild Life Control Measures

8.16.1 If applicable, inspect animal fence for proper working power supply, broken sections, gaps between panels, shorted sections of mesh, and grounded entry gate per manufacturer specification and station drawings.

8.16.2 Ensure power supply is on after V&O inspection.

8.17 Clean up substation yard.

8.17.1 Remove broken porcelain, debris, and trash

8.17.2 If area requires major clean up or crushed stone requires leveling, note on V&O Report.

8.17.3 If equipment or materials are intentionally stored in the yard insure that they are neatly placed and not a hazard to personal. Barricade area if necessary.

a. Storage should be in compliance with SMS 499.10.1 Substation Work Area Identification Procedure.

9.0 OIL LEAK REPORTING

9.1 Oil filled apparatus must be inspected for any signs of leaks.

9.1.1 The oil leak status shall be recorded for each piece of oil filled apparatus that has an oil leak screen in the Mobile Device.

9.1.2 Leaks from small apparatus that do not have an oil leak screen in the Mobile Device should be recorded in a Mobile Device notes screen.

9.2 Oil Leak Status Codes

9.2.1 Oil leaks are categorized as follows:

a. Unknown - Unknown is used to indicate that no information has been entered in CMMS for this equipment.

b. Clean - Apparatus is dry and shows no evidence of oil leaks.

c. Repaired - A leak is found and repaired, note the repairs made.

d. Weep - Anytime the external surface of a piece of apparatus is wet with oil. Note the location and, if possible, cause of the leak.

e. Leak - Oil is running off or about to run off the external surface of containers or electrical apparatus. Required Action

9.3 Leaks and/or weeps, categorized as such, require immediate attention to stop the leak/weep and to prevent a potential release of oil to the environment. (i.e. impacts to soil, stone containments, foundations, concrete slabs and/or water etc)

9.4 Leaks categorized as Leak require creation of a Leak Report Work Order.

9.4.1 When the supervisor reviews the V&O inspection Validation Overrides all leak status changes and notes will show up as exceptions.

9.4.2 The Supervisor will then create a Leak Report Work order (Type LR) in Work Order Tracking or Quick Reporting.

9.5 Leaks from PCB Equipment

9.5.1 If a leak is discovered from equipment classified as over 500 ppm PCB cleanup must begin within 48 hours (40 CFR 761.30(a)(1)(x)).

9.5.2 The inspection records must also include:

a. The location of the leak;

b. The estimate of fluid released;

c. The date and description of any cleanup, containment, repair or replacement;

d. The results of any containment (for example, was containment successful or not).

e. The daily inspection results required for uncorrected, active leaks (refer to Environmental Procedure EP-14).

f. The records must be available for inspection by the EPA and must be maintained for at least three years after disposal of the equipment.

10.0 APPARATUS INSPECTIONS

For further reference regarding V&O inspections of substation equipment, refer to the V&O section of the following Substation Maintenance Procedures (SMP), Substation Maintenance Standards (SMS), or Electric Operating Procedures (EOP).

10.1 Circuit Breakers
- 10.1.1 SMP 401.01.2 - Air Magnetic Circuit Breaker Maintenance Procedure
- 10.1.2 SMP 401.02.2 - Oil Circuit Breaker Maintenance Procedure
- 10.1.3 SMP 401.03.2 - Vacuum Circuit Breaker Maintenance Procedure
- 10.1.4 SMP 401.04.2 - Air Blast Circuit Breaker Maintenance Procedure5
- 10.1.5 SMP 401.05.2 - Two Pressure Gas Circuit Breaker Maintenance Procedure
- 10.1.6 SMP 401.06.2 - Gas Puffer Circuit Breaker Maintenance Procedure
- 10.1.7 SMP 401.07.2 - Station Recloser Maintenance Procedure
- 10.1.8 SMP 401.08.2 - Vacuum Switch Maintenance Procedure

10.2 Transformers
- 10.2.1 SMP 402.01.2 - Power - 15 MVA and above Maintenance Procedure
- 10.2.2 SMP 402.02.2 - Power - Below 15 MVA Maintenance Procedure
- 10.2.3 SMP 402.03.2 - Dry Type Transformer Maintenance Procedure

10.3 Instrument Transformers & Voltage Regulators
- 10.3.1 SMP 403.01.2 - Instrument Transformers
- 10.3.2 SMP 404.01.2 - Step Voltage Regulator Maintenance Procedure
- 10.3.3 SMP 404.02.2 - Induction Voltage Regulator Procedure

10.4 Emergency Generators
- 10.4.1 SMP 405.01.2 - Emergency Generators Maintenance Procedure

10.5 Batteries & Chargers
- 10.5.1 SMP 406.01.2 - Lead/Acid Battery Maintenance Procedure
- 10.5.2 SMP 406.02.2 - Nickel-Cadmium Battery Procedure
- 10.5.3 SMP 406.03.2 - Static Changers Maintenance Procedure

10.6 Sensing Devices
- 10.6.1 SMP 407.01.2 - Bushing Potential Device Maintenance Procedure
- 10.6.2 SMP 407.02.2 - Coupling Capacitors and CCVTs Maintenance Procedure
- 10.6.3 SMP 407.03.2 - Wave Trap Maintenance Procedure
- 10.6.4 SMP 407.04.2 - Resistive Coupled Potential Device Maintenance Procedure

10.7 Capacitors
- 10.7.1 SMP 408.01.2 - Capacitor Bank Maintenance Procedure

10.8 Disconnect Switches
- 10.8.1 SMP 409.01.2 - Disconnect Switches Maintenance Procedure
- 10.8.2 SMP 409.02.2 - Circuit Switchers Maintenance Procedure
- 10.8.3 SMP 409.03.2 - High Speed Grounding Switch Maintenance Procedure
- 10.8.4 SMP 409.04.2 - Gas Insulated Disconnect Switch Maintenance Procedure
- 10.8.5 SMP 409.05.2 - Gas Insulated Ground Switch Maintenance Procedure

10.9 Load Tap Changer
- 10.9.1 SMP 412.01.2 - Load Tap Changer Maintenance Procedure

10.10 Reactors
- 10.10.1 SMP 413.01.2 - Dry Type Reactor Maintenance Procedure
- 10.10.2 SMP 413.02.2 - Oil Filled Reactor Maintenance Standard

10.11 Metal Clad Bus and Switchgear
- 10.11.1 SMP 417.02.2 - Metal Clad Bus, Switchgear and Substation Maintenance Procedure

10.12 Surge Arresters
- 10.12.1 SMS 419.01.1 - Surge Arrester Standard (with arrester identification guide)
- 10.12.2 SMP 419.01.2 - Surge Arrester Maintenance Procedure

10.13 Network Protectors
- 10.13.1 NG-EOP UG022 - Network Transformer & Protector

11.0 FINAL CHECKLIST

11.1 Turnoff yard lights

11.2 Verify all abnormal conditions found are entered in station log book.

11.3 Report any abnormal conditions, alarms or relay targets found.

11.4 Ensure control house first floor windows that are not equipped with grates are closed and locked

11.5 Turn control house lights off and lock doors.

11.6 Re-arm security alarms.

11.7 If applicable, ensure electric animal fence power supply is on.

11.8 Close and securely lock gate.

11.9 Call the System Operator and notify them that the V&O Inspection has been completed and you will be leaving the station. Connect Mobile Device to the network and sync the device to the CMMS upon return to the work platform.

12.0 APPENDIX A - ADDITIONAL MATERIALS

Not all of the listed items will be required in all areas. It is suggested that the items required for a particular area be stocked in the vehicle used for V&O Inspections or a large container that can be taken when inspections are to be done.

- 12.1 Cleaning Supplies
  - 12.1.1 Broom and dust pan
  - 12.1.2 Rags
  - 12.1.3 Trash bags
- 12.2 Repair and Maintenance
  - 12.2.1 Shovel
  - 12.2.2 Ladder
  - 12.2.3 Electrical tape
  - 12.2.4 Small hand tools
- 12.3 Personal Protective Equipment
  - 12.3.1 Acid resistant gloves
  - 12.3.2 Face Shield and Apron
- 12.4 Station Supplies
  - 12.4.1 Spare Station Log Books
  - 12.4.2 System Operator (phone number) cards
  - 12.4.3 Spare operations counter cards
  - 12.4.4 Pen, pencils and erasers (red pencil for trouble)
  - 12.4.5 Clearance and Control Tags
    - a. Red Tags
    - b. Non-Reclose Assurance (NRA) Tags
    - c. Hold Tags
    - d. Station Control (SCT) Tags
    - e. Worker Placards
  - 12.4.6 Ground Device Identification Tickets (GDIT)
  - 12.4.7 Clearance and Control Switching forms
- 12.5 Security Supplies
  - 12.5.1 Spare Padlocks Locks:
    - a. Long shank 9309805
    - b. Short shank 9309806
  - 12.5.2 Chain for gates
  - 12.5.3 Sign, NOTICE NO TRASSPASSING 9390669
  - 12.5.4 Sign, WARNING KEEP OUT 9390668

12.5.5 Sign, 911 SUBSTATION NAME AND ADDRESS – Order following SMP 400.104.2 Substation 911 Sign Order Details procedure.

12.6 Indicating Lamps and Lenses:

12.6.1 Switchboard LED (Red) 9309219
12.6.2 Lens Cap (Red) 9302874
12.6.3 Switchboard LED (Green) 9309218
12.6.4 Lens Cap (Green) 9302875
12.6.5 Switchboard LED (Amber & White) 9309217
12.6.6 Lens Cap (Amber) 9302876
12.6.7 Lens Cap (White) 9309216
12.6.8 Switchboard Lamp 24EX 9317548
12.6.9 Switchboard Lamp 145 Volt, 15W 9309684
12.6.10 Indicating Bulb type 49 9317550
12.6.11 Indicating Bulb type 47 9309672
12.6.12 18 Volt Miniature 0.11A Automotive 9309671
12.6.13 Indicating 35V, .06A 9309678
12.6.14 Indicating type 43A 9317549
12.6.15 Switchboard Lamp 24X 9317555
12.6.16 Switchboard Lamp 55C 9309483
12.6.17 Indicating Lamp 120 P.S.B. 9317601
12.6.18 (for V.S.A. Reclosers)

12.7 Incandescent Lamps:

12.7.1 Incandescent Lamp 75 Watt 9317577
12.7.2 Incandescent Lamp 100 Watt 9317554
12.7.3 Incandescent Lamp 135 Watt 9309687
12.7.4 Incandescent Lamp 200 Watt 9309675
12.7.5 Mogul Base Lamp 500 Watt 9317552
12.7.6 Flood Lamp PAR 38 100 Watt 9309677

12.8 Fluorescent Lamps:

12.8.1 8 FT Single Pin Lamp 75 Watt 9317604
12.8.2 4 FT Bi - Pin Lamp 40 Watt 9317607
12.8.3 4 FT Single Pin Lamp 40 Watt 9309708
12.8.4 8 FT Recessed Pin Lamp 105 Watt 9309685

12.9 Spare emergency light batteries

12.10 Spare fuses

12.11 Recloser control and trip fuses

12.11.1 Reclosers often use time delay fuses that are similar in appearance to AGC types. If the wrong type fuse is installed it will blow after a couple of operations.

12.11.2 Cartridge fuses
- a. 5A
- b. 10A
- c. 15A
- d. 20A
- e. 30 A

12.11.3 AGC Fuses
- a. 2 A slow blow and instantaneous
- b. 5A slow blow and instantaneous
- c. 10A slow blow and instantaneous
- d. 20A slow blow and instantaneous

12.12 Spare nitrogen bottles

12.13 Battery Supplies

12.13.1 5 Gallon distilled water and battery filler 9309551

12.13.2 Sign, Battery DANGER EXPLOSION HAZARD – CORROSIVE BATTERY ACID sign 9390657

12.13.3 Extra thermometer 9302854

12.13.4 Baking Soda

12.13.5 Spare eyewash bottles 9317059

12.13.6 Nylon brush to clean battery posts

12.13.7 Battery grease

12.14 Spare recloser batteries

13.0 APPENDIX B – TROUBLE REPORTING

13.1 Trouble

13.1.1 The term trouble is defined as any condition which occurs on the equipment that has or could affect the ability of that equipment to perform its required function.

13.2 Severe Trouble

13.2.1 A severe trouble condition is a situation that is immediately hazardous to the system operation and/or personnel. These troubles are immediately reported to the System Operator and to the person in charge of the substation. The employee shall secure the area and warn unauthorized people to stay clear of the danger.

13.2.2 Examples of Severe Trouble

a. Dead station battery
b. Blown bushings or cable terminator
c. Downed live lines
d. Multiple broken support insulators
e. Electrical fires
f. Grounds cut in station
g. Loss of station service power
h. Broken pole or structure
i. Blown By-Pass/shunt arresters on regulators
j. Low oil levels
k. Unusually noises

13.3 Not Immediately Fixable Trouble

13.3.1 These troubles are reported to the System Operator and the person in charge of the substation. They shall also be noted on the V&O form and station logbook in red and scheduled for repair at a later date.

13.3.2 Examples of Not Immediately Fixable Trouble

a. Surge Arrester blown
b. Broken operating rods on disconnects
c. Damaged bus support insulators

13.4 Fixable Trouble

13.4.1 Fixable items should be repaired as they are discovered during the V&O Inspection if the inspectors can perform the fix safely, maintains all electrical clearances, and has the correct tools and materials to perform the repair. This insures that the station is maintained in the best possible operating condition and prevents unnecessary return trips. Repaired items are to be noted in the V&O Report and in the station logbook.

13.4.2 Examples of Fixable Trouble

a. Low Battery electrolyte
b. Replacing blown lamps
c. Changing filters
d. Installing missing covers
e. Installing signs
f. Repairing holes in fence
g. Installing new locks
h. Cleaning and repairing oil leaks
i. Tightening compressor belts
j. Changing recloser batteries
k. Replacing control fuses
l. Changing nitrogen bottles
m. Changing Silica Gel turned pink or white
n. Cleaning and repairing leaks

14.0 REVISION HISTORY

Version	Date	Description of Revision
0.0	xx/xx/xx	Initial version of document
1.0	12/26/06	Initial version of document Corrected - Formmatting Changed - Header title, Document number prefix Removed - Subtitle Changed - First page footer to reference Documentum
1.1	02/22/02	Corrected - Formatting and grammar
1.2	04/06/07	Materials Required Removed – Infrared Thermometer Additional –Materials Changed – Switching Order pads to Clearance and Control switching forms Control House Changed – Switching Order/Markup Pads to Clearance and Control switching forms
1.3	05/23/07	Document Added - Documentum Version # to headers Added - File name to footer
1.4	07/02/07	Yard Inspection Moved – Be alert for unusual noises to beginning of section Added – Foundations Added – Cableways Apparatus Inspections Added – Metal Clad Bus, Switchgear and Substation Changed – SMS to SMP (33 places)
1.5	07/26/07	Control House Removed - Verify Check Lists Posted - New England only
1.6	08/20/07	Reporting Changed - Section name to Reporting and Correcting Problems and Discrepancies Revised 0 Section extensively revised Materials Required Removed - Substation V&O Inspection Report form, Report from last V&O Inspection, Substation V&O Checklist form
1.7	09/30/07	Switch Sticks Added - or; Test locally using approved methods, test equipment and competent, trained personnel.
1.0	08/31/12	Document Number - Changed “SMP 400.06.2” to “SMP 400.13.2” Originating Department - Changed from “Substation O&M Services” to “Substation Work Methods” Sponsor - Changed “Donald T. Angell” to “Susan Fleck” PURPOSE - Added 2nd paragraph COORDINATION - Added REFERNCES - Changed “SMS 400.13.1” to “SMS 400.21.1” and “SMS 400.08.1” to “SMS 400.15.1”

DEFINITIONS - Added
TRAINING - Added
Section 1.3 - Added
Section 2.1 - Changed “PDA with National …” to “Mobile Device with National …”
Section 6.5 - Changed “… shall be recorded on theInspection Card (Apparatus Inspections) or as a note in the PDA (Station V&O Inspections).” to “… shall be recorded on the Mobile Device as a note in all cases (Station V&O Inspections).’
Section 6.5.1 - Added and renumbered accordingly
Section 6.6 - Changed “Record findings in the PDA if listed in the PDA “round”” to “Record findings in the Mobile Device”
Section 6.6.1 - Changed “…as Notes in the PDA” to “…as Notes in the Mobile Device”
Section 8.2.5 - Replaced
Section 8.2.7 - Added
Section 8.3.4 - Added
Section 8.9.1 - Added and renumbered accordingly
Section 9.1.1 - Changed “…leak screen in the PDA” to “…leak screen in the Mobile Device.”
Section 9.1.2 - Changed “…screen in the PDA should be recorded in a PDA notes screen.” to “…screen in the Mobile Device should be recorded in a Mobile Device notes screen.”
Section 9.2.1.a - Changed “… been entered in AIMMS for this equipment.” to “… been entered in CMMS for this equipment.”
Section 10.13.1 - Replaced
Section 11.8 – Replaced

2.0 06/01/18 Document updated per review cycle – WL
Originating Department - Changed from “Substation Work Methods” to ““Substation O&M Services”
Sponsor - Changed “Susan Fleck” to “David R. Ethier”
Document - Converted to 2010 format
Accountability - Added “Functional Groups engaged in performing Substation Inspections”
Coordination - Changed “Not Applicable.” to “Substation management who schedule, review, and follow-up on reported V&O observations.”
Training - Changed “Not Applicable” to “Included as part of the L&D Training Modules”
Section 3.2.3 - Added and re-numbered accordingly
Section 3.3 - Added and re-numbered accordingly (Note: Previous Version Section 7.2)
Section 6.1.1 - Changed “... area and warn unauthorized people to stay ...” to “... area and warn all personnel in the area or substation to stay ...”
Section 6.1.2 - Changed “... National Grid employees or the public.” to “... National Grid employees or contractors and the public.”
Section 6.5 - Changed “... shall be recorded on the Mobile Device as a note in all cases (Station V&O Inspections).” to “... shall be recorded in the mobile device during the Substation V&O Inspection or as a note on the equipment Inspection Card when conducting equipment maintenance activities.”
Section 6.5.2 - Changed “... reviewing the inspection shall generate follow-up work orders to document ...” to “... reviewing the mobile device inspection report or the equipment Inspection Cards shall generate follow-up work orders in CMMS to document ...”
Section 6.6.2 - Changed “... V&O section of the Inspection Card.” to “... V&O section of the equipment Inspection Card.”
Section 7.1.1 - Added and re-numbered accordingly
Section 7.2 - Added and re-numbered accordingly
Section 7.3 - Previous Version Section 7.2 - Deleted and re-numbered accordingly
Section 7.12 - Changed “Radio Alarms” to “Radio Alarms (if applicable)”
Section 7.14 - Changed “Control House Heating and Lighting” to “Control House Heating and Cooling Systems and Lighting”
Section 7.14.2.b - Added and re-numbered accordingly
Section 7.14.3 - Changed “Inspect heaters, fans and thermostats for proper operation. Make sure fans are not broken or bound up and they are in good working order.” to “Inspect HVAC system”
Sections 7.14.3.a - 7.14.3.f - Added and re-numbered accordingly
Section 7.16.1 - Added and re-numbered accordingly

Section 7.17 - Changed “Check DC Circuit Breaker of Fuse Panel:” to “Check DC Circuit Breaker / Fuse Panel for:”
Section 7.17.1 - Changed “Check DC supply panel for:” to “Proper labels with voltage and circuit information.”
Sections 7.17.2 - 7.17.3 - Added and re-numbered accordingly (Note: Previous Version Sections 7.17.1.a-7.17.1b)
Sections 7.17.1.a - 7.17.1.b - Previous Version - Deleted and re-numbered accordingly
Section 7.17.3 - Previous Section 7.17.1.b - Deleted and re-numbered accordingly
Section 7.18 - Changed “Protective Grounds” to “Protective Grounds (if applicable)”
Section 7.18.1 - Added and re-numbered accordingly
Section 7.19 - Changed “Switch Sticks” to “Switch Sticks (if applicable)”
Section 7.20.6 - Added and re-numbered accordingly
Section 7.21 - Added and re-numbered accordingly
Section 7.24 - Previous Section 7.23 - Changed “Turn on yard lights, so they can be checked during the Yard Inspection.” to “Intrusion Alarms & Security System”
Section 7.24.1 - Added and re-numbered accordingly
Section 8.2 - Changed “Walk the fence and inspect:” to “Walk the fence, inspect, and record any findings in the comments section of the inspection card for:”
Section 8.2.4.a - Changed “... than 3 inches.” to “... than 3 inches. If greater than 3 inches it should be noted for additional grading.”
Section 8.2.8 - Added and re-numbered accordingly
Section 8.4 - Added and re-numbered accordingly
Section 8.5 - Previous Section 8.4 - Replaced entire section
Section 8.8.1 - Previous Section 8.7.1 - Changed “Check all yard lights working. (Yard lights should have been turned on during control house inspection.)” to “Check all yard lights working. (Yard lights should have been turned on during control house inspection.)”
Sections 8.8.1.a - 8.8.1.e - Added and re-numbered accordingly
Section 8.9.1 - Previous Section 8.8.1 - Changed “Check for any growth ... over the fence.” to “Check for growth ... over the fence. Vegetation should not be allowed to overhang from outside the perimeter fence into the station yard.”
Section 8.9.1.b - Previous Section 8.8.1.b - Added and re-numbered accordingly
Section 8.11.3 - Added and re-numbered accordingly
Section 8.16 - Added and re-numbered accordingly
Section 9.3 - Changed “Leaks categorized as Leak require immediate action to stop the leak or contain the released oil.” to “Leaks and/or weeps, categorized as such, require immediate attention to stop the leak/weep and to prevent a potential release of oil to the environment. (i.e. impacts to soil, stone containments, foundations, concrete slabs and/or water etc)”
Section 9.4 - Changed “All leaks require ... ‘ to “Leaks categorized as Leak require ...”
Section 9.4.1 - Changed “... reviews the V&O inspection work order round screen the leak status changes ...” to “... reviews the V&O inspection Validation Overrides all leak status changes ...”
Section 10.0 - Changed “Refer to the V&O Inspection sections of the following SMS’s for the apparatus Inspections.” to “For further reference regarding V&O inspections of substation equipment, refer to the V&O section of the following Substation Maintenance Procedures (SMP), Substation Maintenance Standards (SMS), or Electric Operating Procedures (EOP).”
Section 10.3 - Changed “Instrument Transformers” to “Instrument Transformers & Voltage Regulators”
Section 10.3.1 - Changed “SMP 403.01.2 - Currents, Potentials and Metering Maintenance Procedure Voltage Regulators” to “SMP 403.01.2 - Instrument Transformers”
Section 10.5.2 - Added and re-numbered accordingly
Section 10.7.1 - Changed “SMP 408.01.2 - Station Capacitor below 69kV Maintenance Procedure” to “SMP 408.01.2 - Capacitor Bank Maintenance Procedure”
Section 11.3 - Deleted and re-numbered accordingly
Section 11.3 - Previous Section 11.3.1 - Re-numbered accordingly
Section 11.4 - Added and re-numbered accordingly
Section 11.7 - Added and re-numbered accordingly
Section 11.8 - Previous Section 11.7 - Changed “Turn in completed V&O Inspection Report to supervisor.” to “Call the System Operator and notify them that the V&O Inspection has been completed and you will be leaving the station.”

Section 11.9 - Previous Section 11.8 - Changed "... device to the CMMS" to "... device to the CMMS upon return to the work platform."
Sections 12.5.1.a - 12.5.1.b - Updated Item ID Numbers
Section 12.5.3 - Changed "Fence tie wire" to "Sign, NOTICE NO TRASSPASSING 9390669"
Section 12.5.4 - Changed "Fence fabric" to "Sign, WARNING KEEP OUT 9390668"
Section 12.5.5 - Changed Warning signs 0810029" to "Sign, 911 SUBSTATION NAME AND ADDRESS – Order following SMP 400.104.2 Substation 911 Sign Order Details procedure"
Sections 12.6.1 - 12.6.17 - Updated Item ID Numbers
Sections 12.7.1 - 12.7.6 - Updated Item ID Numbers
Sections 12.8.1 - 12.8.4 - Updated Item ID Numbers
Section 12.13.1 - Updated Item ID Number
Section 12.13.2 - Changed "Battery NO SMOKING Signs S/C 5483448" to "Sign, Battery DANGER EXPLOSION HAZARD – CORROSIVE BATTERY ACID sign 9390657"
Section 12.13.3 - Deleted and re-numbered accordingly
Section 12.13.3 - Previous Section 12.13.4 - Updated Item ID Number
Section 12.13.5 - Previous Section 12.13.5 - Updated Item ID Number
Section 13.4.1 - Changed "Fixable items ... the V&O Inspection. This insures ... unnecessary return trips. The items fixed should be noted on the V&O Report and in the station logbook." To "Fixable items ... the V&O Inspection if the inspectors can perform the fix safely, maintains all electrical clearances, and has the correct tools and materials to perform the repair. This insures ... unnecessary return trips. Repaired items are to be noted in the V&O Report and in the station logbook."

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Appendix 16

NG-USA EOP G029 Tracking Temporary Repairs To Electric System

INTRODUCTION

The purpose of this procedure is to outline the steps to be taken when a temporary repair is made to the primary/secondary electric system to restore service or maintain public safety until a permanent repair can be made. Every effort should be made to make permanent repairs to the primary/secondary electric system within 90 days. For those rare exceptions when permanent repairs are not made within 90 days, special reporting and periodic site visits are required to monitor the temporary repairs until the permanent repairs are completed. In Upstate NY, Temporary residential repairs should be made permanent within ten (10) days.

PURPOSE

This procedure applies to all personnel who are responsible for initiating/inspecting/tracking temporary repairs along with employees who are responsible for designing, planning, scheduling and construction of permanent repairs made at locations where temporary repairs were made to restore service or maintain public safety.

ACCOUNTABILITY

1. Electric Work Methods
    A. Update procedure as necessary.
2. Operations
    A. Ensure the components of the procedure are implemented.
    B. Ensure workers are trained in this procedure.
    C. Provide revision input as necessary.
    D. Submit Temporary Waiver Form to Customer Order Fulfillment
3. Workers
    A. Demonstrate the understanding of the procedure.
    B. Comply with the requirements of the procedure.
4. Inspections
    A. Ensure components of this procedure are implemented.
    B. Track temporary repairs identified by Inspections
    C. Provide periodic inspections of temporary repairs greater than 90 days.
    D. Compile and submit report to New York Public Service Commission (PSC).
5. Customer Order Fulfillment
    A. Administer, distribute and file Temporary Residential Connection Agreement
    B. Enter into CSS on customer account
    C. Track and enforce terms of agreement enforcing the ten (10) period for receiving electrical inspection for permanent connection or issuing a disconnect order.

REFERENCES

State of New York Public Service Commission Order 04-M-0159
State of New York Public Service Commission Order 04-M-0159 Adopting Changes to Electric Safety Standards Effective December 15, 2008.

DOCUMENT CONTENTS

Table of Contents

1.0 TEMPORARY REPAIRS MADE BY OPERATIONS 2

2.0 TEMPORARY REPAIRS DISCOVERED BY INSPECTIONS GROUP 3

3.0 TEMPORARY OVERHEAD REPAIRS (TOH) 3

4.0 TEMPORARY REPAIRS NOT MADE PERMANENT WITHIN 90 DAYS 3

5.0 NYS PUBLIC SERVICE COMMISSION REPORTING (UPSTATE NY ONLY) 4

6.0 TEMPORARY RESIDENTIAL SERVICE REPAIRS (UPSTATE NY ONLY) 4

7.0 REVISION HISTORY 5

1.0 TEMPORARY REPAIRS MADE BY OPERATIONS

1.1 Temporary repairs that are made by operations to restore service or maintain public safety until permanent repairs can be made should be forwarded to the Local Area Inspection Supervisor for tracking in the Maintenance Database.

1.2 Inspections Supervisor and/or his/her designee will enter the Temporary Repair into the Maintenance Database with the appropriate maintenance code and assign a priority of Level 9.

1.3 The Level 9 indicates that this is a temporary repair that shall be made permanent within 90 days.

1.4 Level 9 codes associated with a maintenance item will be assigned directly to Scheduling to be scheduled within 20 business days.

1.5 Level 9 codes that require design will be downloaded from the maintenance database and placed in the work queue of the Distribution Design Supervisor or Engineering Supervisor for the appropriate area.

1.6 Scheduling will have 20 business days to schedule the Level 9 work request to the field for completion within 90 days of the temporary repair.

2.0 TEMPORARY REPAIRS DISCOVERED BY INSPECTIONS GROUP

2.1 Temporary repairs discovered by Inspections group shall be recorded in the Maintenance Database with the appropriate maintenance code and with an assigned priority Level 9.

2.2 The Level 9 indicates that this is a temporary repair that should be made permanent within 90 days.

2.3 Level 9 codes associated with a maintenance item will be assigned directly to Scheduling to be scheduled within 20 business days.

2.4 Level 9 codes that require design will be downloaded from the maintenance database and placed in the work queue of the Distribution Design Supervisor or Engineering Supervisor for the appropriate area.

2.5 Scheduling will have 20 business days to schedule the Level 9 work request to the field for completion within 90 days of the temporary repairs.

3.0 TEMPORARY OVERHEAD REPAIRS (TOH)

3.1 Temporary overhead repairs (TOH) are utilized by operations to restore service while the underground cable that generally serves the facilities is being repaired.

3.2 TOH's that meet National Grid Overhead Standards for construction would not be considered a temporary repair that would need to be tracked under this procedure.

3.3 TOH's not meeting National Grid Overhead Standards for construction are required to be tracked under this procedure as a temporary repair and should follow the process outlined in paragraph 2.0 above.

4.0 TEMPORARY REPAIRS NOT MADE PERMANENT WITHIN 90 DAYS

4.1 Every effort should be made to make temporary repairs permanent within 90 days.

4.2 In extraordinary circumstances, which may include major storms, where permanent repairs may extend beyond 90 days (exceptions), the company shall periodically perform site visits to monitor the condition of the temporary repairs.

4.3 In Upstate New York, National Grid shall also report these exceptions as part of the reporting requirements outlined in the State of New York Public Service Commission Order 04-M-0159 Adopting Changes to Electric Safety Standards Effective December 15, 2008.

4.4 The Inspections group is responsible for tracking all temporary repairs that extend beyond 90 days.

4.5 The initial inspection should take place after 90 days and then periodic inspections should take place every 45 days until the permanent repair is made.

4.6 The Inspection supervisor should run a report from the maintenance database for open Level 9 codes.

4.7 The periodic inspection time frame lines up with the periodic inspection requirements for the elevated voltage findings requirements and could be run at the same intervals.

It is strongly encouraged that these temporary repairs be made permanent as soon as practicable to limit the burden of tracking these repairs.

5.0 NYS PUBLIC SERVICE COMMISSION REPORTING (UPSTATE NY ONLY)

5.1 Temporary repairs that are beyond 90 days shall be identified and justified as part of the reporting requirements of the PSC Orders referenced below.

5.2 The 90-day time period commences on the day the temporary repair was made or the day the temporary repair was discovered.

5.3 The Inspections group will be responsible for consolidating the temporary repair information from operations and from the maintenance database in order to prepare the report that will be submitted to the PSC.

5.4 The report will identify the temporary repairs that exceeded 90 days, the periodic site visit information and the justification for the repair taking longer than 90 days.

5.5 The Inspections group shall file the report by February 15 each year.

6.0 TEMPORARY RESIDENTIAL SERVICE REPAIRS (UPSTATE NY ONLY)

6.1 Temporary electric service connections under emergency conditions will only be made for residential customers where the Premise Owner agrees to make permanent repairs and obtain an approved electrical inspection of the repairs within ten (10) business days.

6.1.1 An exception may be permitted by the Customer Fulfillment Department for extension as a result of major storms.

6.1.2 Temporary residential services repairs are valid for no more than 10 business days.

6.2 A Temporary Residential Electric Service Connection Agreement (Agreement) (See Appendix A) must be executed by the Owner, or their designee and a National Grid employee prior to installation of a temporary service.

6.3 Temporary residential electric service connections shall only be made under the following conditions:

6.3.1 When inspection agency services are not available.

6.3.2 In the event of customer-owned equipment failure when electrical repair services are not available, such as:

a. Failure of the residential customer's overhead service attachment bracket.

b. Loss of customers service conductors (service entrance cable or underground service cable) between the service point and their service equipment.

6.3.3 Under no circumstances shall National Grid employees work on customer-owned equipment including, but not limited to, replacing service attachment brackets or performing any repairs on service equipment or meter sockets.

6.3.4 In the event of an emergency such as fire, flood, weather, or earth-related catastrophe, unless ordered otherwise by the local Fire Marshall.

6.4 Copies of the executed Agreement shall be distributed in accordance with the copy distribution outlined at the bottom of the Agreement. It will be the responsibility of the Customer Fulfillment Department to track and enforce the terms of the executed Temporary Residential Electric Service Connection Agreement.

6.5 Temporarily residential services are not subject to NY Public Service Commission Reporting requirements.

7.0 REVISION HISTORY

Version	Date	Description of Revision
1.0	05/07/10	This is a new document.
2.0	04/19/18	Updated entire document to new format. Added Safety, Temporary Residential Service Repair (Upstate NY Only) and Exception Sections.
3.0	04/01/20	This document supersedes 2.0 dated 04/19/18. Remove Exception Approval, N/A Remove Safety Section, N/A

APPENDIX A

nationalgrid

Niagara Mohawk Power Corporation D/B/A National Grid

Temporary Residential Electric Service Connection Agreement

Subject to the terms and conditions of this Temporary Residential Electric Service Connection Agreement (the "Agreement"), Niagara Mohawk Power Corporation d/b/a National Grid (the "Company") agrees to temporarily reconnect this residential electric service at the Service Address specified below (the "Service Reconnection") for no more than ten (10) business days while the Owner secures the services of an electrician to make permanent repairs to the electric service (the "Repairs") and obtains an approved electrical inspection of those Repairs [unless either party is ordered otherwise by the Fire Marshall, Municipal Code Enforcement Agent, Authority Having Jurisdiction (AHJ), or a third party inspection agency operating under the authority of the AHJ.]

In consideration for the Company's implementation of the Service Reconnection, the Owner acknowledges and agrees to the following:

1. The Service Reconnection is a temporary service connection of an emergency nature and is not intended for the permanent or continued provision of service; and
2. The Company will disconnect the Service Reconnection if permanent Repairs are not made and an approved inspection thereof is not received within ten (10) business days of the Effective Date listed below; and
3. All Repairs must be inspected by the AHJ, or a third-party inspection organization acceptable to the AHJ within ten (10) business days of the Effective Date listed below; and
4. The Company is not responsible for any damages incurred as a result of the Service Reconnection or otherwise in connection with this Agreement; and
5. Any potential damage to the Owner's premises or otherwise that may occur as a result of the Service Reconnection without an approved inspection certificate may jeopardize the Owner's eligibility for fire and casualty insurance.
6. The Owner has read and understands the terms and conditions of this Agreement, which continue on the next page.

Owner Initials _____

Temporary Residential Service Address / Service City / Zip Code	
Effective Date _____/_____/_____	**Repair and Inspection Deadline Date** _____/_____/_____
Owner Name (Print)	**Owner Name (Signature)**
Owner Contact Telephone Number	
Owner's Electrician (to Make Repairs)	**Electrical Inspection Agency**
Company Employee Name (Print)	**Company Employee Name (Signature)**

Page 1 of 2

White Copy: Customer Fulfillment (Email: CFNY@nationalgrid.com) **Canary Copy:** Electrician **Pink Copy:** Owner **Goldenrod Copy:** OMS / Distribution Line

APPENDIX A

nationalgrid

Terms and Conditions

1. **RELEASE AND DISCLAIMERS:** This Agreement is limited to emergency temporary electric service connections made by the Company at Owner's request when electrical repair and inspection agency services are not readily available due to emergencies arising from accidental damage, weather, or earth-related catastrophes.

   THE SERVICE RECONNECTION IS BEING MADE AT OWNER'S EXPRESS REQUEST AND SHALL BE AT OWNER'S SOLE AND EXCLUSIVE RISK AND LIABILITY. OWNER FOREVER WAIVES, RELEASES AND DISCHARGES THE COMPANY, ITS PARENTS AND AFFILIATES, AND THEIR RESPECTIVE OFFICERS, DIRECTORS, MEMBERS, MANAGERS, EMPLOYEES, SERVANTS, REPRESENTATIVES, CONTRACTORS, AGENTS, SUCCESSORS, AND ASSIGNS (EACH, INDIVIDUALLY, A "COMPANY PARTY" AND, COLLECTIVELY, THE "COMPANY PARTIES") FROM ANY AND ALL CLAIMS, SUITS, CAUSES OF ACTION AND/OR LIABILITY WHATSOEVER (INCLUDING, WITHOUT LIMITATION, LIABILITY FOR ANY LOSS, INJURY, OR DAMAGE FOR DEATH, PERSONAL INJURY OR PROPERTY DAMAGE) WHICH THE OWNER MAY NOW OR HEREAFTER HAVE AGAINST THE COMPANY AND/OR ANY COMPANY PARTY ARISING OUT OF OR RELATING TO THE SERVICE RECONNECTION OR THIS AGREEMENT. OWNER HEREBY ASSUMES ANY AND ALL RISK AND LIABILITY OF ANY KIND ARISING FROM OR IN CONNECTION WITH THE SERVICE RECONNECTION OR THIS AGREEMENT.

   In no event, whether as a result of breach of contract, tort (including negligence and strict liability), or otherwise shall Company be liable in connection with this Agreement or the Service Reconnection for any special, indirect, incidental, penal, punitive or consequential damages of any nature, whether or not (i) such damages were reasonably foreseeable or (ii) Company was advised or aware that such damages might be incurred. The provisions of this Section shall survive termination, expiration, cancellation, or completion of this Agreement.

2. **NO WARRANTIES OR REPRESENTATIONS:** COMPANY MAKES NO COVENANTS, GUARANTEES, REPRESENTATIONS OR WARRANTIES, WRITTEN OR ORAL, STATUTORY, EXPRESS OR IMPLIED, WITH RESPECT TO THE SERVICE RECONNECTION OR THIS AGREEMENT (INCLUDING, WITHOUT LIMITATION, ANY COVENANTS, GUARANTEES, REPRESENTATIONS OR WARRANTIES WITH RESPECT TO QUALITY, SAFETY, SUITABILITY OR FITNESS FOR A PARTICULAR PURPOSE, THE ABSENCE OF ANY DEFECTS, WHETHER LATENT OR PATENT, OR COMPLIANCE WITH ANY FEDERAL, STATE OR LOCAL LAWS, RULES, REGULATIONS OR ORDINANCES) ALL OF WHICH ARE HEREBY EXPRESSLY EXCLUDED AND DISCLAIMED. THIS AGREEMENT (INCLUDING, WITHOUT LIMITATION, ANY PERFORMANCE HEREUNDER) DOES NOT CONSTITUTE AN ELECTRICAL INSPECTION NOR DOES IT REPRESENT ANY RECOMMENDATION ON THE PART OF THE COMPANY REGARDING IMPLEMENTATION OF THE SERVICE RECONNECTION.

   The provisions of this Section shall survive termination, expiration, cancellation, or completion of this Agreement.

3. **HOLD HARMLESS:** To the fullest extent permitted by applicable law, Owner shall at all times indemnify, defend (with counsel satisfactory to Company), and hold the Company, its parents and affiliates, and their respective officers, members, managers, directors, employees, servants, representatives, contractors, agents, successors, and assigns, harmless from and against any and all damages, costs (including, without limitation, reasonable attorney fees), expenses, losses, claims, demands, suits, recoveries, and liabilities(including, without limitation, liabilities to third parties and liabilities related to injury to, or death of, any person and damage to property), arising out of or relating to this Agreement, the Service Reconnection or the Company's performance or nonperformance of its obligations under this Agreement.

   Owner shall take prompt action to defend and indemnify Company, its affiliates, parents, and their respective officers, members, managers, directors, employees, servants, representatives, contractors, agents, successors, and assigns, against claims, actual or threatened, but in no event later than notice by Company to Owner of the service of a notice, summons, complaint, petition or other service of process against Company alleging damage, injury, liability, or expenses that may be subject to indemnification hereunder. The Owner shall defend any such claim or threatened claim, including as applicable, engagement of legal counsel satisfactory to the Company, to respond to, defend, settle, or compromise any claim or threatened claim. Furthermore, Owner understands and agrees that it is responsible for any and all costs and expenses incurred by Company to enforce this indemnification provision.

   The provisions of this Section shall survive termination, expiration, cancellation, or completion of this Agreement.

4. **MISCELLANEOUS:** This Agreement shall not be amended, superseded or modified, except in a writing signed by both parties. No term of this Agreement may be waived except in a writing signed by an authorized representative of the party against whom the amendment, modification, or waiver is sought to be enforced. Waiver of any provision herein shall not be deemed a waiver of any other provision herein, nor shall waiver of any breach of this Agreement be construed as a continuing waiver of other breaches of the same or other provisions of this Agreement. To the extent that any provision of this Agreement shall be held to be invalid, illegal or unenforceable, it shall be modified so as to give as much effect to the original intent of such provision as is consistent with applicable law and without affecting the validity, legality or enforceability of the remaining provisions of the Agreement. This Agreement shall be interpreted and enforced according to the laws of the State of New York and not those laws determined by application of New York's conflicts of law principles. Owner and Company each agree that there are no understandings, agreements, or representations, expressed or implied, with respect to the subject matter hereof other than those expressed herein. This Agreement supersedes and merges all prior discussions and understandings with respect to the subject matter hereof, and constitutes the entire agreement between the parties with respect to such subject matter.

Page 2 of 2

CM5985 (2/15)

Appendix 17

Certifications

CERTIFICATION
STRAY VOLTAGE TESTING

STATE OF NEW YORK)
) ss.:
COUNTY OF ALBANY)

Matthew T. Barnett, on this 12th day of February 2021, certifies as follows:

1. I am the Vice President, Maintenance and Construction, New York Electric, of Niagara Mohawk Power Corporation d/b/a National Grid (the "Company"), and in that capacity I make this certification for the annual period ending December 31, 2020 (the "Twelve-Month Period") based on my knowledge of the testing program adopted by the Company in accordance with the Public Service Commission's Orders issued and effective January 5, 2005, July 21, 2005, December 15, 2008, March 22, 2013, and January 13, 2015 in Case 04-M-0159 (collectively the "Orders"), including the Quality Assurance Program filed by the Company with the Commission.

2. In accordance with the requirement of the Orders, the Company developed a program designed to test (i) all publicly accessible underground electric distribution facilities owned by the Company ("Underground Distribution Facilities") on an annual basis, (ii) all metallic streetlights and traffic signal poles located in public thoroughfares in the Company's service territory to which the Company provides service ("Streetlights") on an annual basis, and (iii) all publicly accessible overhead distribution facilities, underground

residential distribution ("URD") facilities, overhead and underground transmission facilities, and substation fences owned by the Company at least once every five years ("Facilities"), all as identified through a good faith effort by the Company for stray voltage (the "Stray Voltage Testing Program").

3. I am responsible for overseeing the Company's Stray Voltage Testing Program.

4. I hereby certify that, to the best of my knowledge, information, and belief the Company has implemented and completed its Stray Voltage Testing Program for the Twelve Month Period. Except for untested structures that are identified as inaccessible in the Company's Annual Report and those Facilities that were already tested at least once during the five-year period ended December 31, 2020, the Company is unaware of any Facilities, Underground Distribution Facilities, or Streetlights that were not tested during the Twelve-Month Period in accordance with the Stray Voltage Testing Program.

5. I make this certification subject to the condition and acknowledgement that it is reasonably possible that, notwithstanding the Company's good faith implementation and completion of the Stray Voltage Testing Program, there may be Facilities, Underground Distribution Facilities, and Streetlights that, inadvertently, may not have been tested or were not discovered or known after reasonable review of Company records and reasonable visual inspection of the areas of the service territory where Facilities, Underground

Distribution Facilities, and Streetlights were known to exist or reasonably expected to be found.

Matthew T. Barnett

Sworn to before me* on this 12 day of February, 2021

Notary Public:

LINDA KYRIAKIDIS
Notary Public, State of New York
Registration #01KY6374279
Qualified In Nassau County
Commission Expires April 23, 20 23

* PURSUANT TO NEW YORK STATE EXECUTIVE ORDER NO. 202.7

CERTIFICATION
FACILITY INSPECTIONS

STATE OF NEW YORK)
) ss.:
COUNTY OF ALBANY)

Matthew T. Barnett, on this 12th day of February 2021, certifies as follows:

1. I am the Vice President, Maintenance and Construction, New York Electric, of Niagara Mohawk Power Corporation d/b/a National Grid (the "Company"), and in that capacity I make this certification for the annual period ending December 31, 2020 (the "Twelve-Month Period") based on my knowledge of the inspection program adopted by the Company in accordance with the Public Service Commission's Orders issued and effective January 5, 2005, July 21, 2005, December 15, 2008, March 22, 2013, and January 13, 2015 in Case 04-M-0159 (collectively the "Orders"), including the Quality Assurance Program filed by the Company with the Commission.

2. The Company has an inspection program that is designed to inspect all of its electric facilities on a five-year inspection cycle, as identified through a good faith effort by the Company ("Facilities"), in accordance with the requirements of the Orders (the "Facility Inspection Program").

3. I am responsible for overseeing the Company's Facility Inspection Program.

4. I hereby certify that, to the best of my knowledge, information, and belief the Company has implemented and completed its Facility Inspection Program to inspect approximately 20 % of its Facilities during calendar year 2020, to comply with the five-year inspection cycle required under the Orders.

5. I further certify that, to the best of my knowledge, information, and belief, the Company has inspected 100% of its Facilities for the five-year period ended December 31, 2020, except for those identified in the Company's Annual Report.

Matthew T. Barnett

Sworn to before me on this 12* day of February, 2021

Notary Public:

LINDA KYRIAKIDIS
Notary Public, State of New York
Registration #01KY6374279
Qualified In Nassau County,
Commission Expires April 23, 20 22

* PURSUANT TO NEW YORK STATE EXECUTIVE ORDER NO. 202.7