

January 10, 2006

Mary L. Cottrell, Secretary
Department of Telecommunications and Energy
One South Station
Boston, MA 02110

Re: Plan for Implementation of the Recommendations Contained in Independent Consultant Reports to the Department on Stray Voltage and Manhole Safety

Dear Secretary Cottrell:

In compliance with the Department's December 9, 2005 letter order regarding the assessments of the Department's independent consultants on stray voltage and manhole safety, Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid hereby submit their plan for implementation of the recommendations contained in the assessments. Thank you very much for your time and attention to this matter.

Very truly yours,



Amy G. Rabinowitz

cc: Joseph W. Rogers, Office of the Attorney General

National Grid

Plan for Implementation of the
Recommendations Contained
in Final Consultants' Reports
to the Department on Stray
Voltage and Manhole Safety

January 10, 2006

Submitted to:
Massachusetts Department of
Telecommunications and Energy
Docket D.T.E. No.

Submitted by:

nationalgrid

National Grid
Plan for Implementation of the Recommendations Contained in Final
Consultant Reports to the Department on Stray Voltage and Manhole Safety

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National Grid
Plan for Implementation of the Recommendations Contained in Final Consultant Reports to the Department on Stray Voltage and Manhole Safety

I. GENERAL

On December 9, 2005, the Massachusetts Department of Telecommunication and Energy (the “Department”) directed each Massachusetts electric distribution company to submit, by January 10, 2006, its plan for implementation of the recommendations contained in two final reports:

- (1) The Independent Assessment of Stray Voltage in Underground Distribution Systems of Massachusetts Electric Utilities. (“Stray Voltage Final Report”) as prepared by Navigant Consulting, Inc. (“Navigant”), and
- (2) the Independent Assessment of Dislodged Manhole Covers (“Manhole Safety Final Report”) as prepared by Siemens Power Transmission & Distribution, Inc. (“Siemens”);

These two reports are hereinafter collectively referred to as the “Final Reports”.

Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid (“Company” or “National Grid”) have prepared this implementation plan (the “Plan”) in compliance with the Department’s directive (the “Directive”) to implement the recommendations in the Final Reports.

The Directive provides guidance regarding the levels at which voltage should be detected, the need for a dynamic and evolving voltage detection standard and the need for detection training. The Directive also requires respondents to identify the circumstances that warrant any departure from the recommendations contained in the Final Reports.

This Plan is intended to fully address the Department's Directive. To assure quality and integrity of the testing, documentation and repair process, the Company will implement a quality assurance program as described in detail below in Attachment 6.

II. OVERVIEW

The Directive calls for stray voltage (a.k.a. elevated voltage) testing, initially to a 20-volt standard, with an ultimate goal of testing to an 8-volt standard over time. The Stray Voltage Final Report calls for metallic equipment accessible by the general public to be tested for stray voltage including:

- Metallic street lights and fixtures
- Metallic risers, sweeps and conduits
- Metallic manhole and handhole covers
- Secondary pedestals
- Padmount transformers and translosures
- Padmount switchgear , termination cabinets and junction boxes
- Control cabinets such as pole-mounted capacitor controls within public reach
- Exposed down grounds

The report also requires monitoring, tracking and reporting to the Department of stray voltage events as well as testing results.

At the outset, the Company can assure compliance with the 20 volt standard provided in the Directive. The initial Plan implements a 5-year rolling schedule for stray voltage testing and a 5-year manhole inspection program. With respect to stray voltage testing, the Company will complete the required initial 5 year cycle of testing of its overhead distribution system in concert with the Company's on-going inventory and condition assessment survey of its overhead distribution system.

Supplementing this joint survey and inspection work with stray voltage testing on conductive metallic equipment will minimize overall cost (however metal street lights will be tested separately, at night.) The Company's Plan provides a comprehensive approach to test for stray voltage of metallic equipment accessible by the general public to an 8-volt standard at the onset of the program. While this initial 8-volt testing standard is part of the initial Plan, development and application of effective mitigation solutions to an 8 volt standard may take time to accomplish.

Based upon the Company's experience with stray voltage from a prior survey, related public events and data gathered in the Company affiliate's New York operations, metallic street lights present the greatest risk of exposure for stray voltage. As such, testing of metallic street lights and fixtures has been given the highest priority. There are approximately 18,000 metallic street lights in the Company's service territory in Massachusetts. The Plan calls for inspection of 100% of these facilities in one 12 month period starting April 1st, 2006 with completion by March 31st, 2007. After that time the Company will assess the need to start the rolling five year inspections on these facilities or to continue with one 100% inspection at least once every five years.

With respect to the Manhole Safety Final Report, the Company's Plan calls for the internal inspection of all manholes over a five-year period, including infrared testing of separable connectors, development of a recording system for cable splices and incident analysis and documentation of manhole events to include incidents with smoke, fire and/or explosions with and/or without cover dislodgement. Specifically, the Manhole Safety Final Report recommends that the Company:

- Broaden its definition of manhole events to include smoke, fire, explosions with and/or without cover dislodgement; with notification to the Department for such events.
- Implement a program designed to inspect all manholes over the five-year period beginning January 1, 2006 and create a database of manhole conditions and required repairs. The resulting data should be used to prioritize future manhole inspections

and/or determine an appropriate periodic re-inspection cycle. Additionally, the report recommends that the Company adopt a standardized repair priority schedule and track repair backlogs by priority.

- Maintain a database of splices and splice repairs made by employees and contractor crews in order to determine possible workmanship issues and related training needs.
- Perform field failure analysis for all manhole events. Analysis should be performed by employee(s) trained in forensic failure analysis. Prepare annual trend assessments of root-cause failure analysis results and submit to the Department.
- Employ standardized manhole inspection and manhole event data collection forms that maximize checklist items and minimize the need for free-form comments. Submit quarterly and annual reports with prescribed summary analysis to the Department. Submit individual standardized reports on all events involving dislodged covers to the Department.
- Create a Working Group of representatives from each of the other three Massachusetts distribution companies and the Department staff to meet quarterly for sharing information on manhole event trends, root cause analyses, research studies, results of pilot programs, new technologies, and lessons learned. The Working Group could also address broader issues related to electric distribution reliability and safety, as appropriate.
- Survey non-jurisdictional operators of underground electric distribution systems regarding manhole events and manhole inspection practices, and determine their interest in participating in the Working Group.

To communicate the requirements of the Final Reports to its workforce and implement the details of the Plan, the Company has drafted a series of electric operating procedures ("EOP's"). These EOPs are attached to this Plan, and are subject to change based on experience over time. In addition to the detailed EOPs, a general description of the Plan follows.

A. Stray Voltage Testing of all Publicly Accessible Electric Facilities Capable of Conducting Electricity

The details of the Company's stray voltage testing procedures and protocols are included in NG-USA EOP G016, entitled "Elevated Equipment Voltage Testing Procedure," provided in Attachment 1. Below is an overview of the programs and associated procedures and protocols.

(1) Facilities to Be Tested

In accordance with the recommendations in the Stray Voltage Final Report, utilities should inspect and test the following equipment where accessible by the general public:

- Metallic street lights and fixtures
- Metallic risers, sweeps and conduits
- Metallic manhole and handhole covers
- Secondary pedestals
- Padmount transformers and transclosures
- Padmount switchgear , termination cabinets and junction boxes
- Control cabinets such as pole-mounted capacitor controls within public reach
- Exposed down grounds

For purposes of the Company's program, all facilities falling into the covered categories listed below that are within reach of a person will be tested (i.e., within reach by an inspector standing on the ground). The Company has identified common equipment that is covered by this directive and

developed a list of such equipment and facilities, as set forth below:

(a) *Metallic* street lighting standards owned by the Company. Consistent with the Directive to test when exposure may be greatest, street lighting standards will be tested at night, when the light would normally be energized. Stray voltage testers also will be equipped with “angel guards” (street light standard base covers) for installation if covers are missing or wires are found to be exposed to the public at the time of testing. Private area lighting, state- or municipal-owned lights, lights owned by park associations, lights in parking lots, municipal traffic signals, non-conductive (e.g., fiberglass) street light standards, and standards located in places that are not publicly accessible (e.g., without stopping traffic or creating hazardous situations for workers or members of the public) will not be tested;

(b) *Metallic* components of overhead distribution facilities, excluding transmission facilities, that are within reach of inspectors, including such items as metallic towers and metallic poles, metallic riser guards or conduit, uncovered or non-insulated down grounds, and any other metallic piece of equipment on the pole (i.e., other than a pole step, stencil or any other metallic piece that is an incidental attachment to a non-conductive structure) within reach of the ground. Meters and customer meter pedestals are excluded.

(c) The following *metallic* equipment associated with underground facilities: manhole covers, vault covers and grates, junction box covers, handhole covers, padmount transformers, and switchgear.

(d) Concrete and fiberglass handholes and other non-conductive equipment will not be tested.

The Company maintains information about the equipment to be tested in multiple systems, in both electronic and paper form. Based on those records, the Company estimates that the number of potentially conductive equipment that will require testing is shown in Table 1 below.

Table 1
Conductive T&D Equipment Items Referenced in Order for Voltage Testing

Element	Totals
Dist Poles (portion, refer to b. above)	767,452
Handhole Covers – all	39,219
Manhole Covers	15,500
Vault Covers/Entrances	1,690
Pad Mount Transformers	30,587
Switchgear	708
Metallic Outdoor Lighting	18,000

(2) *Limitations on Testing*

The Company expects to encounter situations where equipment is located in areas where access to the public is prevented, located in areas where the public is reasonably not expected to be walking (median strips of limited access highways, for example). The Company will not scale barriers, or endanger personnel, to test such equipment, which will be considered not publicly accessible.

Similarly, there may be temporary construction or other work activity that obstructs access to a particular facility for an extended period of time. In such cases, the Company will make note of the obstruction, but will not attempt to test the equipment at such time.

(3) *Daily Job Site Testing*

In addition to the formal testing program, the Company will implement daily job site testing.

The daily job site testing will require that metallic equipment, associated with a job at each job site where Company personnel or contractors complete a work assignment, shall be tested for stray voltage at the end of the work day or the completion of the assignment. These stray voltage tests will not be documented.

(4) Use of Test Equipment

The Company will use hand held devices (proximity detection units) that are capable of detecting voltage from 8 volts to 600 volts. The devices will be certified to a minimum level of 8 volts and to a maximum level of 600 volts by an independent laboratory. At this time, the following unit has been certified: HD Electric model LV-S-5.

When testing, if the presence of voltage is indicated by the proximity detection unit, a portable AC digital voltmeter with a minimum of Category III 1,000 volt rating will be utilized to confirm the voltage. The test meter will have an input load impedance of at least 500 ohms. However, since 500 ohm resistors must be made manually, the Company may migrate to a 3,000 ohm resistor which can be readily obtained.

At this time, the following units have been approved:

1. HD Electric model LV-S-5 (5-600 volts).
2. Fluke 85
3. Fluke 87
4. Fluke 170 series or equivalent
5. Fluke 175
6. Fluke 177
7. Fluke 179
8. Fluke 187
9. Fluke 189

The details of the testing procedure that will be used are set forth in EOP-G016 in Attachment

1.

(5) Corrective Action Requirements

The Company has established a procedure to be followed when a stray voltage condition is found, in accordance with the testing procedure.

To assure safety, where stray voltage in excess of 8 volts is found on a facility that is located in an area where pedestrians can make contact, a person will be assigned to remain on site to “guard” the location until action is taken to reduce the voltage to 8 volts or less. If the stray voltage measures less than 8 volts, but above 4.5 volts, the Company will, at a minimum, install a barrier and protective markings, but will also use its discretion on whether or not to assign a guard until action is taken to reduce the voltage to 4.5 volts or less.

Temporary repairs will be made to reduce the voltage to 4.5 volts or less as soon as practical after the condition is discovered. Permanent repairs will be made within 45 days of the occurrence. If permanent repairs cannot be made within 45 days of the occurrence, due to extraordinary conditions, the Company will periodically visit the site to monitor the condition of the temporary repair until the permanent repair is made.

Where the tester detects a minimal voltage level of 4.5 volts or less (i.e. the voltage standard of the proximity tester) that is attributable to the design of the facility (e.g., a nominal induced voltage) and not the result of an improper condition, no corrective action would be taken.

B. Manhole Inspection Programs

The recommendations contained in the Manhole Safety Final Report can be summarized into four requirements:

- Internally inspect all manholes over a five year period, including infrared thermal testing of separable connectors, with repairs completed using a standardized repair priority schedule,
- Develop a record keeping system of new and replaced cable splices,

- Develop an incident analysis and documentation of manhole events to include failure and trend analysis, and,
- Inter-company coordination along with outreach to non-jurisdictional operators.

The Company's underground inspection program will have its inspectors report maintenance and safety issues through hand held computers, or pre-printed forms, that will be inputted into the Company's central database, which is described in greater detail in Section IV below. The underground distribution facility maintenance items identified through this patrol will be separated into four priority categories A, B, C, and E priority. The problem codes, used for each identified type of maintenance and safety issue, will automatically default to the appropriate priority category, but the default priority can be adjusted by the individual performing the inspection based on actual field conditions. A complete list of maintenance items, default priorities, and repair time-frames can be found in Attachment 2, NG-USA EOP UG006. The priority categories are defined as follows:

- A Priority - An identified facility/component that must be repaired or replaced as soon as practical.
- B Priority – An identified facility/component condition that shall be considered for repair or replacement as the feeder is scheduled for maintenance. These identified conditions will be corrected as preventive maintenance and or facility life extension.
- C Priority – An identified facility/component condition that is being trended and reviewed by Asset Management that may require replacement through the engineering process (Requires project/capital expenditures). Non-capital conditions identified under this priority will be corrected at the discretion of field operations.

- E Priority – An identified facility/component that must be replaced or repaired immediately to address public safety or system reliability. The inspector shall notify the appropriate operations department for immediate response and corrective action any time an E priority is found during an inspection.

(1) *Underground Inspection*

The underground inspection procedures and protocols are included in NG-USA EOP-UG006, entitled “Underground Inspection and Maintenance,” provided in Attachment 2, along with NG-USA EOP-UG001, entitled “Infrared Non-Contact Thermometer Inspection” in Attachment 3. Underground electrical facilities requiring inspection include an estimated 15,500 manholes and 1,690 electrical vaults. These facilities are located in the Company’s underground networks (Worcester, Brockton, and Lynn) and in conventional, non-network, underground manhole/handhole and duct. systems. The database of the network equipment is included in paper drawings, but will be converted to electronic format with the documentation of this program. A data base will be used to retain the documentation of equipment maintenance items and priority. Attachment 4 is the “Underground Inspection Log” data base, and Attachment 4.a. is the “Underground Inspection Log Form.”

(2) *Inspection Schedules*

The manhole visual inspection program will be accomplished over a five year period, in accordance with the Directive. Each year, an inspection of 20% of the total amount of facilities will be targeted.

(3) *Database of Cable Splices*

The Company will establish a procedure and database to track all newly installed and maintenance replaced cable splices. The database of cable splices will be developed in tandem with the “Underground Trouble Report Data Base” program. This cable splice data base will require the

Company's inspectors to report "Underground Trouble" and "Cable Splices" through hand held computers, or pre-printed forms, that will be inputted into the Company's database.

The National Grid splice log will only include splices located in manhole and vault type systems; not those as part of an underground residential development (URD), underground commercial development (UCD), or rural area splices; which are typically direct buried cable applications. Attachment 5 shows "screen shots" of the Trouble / Splice Log data base.

(4) *Manhole Event Incident Analysis*

The Company will establish a procedure and system to analyze all manhole events. The Company maintains a data base of all events that result in an outage, including those events occurring in manholes, vaults, and service boxes. Qualified Company personnel investigate every customer outage event to determine the root cause. Once found, the root cause is recorded in a data base that is analyzed for trends. The Company's engineering laboratory and distribution engineering services department also examine the root causes of underground system events in order to learn how to minimize the occurrence of future events.

When a material defect is suspected as the root cause of a failure, manufacturers' representatives are contacted, or independent laboratories consulted, to assist in further analysis. If the Company suspects that it is not using material or equipment appropriately, Company work methods engineers investigate. If a material defect or work method is found to be the cause of an underground or manhole event, mitigation strategies are quickly communicated directly to the workforce via alert bulletins illustrated in Attachment 8 a-c, at the Company's weekly scheduled safety briefings, or if necessary, through safety stand-downs.

The Company tracks and analyzes data on manhole cover events that the Company becomes aware of, even if there is no outage involved. By this policy, the Company will capture critical data

surrounding the event and document it in an “Underground Trouble Report.” Attachment 5 shows the Trouble / Splice Log data base input screens format.

III. *Notification to Department*

The Final Reports require notification to the Department for any events including, (i) electrical shocks reported by the public, and (ii) manhole events including smoke, fire, explosions with and/or without dislodgement. To accomplish this, the Company has modified its NG-USA EOP G009 entitled “Personal Injury Accidents/Newsworthy Events Report,” provided in Attachment 7, to utilize its Outage Reporting Protocol (“ORP”) system to notify the Department of such events. The EOP was modified to incorporate the following:

A. National Grid, in compliance with the requirements of Massachusetts General Laws, Chapter 164, Section 95, shall report within a 24 hour period an accident to employees or the public in regards to National Grid electric facilities where the individual is injured, rendered insensible or killed. The notification will be made utilizing the Department’s Outage Reporting Protocol (ORP) website, as described in Section II.A of Attachment 7, NG-USA-EOPG009. The Accident Report Program shall be the form utilized. The following information is required:

1. Date
2. Company name
3. Contact person
4. Telephone number
5. Accident date and time
6. Location of incident
7. Detailed description of accident

The notification/report is to be completed and submitted by the appropriate Regional Control Center upon receiving the information from Company personnel. Additionally, a copy of the submittal shall be faxed to the Company's Manager of Corporate Safety and Health.

B. Exceptional, or non-routine events, due to elevated equipment voltage that required reporting to OSHA, or other government organizations, due to injuries or other substantive impacts, are required to be submitted to the Department within one to three days. Events involving a fatality or injury (human or domestic animal) should be reported immediately. The notification shall be made utilizing the Department's Outage Reporting Protocol (ORP) website as described in Section II.A. of Attachment 7, NG-USA-EOPG009. The Accident Report Program, providing the same information listed above, shall be the form utilized.

The notification/report is to be completed and submitted by the appropriate Regional Control Center upon receiving the appropriate information from Company personnel. Additionally, a copy of the submittal shall be faxed to the Company's Manager of Corporate Safety and Health.

C. The Department requires initial notification of all manhole events (i.e., explosions, fires and smokers) to be submitted as soon as possible, but no later than 24 hours after the event. Manhole events include the following:

1. Smoking Manhole – A manhole event in which smoke is visible, but no visible flame is escaping from the edge of the manhole cover or from holes in the cover.
2. Manhole Fire – A manhole event in which the cover remains seated in its frame and there is visible flame escaping from the cover's edge or from holes in the cover.
3. Manhole Explosion – A manhole event in which a release of energy from the manhole occurs and the manhole cover is dislodged from its frame, or debris such as cement and dirt is projected into the air although the manhole cover remains seated.

The notification shall be made utilizing the Department's Outage Reporting Protocol (ORP) website, as described in Section II.A. of Attachment 7, NG-USA-EOPG009. These required reports involving manhole events should contain the following information:

1. Event record number
2. Location of failure
3. Date and time of failure
4. Weather conditions for previous 24 hours
5. Manholes involved in event
 - a. Number and location
 - b. Manhole size
 - c. Manhole covers type (solid or slotted)
 - d. Whether manhole cover was dislodged
6. Failed equipment type (cable, splice, etc.)
 - a. Feeder number for primary cable failure
 - b. Voltage
 - c. Cable type and age
 - d. Cable loading
 - e. Other equipment involved and age
7. Supply substation identification
8. Event type (smoke, fire, explosion)
9. Manhole entry
 - a. Date of most recent manhole inspection (attach inspection sheet)
 - b. Date of most recent manhole entry and reason (e.g. maintenance)

- c. Failures at this location in the past five years
 - d. Gas detected in manhole
10. Sequence of occurrences during the event
- a. Number of customers interrupted
 - b. Duration of interruption
 - c. Personal injuries and/or property damage
 - d. Related outages
11. Summary of initial investigation into cause of failure

The initial notification/report is to be completed and submitted by the appropriate Regional Control Center upon receiving the information from Company personnel. Additionally, a copy of the submittal shall be faxed to the Company's Manager of Corporate Safety and Health. The final manhole cover dislodgement report is to be completed by the appropriate Field Operations Supervisor and to be sent as soon as possible after the event, when the information required by the Department becomes available.

IV. THE DATABASE SYSTEM

The Company has developed a tabular database to document the equipment requiring maintenance. The database will be populated with information from hand-held computers, within which the maintenance codes are pre-programmed.

The equipment deficiencies are entered into the hand-held computer. At days-end, the hand-held computer information is downloaded into the database.

The hand-held computers have built-in GPS capability that allows the inspector or tester to confirm an equipment location, or add additional facilities, with the touch of a key to input the longitude and latitude of the facility. Hand-held computers utilized in the Stray Voltage testing will be

provided by the contractor hired by the Company to perform the services. The Company will provide the necessary data requirements (as listed in EOP G016) and the contractor will be required to provide them to the Company in the proper format.

The Stray Voltage data repository will be developed to meet the information requirements listed in NG-USA EOP G016, included in Attachment 1.

The Company will be completing a comprehensive survey of its overhead distribution equipment and will conduct the stray voltage testing at that time. The handheld devices will document; the equipment characteristics, GPS longitude and latitude points, and the results of the stray voltage tests.

V. TRAINING

The training programs for the Stray Voltage testing and inspections will involve the following subjects:

- Use of personal protective equipment, including rubber gloves
- Understanding the Electric Operating Procedures described herein
- Knowing what constitutes elevated voltage
- How to perform inspections, including priority maintenance codes assessment
- How to use a proximity tester
- How to use a multi-meter
- Identification of distribution system equipment
- A review of construction standards
- How to perform street light inspections and make minor repairs(e.g., grounds, bonding)
- Hands on lab training in all the above subjects, as well as classroom training
- How to use handheld data entry devices

All Company employees doing inspections are trained to work on or with overhead facilities and/or are specially trained for underground equipment. Entry to manholes and vaults requires additional training and safety requirements. Through this training, employees are trained on the principles of electricity, electrical equipment, Company standards, safety requirements, personal protective equipment and first aid.

To utilize the database (i.e., to electronically gather data), workers (in-house and contractor) will be trained on the use of the hand-held device that inputs the data to the Company's data base, its operation, various asset class screens on the device (e.g., overhead, underground, street light standards, stray voltage testing, etc.), and other corresponding maintenance priority codes.

The Company anticipates that employees will be qualified with the aforementioned training and will be skilled in the ability to conduct the required stray voltage testing and voltage measurements. The same workers who do the voltage testing may also be used to make any necessary repairs.

Contractors conducting inspections will be required to meet training qualification criteria comparable to that of in-house workers. The Company's Construction and Management Services (C&MS) group coordinates safety and proficiency training for contractors on a routine basis when using such contractors. The bid specification for these workers will require proof of such qualification. This includes contractor orientation for the different levels of testing and inspection activity, review of safety plans and risk mitigation, and contractor safety procedures in general. Required technical skills are outlined in the EOPs and any additional training necessary for contractors to perform the required testing and inspection activities will be provided by the Company.

Contractors conducting the stray voltage tests shall be provided orientation training regarding the program for a subset of their workforce, who will then serve as trainers to instruct and train the remainder of the contractor's workforce using Company training materials. Testing equipment will be

demonstrated, and materials and policies will be provided. Workers will be equipped with the applicable materials to perform their job and will be trained on the protocols to secure an area where an excessive stray voltage condition is found. The training will include a review of the applicable EOPs.

VI. MATTERS OF INTERPRETATION AFFECTING IMPLEMENTATION

In developing its Plan, the Company identified a number of items where implementation may differ from the recommendations and/or clarification is required. Below, each matter is identified and explained in further detail.

A. Non-Metallic Manhole & Handhole

The Stray Voltage Final Report references testing “manhole and handhole covers”. The Company will test these if they are metallic, but will not test concrete and fiberglass covers.

B. Inspections and Stray Voltage Tests Documented by GPS Point of Facility

The Company’s system for inspections and stray voltage testing itemizes the facility at each GPS point and identifies it by asset type; e.g., pole, street light standard, manhole, handhole, vault, pad mount transformer, or pad mount switchgear. For example, a pole may have a guy and a downground, which requires two stray voltage tests. This will be recorded as a “pole tested.” Similarly, regarding inspections, a pole may have a pole-top transformer, guy, downground, cutouts, connections, etc. If all associated equipment on the pole is in good condition, it will be recorded as a “pole inspected,” but every piece (and sub-piece) of equipment will not be separately noted.

C. Street Lights on Wood Poles - Testing Down Ground During Daytime

Metallic street light poles will be tested for stray voltage when the light is operating during the night. However, for wood poles with a guy or downground, a street light arm/head located on that wood pole would be tested during the daytime along with the rest of the overhead system.

D. Inaccessible Street Lights on Highways

Certain street light poles, especially those in the median between interstate highways or other major roads, are inaccessible to the public. Thus, the Company does not interpret the Stray Voltage Final Report recommendations to require voltage testing of such facilities, as this could place the Company's workers in a potentially hazardous situation. While these facilities can be visually inspected from a distance, the detailed inspection, and stray voltage testing, will not be performed.

E. Inaccessible Equipment Due to Fence

Certain equipment may be generally inaccessible to both the public and our employees due to customer fences. (e.g., poles in back-yard lots). In such cases, we are recommending that stray voltage testing would not be conducted.

F. Stray Voltage Detection Level

As described herein, the Company will utilize a proximity tester typically sensitive to 4.5 volts certified to 8 volts, for its stray voltage testing. Upon any positive test, a separate reading with a grounded multi-meter with a minimum of a 500 ohm impedance shall be utilized for a voltage reading. Where greater than 8 volt is found, actions for immediate guarding, investigation, and repair will be taken.

G. Cable Load & Temperature Readings

The Manhole Safety Final Report recommends load and temperature readings taken on the secondary network to assist in assessing where customer load may contribute to overloading the secondary cable and cause failures as a result. The Company's Plan does not incorporate this recommendation. National Grid's network is primarily paper and lead cable which does not allow for a clamp on meter to take load and temperature readings. Nevertheless, the Company's system design and operation addresses this issue, and thus it should not be a concern. National Grid's primary ring bus network is managed through extensive load flow analysis, which appropriately manages the network

load. The Company manages spot network customers in a similar manner to customers of an overhead line transformer, aggregating their metered load to assess the need, number, and location of network vaults to meet the total load obligations. If overloading were a problem, it would appear in customer interruptions on the secondary network, which has not been the case.

H. Seasonal Factors

Scheduling inspections during periods when equipment may have greater susceptibility to stray voltage is not always feasible. For example, it is not practical to locate all of the Company's underground facilities during winter months due to snow cover. When there are instances of possible damage caused by snow clearing activities, we are contacted by the local authorities to assess and remedy any problems. Through its inspection programs, which span all seasons, National Grid will have the opportunity to gather factual information to help determine and identify what impacts seasonal factors may have on elevated voltage.

I. Splice Log

The National Grid splice log will only include splices on manhole and vault type systems. No logs will be maintained for splices in underground residential developments (URDs), underground commercial developments (UCDs), or rural areas, as these are typically direct buried cable applications.

Furthermore, while the Company has established a database to record splices in conventional manhole and in the network systems, implementation will require training and maturity through the workforce. The Company will work with the Utility Working Group to consider an alternative approach that would facilitate the identification of workmanship issues on spliced, underground cables.

It should be noted that splicing logs were of more importance in the past, when the splices were lead-wipe and required a considerable amount of craft expertise to install successfully. This is no longer the case. Splices are now completed as cold splices or using heat-shrink technology. These

splices are routinely performed using much less craft expertise, and therefore, the Company (like most other utilities) finds little value to maintain detailed splicing logs tracking the level of information suggested by the Manhole Inspection Final Report. The utility working group will provide a forum for the consideration of alternative approaches that will coincide with the systems and operational practices of the companies.

J. Underground Asset Repository Information

In Appendix B.5 of the Manhole Safety Final Report, Siemens recommends the collection of certain information that is better gathered and retained in the Company's GIS system. To date, the Company has not justified the costs versus benefits of completing a GIS survey update of its underground system. Even though it was recommended in the Final Report, the Company continues to believe that updating its underground asset register for certain information is not necessary if the real focus is on inspection and completion of any needed repairs to ensure manhole safety. In particular, the Company believes that gathering the following information in an inspection assessment program is unwarranted:

- Grid # - Not required given that the feeder and equipment location identify this.
- Combustible gas is tested as a required safety item before a manhole is opened, but does not add value to record and maintain
 - Ambient MH temperature
 - Transformer type and ratings
 - Breaker information
 - Other equipment information
 - Sump pump
 - Sewer connection

- Voltages in manhole
- Number of feeders
- Type of primary cables
- Type of secondary cable
- Rodent droppings
- Record ampacity and temperature

K. Underground Inspection Priority Maintenance

The Manhole Safety Final Report in Appendix B.1 outlines certain priority maintenance items along with explicit repair timelines. The Company, in its EOP described in Section II.B. of this Plan, identifies a different set of priority items and repair timelines which the Company will implement. The priorities the Company plans to implement have been established and proven to be effective through numerous years of National Grid operations experience. Comparison can be made by reviewing the EOP along-side Appendix B.1.

L. Stray Voltage Conduits and Sweeps

The Directive calls for Stray Voltage testing of conduits and sweeps. Conduits and sweeps, typically underground portions of a riser installation, will not be tested as separate items, but, since they are electrically connected to a metallic riser, will, be tested as part of the riser system.

M. Manhole Event Definition

The Company agrees with the Manhole Inspection Final Report of establishing uniform definitions of “manhole events” for the purpose of data tracking and monitoring activities. The Company proposes to work with the other Massachusetts electric companies through a Working Group to develop these uniform definitions.

Consolidated Edison Electric Company (“ConEd”) operates a large underground distribution system in New York City and has experience with these types of events. Therefore, the Company recommends that the definitions developed by ConEd be used as a starting point for uniform definitions in Massachusetts. The ConEd definitions are as follows:

- *Smoking Manhole* – A manhole event in which smoke, but no visible flame is escaping from holes in the cover or around the cover’s edge and the cover remains seated in its frame.
- *Manhole Fire* – A manhole event in which flame is visible at holes in the manhole cover or around the cover’s edge and the cover remains seated in its frame.
- *Manhole Open* – A manhole event in which a release of energy from the manhole occurs and one or more manhole covers are dislodged from their respective frames. There is no reported injury or damage.
- *Manhole Explosion* – A manhole event in which a release of energy from the manhole is accompanied by physical injury to people and/or damage to vehicles or surrounding structures, including windows.

The ConEd Model provides a more precise and appropriate definition of the types of events that have the potential to occur on an underground distribution system and, if adopted by all the Massachusetts utilities, will facilitate the Department’s review and tracking of these types of events.

VII. Working Group

The Manhole Safety Final Report recommends development of multi-utility working group and reach-out to other municipalities and organizations that operate similar systems. The intent of the group would be to share best practices and experience with inspection and repair of manhole events, and to provide a forum to re-define appropriate inspection programs . To date the

Massachusetts Utilities, namely NSTAR Electric, National Grid, Western Massachusetts Electric Company, and Unitil Corp have had technical personnel teleconferencing in the development of these plans to comply with the Department's Directive. Technical personnel from each Company will establish a working group to meet the objectives, and then contact other known organizations for interest in joining and contributing to the group.

VIII. Organization & Execution

A project manager will have supervisory control and authority over the Company's Inspection and Testing Programs. The project manager will facilitate the Quality Assurance program, as well as facilitate oversight of any inspections and stray voltage testing by Company employees and contractors. In addition, the project manager will assure day-to-day management of the inspection schedules, data quality, analysis, and reports. The project manager will issue Requests for Proposals (RFPs) for services and hire workers as necessary. The project manager will be supported by several other Company departments. These departments are as follows. A Construction & Maintenance Service (C&MS) Department maintains relations with qualified contractors, and administers contracts with vendors. The T&D Technical Services Department develops EOPs, maintains the computer system administration, selects qualified testing devices, certifies laboratories, provides technical support for data analysis, and schedules development. Information Technology (IT) offers computer software support. Field Operations will support the inspection of identified facilities.

To ensure that adequate resources, with the necessary qualifications, are available to complete this work, the Company currently plans to perform the work as follows:

(1) Underground Network Vaults, Manholes and Submersible Transformer Vaults

The Company will predominantly use in-house qualified resources, supplemented by contractors where regionally required due to any lack of resources, to inspect the annual targeted

amount of network vaults, manholes and submersible transformer vaults. Stray voltage tests for grates and covers of network vaults, manholes and submersible transformer vaults will be completed and documented at the same time as the inspections.

(2) Stray Voltage Testing

As previously mentioned, the Company has contracted for a comprehensive survey of its overhead distribution system to be completed over the next three years. In concert with this effort, stray voltage testing will be completed on metallic risers, sweeps, conduits, down grounds and control cabinets such as pole-mounted capacitor controls.

In addition, the Company will predominantly use in-house qualified resources, supplemented by contractors where regionally required due to any lack of resources, to inspect the annual targeted amount of:

- Metallic street lights and fixtures
- Metallic risers, sweeps and conduits
- Metallic manhole and handhole covers
- Secondary pedestals
- Padmount transformers and translosures
- Padmount switchgear , termination cabinets and junction boxes
- Control cabinets such as pole-mounted capacitor controls within public reach
- Exposed down grounds

IX. QUALITY ASSURANCE

A. Overview

Quality Assurance programs have been developed, described in further detail in Attachment 6, to assure the integrity of the data developed during inspection and testing.

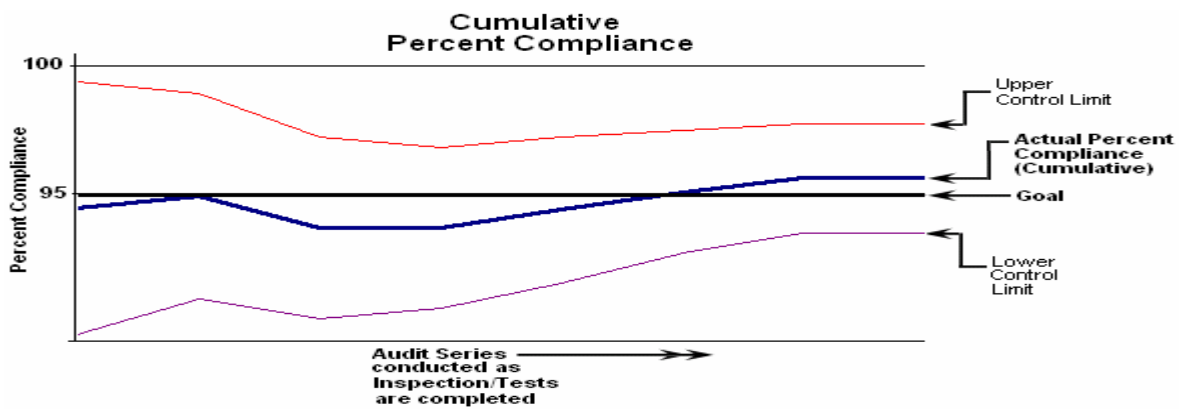
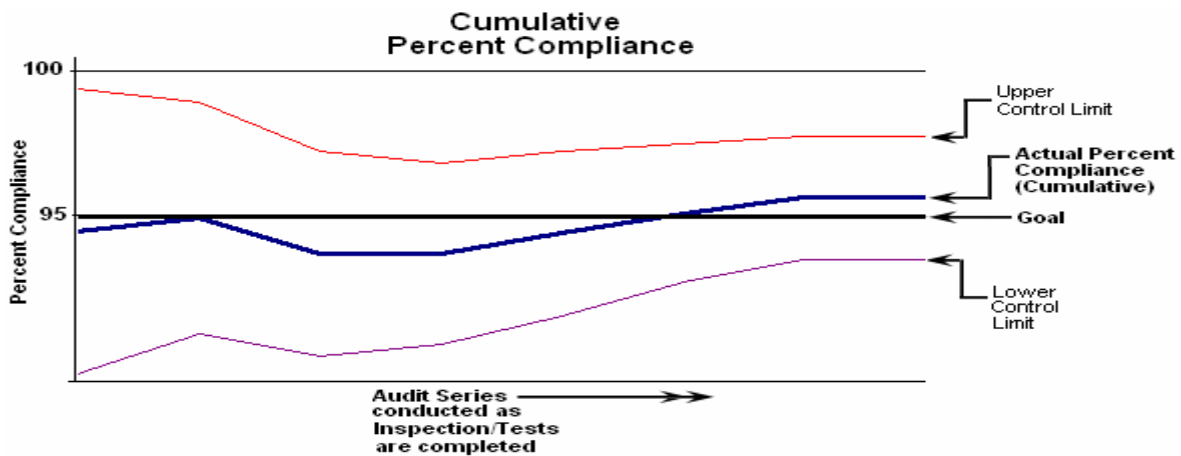
The quality assurance/quality control (QA/QC) approach most suitable for application to the Asset Inspection/Testing Program is the *Statistical Process Control (SPC)* Method. SPC is specifically designed for implementation on a continuous stream of products (data) created over long periods of time (e.g.: manufacturing assembly lines). Features of SPC that will heighten the integrity and efficiency of the Inspection/Test Program include:

- verifying the integrity of inspection/surveillance results at reasonable time intervals,
- providing “early warning” of results that are unacceptably inconsistent and/or trending towards unacceptable quality levels, and
- enabling the determination of root-cause(s)/corrective action to restore process integrity prior to the significant accumulation of suspect inspection/test results

B. QA Program Statistical Compliance

The QA program is designed to assure that the accuracy, thoroughness and integrity of the test/inspection data is maintained. The QA program also provides assessment features that alert analysts to the potential onset of unfavorable trends and the decay of quality before their entrenchment and the accumulation of significant amounts of suspect data.

The minimum level of quality sought is 95% Compliance as designated by the “Goal” threshold on the following plot. The SPC Method also provides depth to the QA process by illustrating trends as audits are conducted, by plotting natural upper and lower bounds against which the level of stability and consistency of data-quality is assessed and, thereby, prompting corrective interventions should trends be unfavorable and/or the stability or consistency is undesirable.



Attachment 1 – NG-USA EOP G016 Elevated Equipment Voltage Testing

 ELECTRIC OPERATING PROCEDURES	Doc No.: NG-USA EOP G016
	Page: Page __ of 12
	Date: 01/01/06
SUBJECT: Elevated Equipment Voltage Testing	SECTION: General

REFERENCE:

NYPSC Order 04-M-0159
Applicable National Grid Safety Rules & Procedures
Testing Equipment Operation Instructions

GENERAL INFORMATION:

The purpose of this procedure is to outline the requirements for the annual elevated equipment voltage testing on National Grid Facilities in New York as required by the New York Public Service Commission’s “Electric Safety Standards” issued on January 5, 2005. Additionally the Massachusetts Department of Telecommunications and Energy provided a series of recommendations on December 9, 2005 that have been included in this procedure.

This procedure also outlines corporate requirements for elevated equipment voltage testing in New Hampshire and Rhode Island. The variance in requirements between New York, Massachusetts, New Hampshire, and Rhode Island is based on sound utility practice versus regulatory requirements.

PROGRAM ADMINISTRATOR:

Distribution Engineering Services

APPLICABILITY

This procedure applies to all personnel involved with or responsible for the testing of facilities designated by this EOP for elevated equipment voltage.

SCOPE:

- I. Facilities Where Elevated Equipment Voltage Testing/Documentation is Required – New York
 - A. Street Lights and Municipally Owned Facilities
 - B. Substation Fences
 - C. Overhead Distribution Facilities
 - D. Overhead Transmission Facilities
 - E. Underground Facilities
 - F. Daily Work Areas
 - G. Exemptions

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- II. Facilities Where Elevated Equipment Voltage Testing/Documentation is Required – New Hampshire and Rhode Island
 - A. Street Lights
 - B. Substation Fences
 - C. Overhead Distribution Facilities
 - D. Underground Facilities
 - E. Daily Work Areas
 - F. Exemptions

- III. Facilities Where Elevated Equipment Voltage Testing/Documentation is Required – Massachusetts
 - A. Street Lights
 - B. Substation Fences
 - C. Overhead Distribution Facilities
 - D. Underground Facilities
 - E. Daily Work Areas
 - F. Exemptions

IV. Test Equipment

V. Test Procedure

VI. Corrective Action Requirements

VII. Database Requirements

VIII. Annual Reporting and Certification Requirements

IX. Responsibility

X. Definitions

XI. Training

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

A. Street Lights and Municipally Owned Facilities

1. Company owned metallic street lighting standards are required to be tested for elevated equipment voltage annually. This test is to be performed while the light is operating.
2. Municipally owned street light systems that National Grid directly provides energy to must be tested for elevated equipment voltage annually. National Grid will complete this testing unless assurances of the completion of required testing and transfer of such test data are made by the appropriate municipality. This test is to be performed while the light is operating.
3. Municipal owned metallic traffic signal standards and accessible devices are to be tested annually for elevated equipment voltage by National Grid.
4. All street lights identified on public thoroughfares regardless of ownership are to be tested annually.
5. All street lights under a maintenance contract are to be tested annually.
6. Exceptions not requiring elevated equipment voltage testing: private lighting, park associations, parking lots, fiberglass (or other non-conductive) street light standards, and 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.

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- B. National Grid Substation Fences
 - 1. Metallic fencing surrounding substations with National Grid Facilities shall be tested for elevated equipment voltage annually. This fencing can be customer owned for customer stations, if a National Grid facility is part of the station.
 - 2. See reference to NG-USA EOP 400.06.2 Substation - V&O Inspection Procedure.
- C. Overhead Distribution Facilities
 - 1. Towers and/or metallic poles with distribution facilities shall be tested annually for elevated equipment voltage.
 - 2. The following equipment on wood distribution poles requires annual elevated equipment voltage testing:
 - a. Metallic riser guard or conduit (company or non-company).
 - b. Uncovered or un-insulated down ground (company or non-company).
 - c. Down guy (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.
 - 3. Exceptions: Customer meters and customer meter poles are excluded.
- D. Overhead Transmission Facilities
 - 1. Towers and/or metallic poles with transmission facilities shall be tested annually for elevated equipment voltage.
 - 2. The following equipment on wood transmission poles or structures require annual elevated equipment voltage testing:
 - a. Metallic riser guard or conduit (company or non-company).
 - b. Uncovered or un-insulated down ground (company or non-company).
 - c. Down guy (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.
- E. Underground Facilities
 - 1. Annual elevated equipment 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, handhole covers, pad mount transformers, and switchgear.
 - 2. Exceptions: Non-metallic concrete or fiberglass pads or handholes are not required to be tested.
- F. Daily Job Site Test Requirements
 - 1. Each job site where National Grid personnel or its contractors complete a work assignment shall be tested for elevated equipment voltage at the end of the work day or the completion of the assignment. **This testing requirement is considered good utility practice and does not require specific documentation.**
 - 2. Exceptions:
 - a. Substation fencing will not require elevated equipment 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.

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G. Exemptions

1. 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.

II. FACILITIES WHERE ELEVATED EQUIPMENT VOLTAGE TESTING/DOCUMENTATION IS REQUIRED – NEW HAMSHIRE AND RHODE ISLAND

A. Company Owned Street Lights

1. Testing will be performed during each outage investigation notification and the data will be recorded for each instance.

B. National Grid Substation Fences

1. Metallic fencing surrounding substations with National Grid Facilities shall be tested for elevated equipment voltage annually.
2. See reference to NG-USA EOP 400.06.2 Substation – V&O Inspection Procedure.

C. Overhead Distribution Facilities

1. Wood distribution poles require testing to be completed on metallic risers in conjunction with the distribution patrol program covered by NG-USA EOP D004.
2. Documentation is only required on metallic risers found to be at an elevated voltage requiring repair. Testing data is not required for a facility that is found to be operating as designed.

D. Underground Facilities

1. Testing for elevated equipment voltage shall be done while completing scheduled inspections of underground equipment covered by NG-USA EOP UG006, Underground Inspection and Maintenance. The following items are to be tested on a five year cycle, padmount transformers, switchgears, and metallic handhole covers.
2. Testing for elevated equipment voltage shall be completed on underground facilities while completing working inspections covered by NG-USA EOP UG006. The metallic items to be tested are manholes covers, vault covers, handhole covers, splice box covers, junction box covers, padmount transformers, switchgear, and submersible equipment covers.

E. Daily Job Site Test Requirements

. Each job site where National Grid personnel or its contractors complete a work assignment shall be tested for elevated equipment voltage at the end of the work day or the completion of the assignment. **This testing requirement is considered good utility practice and does not require specific documentation.**

- a. Substation fencing will not require elevated equipment 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.

F. Exemptions

1. 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.

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

- A. Company Owned Street Lights
 - 1. Company owned metallic street lighting standards are required to be tested for elevated equipment voltage on a five year cycle.
 - 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.

- B. National Grid Substation Fences
 - 1. Metallic fencing surrounding substations with National Grid Facilities shall be tested for elevated equipment voltage annually.
 - 2. See reference to NG-USA EOP 400.06.2 Substation – V&O Inspection Procedure.

- C. Overhead Distribution Facilities
 - 1. Wood distribution poles require testing to be completed as noted below in conjunction with the distribution patrol program covered by NG-USA EOP D004.
 - 2. The following equipment on wood distribution poles requires annual elevated equipment voltage testing:
 - a. Metallic riser guard or conduit (company or non-company).
 - b. Uncovered or un-insulated down ground (company or non-company).
 - c. Down guy (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

- D. Underground Facilities
 - 1. Elevated equipment voltage testing is required on all of the following equipment where accessible to the public on a five year cycle.
 - a. All metallic manhole covers, vault covers and grates, junction box covers, handhole covers, pad mount transformers, secondary pedestals, and switchgear.
 - 2. Exceptions: Non-metallic concrete or fiberglass pads or handholes are not required to be tested.

- E. Daily Job Site Test Requirements
 - 1. Each job site where National Grid personnel or its contractors complete a work assignment shall be tested for elevated equipment voltage at the end of the work day or the completion of the assignment. **This testing requirement is considered good utility practice and does not require specific documentation.**
 - 2. Exceptions:
 - a. Substation fencing will not require elevated equipment 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.

- F. Exemptions
 - 1. 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.

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IV. TEST EQUIPMENT

- A. A hand held device (proximity detection unit) that is capable of detecting voltage from 8 volts to 600 volts.
- B. 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.
- C. The handheld devices utilized must be certified to indicate a minimum of 8 volts and be capable of withstanding a maximum of 1000 volts by an independent laboratory. The portable AC digital voltmeter must be capable of measuring a minimum of 0.1 volt and a maximum of 1000 volts, the following units has been certified:
 - 10. HD Electric model LV-S-5 (5-600 volts).
 - 11. Fluke 85
 - 12. Fluke 87
 - 13. Fluke 170 series or equivalent
 - 14. Fluke 175
 - 15. Fluke 177
 - 16. Fluke 179
 - 17. Fluke 187
 - 18. Fluke 189

V. TEST PROCEDURE

- A. Job Briefing
 - 1. At minimum, the following information must be communicated to all personnel at the beginning of each shift for elevated equipment voltage testing:
 - a. Structures are never to be touched with a bare hand while performing the tests, only the voltage detector or meter probe is to be used to make contact with the facilities.
 - b. Appropriate PPE must 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, either at intersections or any other point.
 - e. Traffic safety vest (DOT Compliant Class II) is to 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.
- B. Measurements for voltages will be performed in accordance with the following:
 - 1. Initial measurements for the presence of voltage shall be made using a certified proximity detection unit as noted in the testing equipment certified equipment list in Section IV C.
 - a. To verify the proper operation of the proximity detector, follow operating instructions for the particular certified 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

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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.

2. If this test detects voltage, repeat the test with the portable AC voltmeter:
 - 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.
 - i. In locations where the neutral or ground point is at a distance in excess of the voltmeter lead length, the connection to the neutral/ground shall be made with up to 25' of # 16 stranded copper lead wire (covered), the other end of which shall be securely connected to the negative (black) probe of the meter. 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.
 - ii. In locations where a system ground is not available, or the existing ground registered voltage upon the proximity test, a metal rod shall be firmly embedded into the earth to a depth of no less than 6" to create a ground reference point for the measurement to be taken. The reference point should be as close as practicable to the facility being tested to simulate an elevated equipment voltage situation (3' to 4'.) On occasion longer leads may be necessary to find undisturbed earth (up to 25'.)
 - c. The "live" meter probe lead shall then be placed into contact with the structure under inspection.
 - i. Install a 500 ohm input load impedance on the volt meter. Measure the voltage and record this voltage in the database for the site.

V. CORRECTIVE ACTION REQUIREMENTS

- A. If an elevated equipment voltage condition is found and verified by the Test Procedure in Section IV, the site is to be guarded until made safe by Company personnel or if municipally owned, made safe by the owner or company. Guarded for the purposes of this EOP is defined as guarded by a person or a protective barrier that prevents public contact if the elevated equipment voltage found is greater than 4.5 volts. **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.** If the voltage measures greater than 4.5 volts and less than 8 volts it can either be guarded in person or by a protective barrier that prevents public contact, contact your supervisor for required action. It is expected that sound judgment shall be utilized in this application. If the voltage measures greater than 8 volts immediate response is required using the notification in section B below.
- B. The following notification process for personnel to respond shall be utilized.
 1. Notification by location:

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- a. New York: contact Systems Operations Dispatch 1-877-716-4996
 - b. Bay State West, and Bay State North & Granite: Westboro Control Center 508-389-9032.
 - c. Bay State South, and Ocean State: Lincoln Control Center 401-335-6075.
2. Inform the operator that this is an elevated equipment voltage call, giving inspector name, company (if not National Grid), unique ID, address where problem is identified, facility number, circuit number, ownership, type of equipment, 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.
- C. Temporary repairs may be used to correct the elevated equipment voltage thereby removing the need to guard the site.
 - D. Except as noted in VI.E, permanent repairs to the equipment shall be made within 45 days of the occurrence.
 - E. If permanent repairs can not 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 must be identified and justified in the annual reporting of the program to the NYPSC.
 - F. The Tester/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.
 - G. The individuals conducting the elevated equipment 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. Angel guards shall only be installed after the testing of the street light standard is complete and 1) there is no indication of elevated equipment voltage above 4.5 volts, or 2) repairs have been completed to correct the elevated equipment voltage.
 - H. The elevated equipment voltage tester shall report any potentially hazardous conditions found on National Grid facilities seen visually during the survey process.
 - I. Customer Owned Equipment
 1. Where the Company finds elevated equipment voltage above 4.5 volts and identifies its source as customer-owned equipment, the Company shall guard the site and notify the customer or a responsible person, as appropriate, that a potentially hazardous situation exists. The Company shall advise the customer or responsible person that the cause of the elevated equipment voltage must be immediately remedied.
 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.
 3. The Company may temporarily remove a customer’s meter or take such other actions as are appropriate and necessary to protect the public.

VI. DATABASE REQUIREMENTS

- A. The database in use shall be easily searchable for information and reporting.

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B. Information fields required to be completed for facilities:

1. Survey Date
2. Region
3. District
4. Contractor
5. GIS ID/Asset # (Unique ID)
6. Facility Type
7. Owner
8. Feeder/Circuit
9. Line #
10. Tax District
11. Pole/Structure/Equipment ID
12. Street Name
13. Inspectors Name
14. GPS Taken
15. Pre-load Match
16. Elevated Equipment Voltage Test Required
17. Voltage Found Y/N
18. Voltage Measurement
19. Type of Equipment (See Appendix A)
20. Immediate Action Taken
21. Person Notified
22. Permanent Repair Date
23. Type of Repair
24. Person Responsible for repair (Employee ID)

VII. NEW YORK ANNUAL REPORTING AND CERTIFICATION REQUIREMENTS

- A. Each Regional program supervisor shall provide certification to the program manager that the Region they supervise has complied with the elevated equipment voltage testing and inspection program as ordered by the PSC.
- B. The program manager shall provide certification to the Vice President Distribution Network Strategy and the Senior Vice President of Distribution Network Strategy that the organization has complied with the elevated equipment voltage testing and inspection program as ordered by the PSC.
- C. Written certification of the completion and results of every elevated equipment voltage test and inspection shall be completed, as well as a certification that all unsafe conditions identified have been remediated by appropriate company personnel.
- D. The President or officer with direct responsibility for overseeing the elevated equipment 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.
- E. The annual reporting and certification is required by January 15 of each year. In addition to certifications, it shall address the following:
 1. Analyses of elevated equipment voltage data to show trends or common causes.

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2. Discussion of performance mechanism, if required.
 3. Changes to program implementation due to lessons learned.
- F. 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.

VIII. MASSACHUSETTS REPORTING REQUIREMENTS

- A. National Grid shall submit an annual report that includes the following:
1. Annual reports that list inspection and testing data, including number of inspections conducted by equipment type.
 2. Number of elevated equipment voltage events detected by inspection personnel versus call-ins or notification by third parties.
 3. Variance reports on current year inspection targets.
 4. Elevated equipment voltage events detected on equipment that is not included in elevated equipment voltage equipment inspection schedules (which will enable the DTE to determine if the company is inspecting and testing the correct equipment).
 5. Number of exceptional or non-routine events that required reporting to OSHA or other government organizations due to injuries or other substantive impacts.

IX. RESPONSIBILITY

- A. Distribution Engineering Services
1. Update program as necessary.
 2. Provide field support and training upon request.
 3. Act as liaison with existing database vendor when required.
- B. Field Operations
1. Ensure the elevated equipment voltage program as outlined in this EOP is implemented properly and timely.
 2. Ensure that the program as outlined in the EOP is completed each year.
 3. Provide qualified personnel to complete elevated equipment voltage testing.
 4. Ensure all elevated equipment voltage testers have been trained.
- C. C&MS Management
1. When requested by Field Operations/Distribution Network Strategy obtain, schedule and manage contractors to perform elevated equipment voltage testing.
 2. Ensure all elevated equipment voltage testers have been trained.
 3. Manage contractual terms and conditions including all change orders and resource requirements.
 4. Establish a process for the delivery of work, collection of data, invoice verification and payment, and reporting to local management and Distribution Network Strategy.
 5. Manage any established support processes such as back office support or data entry clerks.
- D. Elevated Equipment Voltage Inspector
1. Demonstrate the ability and proficiency to perform elevated equipment voltage testing per this EOP.
 2. Demonstrate the ability to become proficient in the use of the appropriate database.
 3. Possess the ability to do walking patrols, collect information, edit data, and guard unsafe facilities.

Attachment 1 – NG-USA EOP G016 Elevated Equipment Voltage Testing

4. Attend elevated equipment voltage training program.
- E. T&D Technical Training
 1. Provide training upon request.
- F. Distribution Network Strategy
 1. Provide input into program revisions.
 2. Ensure the elevated equipment voltage program as outlined in this EOP is implemented properly and timely.
 3. Ensure the program as outlined in the EOP is completed each year.
 4. Provide qualified personnel to complete elevated equipment voltage testing.
 5. Ensure all elevated equipment voltage testers have been trained.
 6. Provide program management.
- G. Process and Systems
 1. Provide and support database.

IX. DEFINITIONS:

- A. “Stray Voltage” – As defined by NYPSC the term “Stray Voltage” means voltage conditions on electric facilities that should not ordinarily exist.
- B. Proximity Detection Unit – A low voltage hand held detector used to test exposed metallic surfaces and conductors for the presence of low voltage from 8V to 600V.
- C. Elevated Equipment Voltage Inspector – The individual performing the elevated equipment voltage inspection.
- E. Handheld Computer - An electronic Data recording device that is used in the field to create a record of conditions found.
- F. Elevated Equipment Voltage – An A.C. rms voltage difference between utility equipment and the earth, or to nearby grounded facilities that exceeds the lowest perceptible voltage levels for humans.

X. TRAINING:

- A. Distribution Engineering Services with assistance from the database vendor will provide training on the utilization of handheld computers and the selected database.
- B. At a minimum, each worker conducting these tests should have knowledge and training in the following areas:
 1. Proper use of appropriate Personal Protective Equipment.
 2. Work Area Protection.
 3. Hazard Communication.
 4. First Aid CPR (This is required only on multi-person crews.)
 5. The proper use of certified voltage detection units and voltmeters.
 6. Hazardous condition identification.


The attendance of this training shall be documented.

Attachment 1 – NG-USA EOP G016 Elevated Equipment Voltage Testing

**TYPE OF EQUIPMENT
APPENDIX A**

TYPE	CODE	EQUIPMENT DESCRIPTION
Distribution	910	Pole
	911	Regulator
	912	Sectionalizer
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)

Attachment 2 - NG-USA EOP UG006 Underground Inspection and Maintenance

 ELECTRIC OPERATING PROCEDURES	Doc No.: NG-USA EOP UG006
	Page: Page __ of 8
	Date: 01/01/06
SUBJECT: Underground Inspection and Maintenance	SECTION: Underground

REFERENCE:

NY PSC Order 04-M-0159
Applicable National Grid Safety Rules and Procedures
Distribution Line Patrol and Maintenance NG-USA EOP D004
Elevated Equipment Voltage Testing NG USA EOP-G016
Transmission Line Patrol and Maintenance NG USA EOP – T007

GENERAL INFORMATION:

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 variance in inspection procedures in New York, Massachusetts, New Hampshire, and Rhode Island service territories is due to the requirements of New York Public Service Order 04-M-0159 and the Massachusetts Department of Telecommunications and Energy recommendations of December 9 2005, which is incremental to National Grid in New York and Massachusetts.

This program is designed for the patrol and designated maintenance of underground facilities on a five year schedule. The Inspector will record all required maintenance on an approved National Grid database.

The underground distribution facility maintenance items identified through this patrol are separated into four priority categories A, B, C, and E priority. The problem codes identified default to the appropriate priority. The default priority can be adjusted by the individual performing the inspection based on actual field conditions. These priority categories are defined as follows:

A Priority - An identified facility/component that must be repaired/replaced as soon as practicable.

B Priority – An identified facility/component condition that shall be considered for repair/replacement as the feeder is scheduled for maintenance by Distribution Planning and Engineering. These identified conditions will be corrected as preventive maintenance and or facility life extension.

C Priority – An identified facility/component condition that is being trended and reviewed by Distribution Planning and Engineering that may require replacement through the engineering process (Requires project/Capital expenditures). Non-capital conditions identified under this priority will be corrected at the discretion of field operations.

E Priority – An identified facility/component that must be replaced/repared immediately to address public safety or system reliability. The inspector shall notify the appropriate operations department for immediate response and corrective action any time an E priority is found during an inspection.

ALL “E” PRIORITY CONDITIONS SHALL BE CORRECTED IMMEDIATELY UPON NOTIFICATION.

ALL “A PRIORITY” CONDITIONS IDENTIFIED PRIOR TO NOVEMEBR 1ST MUST BE REPAIRED/CORRECTED BY NOVEMBER 30TH.

Attachment 2 - NG-USA EOP UG006 Underground Inspection and Maintenance

PROGRAM ADMINISTRATOR:

Distribution Engineering Services

APPLICABILITY

This procedure applies to all personnel involved with or responsible for the inspection or maintenance of underground transmission and distribution facilities.

SCOPE:

Distribution Maintenance

- I. Patrols
- II. Equipment to be Inspected and Maintenance Codes
- III. Maintenance database
- IV. Maintenance
- V. Work management
- VI. Completion
- VII. Definitions
- VIII. Responsibilities
- IX. Training

I. *PATROLS*

1. New York

Inspection of underground equipment will be scheduled in such a manner that each Underground Facility will be examined once every five years. These patrols shall be completed by November 30th of the schedule year.

One-fifth of all underground utility components should be inspected each year. URD and UCD facilities shall be inspected on the existing overhead distribution circuit schedule. Additionally all riser poles are inspected in accordance with the Transmission and Distribution Overhead Inspection Programs, NG-USA EOP T007 and NG-USA EOP D004. Customer owned manholes and vaults that enclose National Grid equipment shall require the inspection of these National Grid facilities.

The T&D Superintendent's are responsible to create the patrol schedule for their respective Regions for the remainder of underground facilities. The Distribution inspector uses a hand held computer to record region, district, employee ID, feeder number, structure ID number, GPS location, tax zone, line number, comments and maintenance problem codes. The Inspector while patrolling shall also complete the following maintenance codes if found deficient upon inspection: 617 – manhole missing nomenclature, 639 - network transformer- missing nomenclature, 660 – switchgear missing nomenclature, 681 – transformer missing nomenclature, 707 – vaults improper nomenclature. The Inspector will input the code into the handheld as required, as well as completing the work unit in the handheld upon field completion while at the site. If the Distribution Inspector finds unmapped facilities from the information supplied from the Geographic Information System (GIS), refer to NG-USA EOP G011, Preparation and Distribution of Electric Facilities Records, for required procedure for corrections.

2. New Hampshire and Rhode Island

Inspection of designated underground equipment will be scheduled in such a manner that each designated Underground Facility will be examined once every five years. These patrols shall be completed by November 30th of the schedule year.

Attachment 2 - NG-USA EOP UG006 Underground Inspection and Maintenance

One-fifth of all metallic handhole covers, padmount transformers and switchgear shall be inspected annually. These facilities shall be opened for a visual inspection. Additionally all separable components in these facilities are to be inspected by infrared. Refer to NG-USA EOP UG001 for infrared procedure. An “E Priority” shall be assigned to a temperature gradient greater than 20°. An “A Priority” shall be assigned to a temperature gradient between 10° and 20°. A “B Priority” shall be assigned to a temperature gradient less than 10°. Additionally, an elevated equipment voltage test shall be completed at each location, refer to NG-USA EOP-G016.

A working inspection on underground facilities is required for all manholes, vaults, handholes, splice boxes, junction boxes, padmount transformers, switchgear and submersible equipment, each time a crew performs work at one of these facilities. The format for data collected shall follow this EOP. Additionally an elevated equipment voltage test shall be completed at each location, refer to NG-USA EOP-G016.

All transmission riser poles are inspected in accordance with the Transmission NG-USA EOP-T007.

The T&D Superintendent’s are responsible to create the patrol schedule for their respective Regions for the designated underground facilities. The Distribution inspector uses a hand held computer to record region, district, employee ID, feeder number, structure ID number, GPS location, line number, comments and maintenance problem codes. The Inspector, while patrolling or crew while inspecting, shall also complete the following maintenance codes if found deficient upon inspection, 617 – manhole missing nomenclature, 639 - network transformer- missing nomenclature, 660 – switchgear missing nomenclature, 681 – transformer missing nomenclature, 707 – vaults improper nomenclature. The Inspector will input the code into the handheld as required, as well as completing the work unit in the handheld upon field completion while at the site. If the Distribution Inspector finds unmapped facilities from the information supplied from GIS, refer to NG-USA EOP G011, Preparation and Distribution of Electric Facilities Records, for required procedure for corrections. Crews performing working inspections are to follow the same protocol for inspections by using either a handheld data entry unit or paper inspection logs requiring data entry by clerical support.

3. Massachusetts

Inspection of designated underground equipment will be scheduled in such a manner that each designated Underground Facility will be examined once every five years. These patrols shall be completed by November 30th of the schedule year.

One-fifth of all metallic handhole covers, padmount transformers, manholes, and switchgear shall be inspected annually. These facilities shall be opened for a visual inspection. Additionally all separable components in these facilities are to be inspected by infrared. Refer to NG-USA EOP UG001 for infrared procedure. An “E Priority” shall be assigned to a temperature gradient greater than 20°. An “A Priority” shall be assigned to a temperature gradient between 10° and 20°. A “B Priority” shall be assigned to a temperature gradient less than 10°. Additionally, an elevated equipment voltage test shall be completed at each location, refer to NG-USA EOP-G016.

A working inspection on underground facilities is required for all vaults, splice boxes, junction boxes, and submersible equipment, each time a crew performs work at one of these facilities. The format for data collected shall follow this EOP. Additionally an elevated equipment voltage test shall be completed at each location, refer to NG-USA EOP-G016.

All transmission riser poles are inspected in accordance with the Transmission NG-USA EOP-T007.

The T&D Superintendent’s are responsible to create the patrol schedule for their respective Regions for the designated underground facilities. The Distribution inspector uses a hand held computer to record region, district, employee ID, feeder number, structure ID number, GPS location, line number, comments and maintenance problem codes. The Inspector, while patrolling or crew while inspecting, shall also complete the following maintenance codes if found deficient upon inspection, 617 – manhole missing nomenclature, 639 - network transformer- missing nomenclature, 660 – switchgear missing nomenclature, 681 – transformer missing nomenclature, 707 – vaults improper nomenclature. The Inspector will input the code into the handheld as required, as well as completing the work unit in the handheld upon field completion while at the site. If the Distribution Inspector finds unmapped facilities from the information supplied from GIS, refer to NG-USA EOP G011, Preparation and Distribution of Electric Facilities Records, for required procedure for

Attachment 2 - NG-USA EOP UG006 Underground Inspection and Maintenance

corrections. Crews performing working inspections are to follow the same protocol for inspections by using either a handheld data entry unit or paper inspection logs requiring data entry by clerical support.

II. EQUIPMENT TO BE INSPECTED AND MAINTENANCE CODES

This EOP requires the visual inspection of the following facilities as designated above for either New York, New Hampshire, Rhodes Island or Massachusetts, which require opening, and may require pumping on some items to assure a proper inspection:

- Manholes
- Vaults
- Handholes – non-fiberglass
- Splice boxes
- Junction boxes
- Pad mount transformers
- Pad mount switchgears
- Submersible equipment
- Handholes – fiberglass do not require opening

Table 1 on page 4 details the Inspection Program and Maintenance Codes.

INSPECTION PROGRAM AND MAINTENANCE CODES

TABLE 1

Maintenance Code	Description	Expense or Capital	Default priority
600	Handholes - Broken/damaged/unsecured	E	B
602	Handholes - Missing nomenclature	E	C
603	Handholes - Secondary needs repair	E	B
604	Handholes – Other (use comments)	E	B
605	Infrared Inspection – Separable Components	E	B
610	Manhole - Bonded	E	B
611	Manholes - Cable/Joint leaking	E	A
612	Manholes - Cables bonded	E	B
614	Manholes - Cracked/broken	C	B
615	Manholes - Fire proofing	E	C
616	Manholes - Improper grade	E	B
617	Manholes - Missing nomenclature	E	A
620	Manholes - Rerack	E	B
621	Manholes - Ring/cover repair/replace	C	B
630	Network Protector - Barriers broken/dama	E	A
632	Network Protector - Oil leak	E	A
633	Network Protector - Worn/damaged gasket	E	A
635	Network transformer - Bushing Broken/Cra	E	B
637	Network transformer - Low oil	E	B
638	Network transformer - Missing Ground	E	A
639	Network transformer - Missing nomenclature	E	A
642	Network transformer - Oil Weeping	E	A
643	Network transformer - Rusted/ Paint peel	E	C
651	Switchgear - Barrier broken/damaged/unsecured	E	A
652	Switchgear - Base broken/damaged	C	B
654	Switchgear - Cable Not Bonded	E	A
656	Switchgear - Door Broken/Damaged	E	A

Attachment 2 - NG-USA EOP UG006 Underground Inspection and Maintenance

657	Switchgear – Excessive vegetation	E	C
659	Switchgear - Missing ground	E	A
660	Switchgear - Missing Nomenclature	E	A
661	Switchgear – Other	E	C
662	Switchgear - Rusted/Paint peeling	E	C
672	Transformer - Bushing Broken/Cracked	E	B
673	Transformer - Door Broken/damaged/unsecured	E	A
675	Transformer - Elbows tracking/burned	E	B
676	Transformer – Excessive vegetation	E	C
680	Transformer - Missing Ground	E	A
681	Transformer - Missing nomenclature	E	A
682	Transformer – Mud/debris	E	C
684	Transformer - Oil Weeping	E	A
685	Transformer - Pad broken/damaged	E	B
686	Transformer - Protection (ballards) damaged	C	B
687	Transformer - Rusted/ Paint peeling	E	C
690	Trench - Exposed Cable	E	A
692	Trench Path - Sunken	E	B
700	Vaults - Cable missing bond	E	A
702	Vaults - Cracked/broken	C	B
703	Vaults - Damaged/broken cover	E	B
704	Vaults - Damaged/broken door	E	B
705	Vaults - Damaged/broken ladder	E	A
706	Vaults - Improper grade	E	B
707	Vaults - Improper nomenclature	E	A
708	Vaults - Light not working	E	B
713	Vaults - Ventilation failure	E	B
720	Submersible equip. - Excess corrosion	E	C
721	Submersible equip. - Physical damage	E	C
722	Submersible equip. - Leaking	E	C
730	Anodes - Missing	E	C
731	Anodes - Need replacement	C	C

III. MAINTENANCE DATABASE

The Maintenance database consists of data downloaded from the hand held and data entered from the desktop computer. The field hand held can be downloaded to any National Grid desk top computer that is connected to the network and the inspector is logged on as a valid user of the UG Maintenance program. 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.

IV. MAINTENANCE

The maintenance activities are scheduled by priority categories with all "A Priority" conditions identified prior to November 1 repaired/corrected by November 30th. The "B Priority" conditions are scheduled based on the reliability of the circuit, load served, and condition of facilities. The "B Priority" maintenance is to be performed on circuits selected by Distribution Planning and Engineering, and identified in the "Energy Delivery Work Plan". All "B Priority" maintenance as outlined in the "Energy Delivery Work Plan" must be completed by March 31 of that fiscal year. The "C Priority" maintenance work will be completed as planned and directed by the Distribution Planning and Engineering department (Capital expenditures) after reviewing annually for trends that would require expenditures. All "E Priority" conditions shall be responded to immediately upon notification for correction.

V. WORK MANAGEMENT

Attachment 2 - NG-USA EOP UG006 Underground Inspection and Maintenance

The time recording of both patrol and maintenance activities is accomplished in the Severn Trent Operating Resource Management System (STORMS).

STORMS requires that the Distribution Inspector/Operations Personnel fill out a daily time sheet. The Distribution Inspector would record their time actually performing the foot patrol inspection of the Distribution system under the DO2105 Activity along with the appropriate work order or a work request if the patrol has been scheduled. For Transmission and Sub-transmission facilities the inspector shall utilize activity TO2100. Work orders or work request numbers can be obtained from the Operations Supervisor or from the Distribution Planning/Area Resource Coordinator (ARC).

Operations Personnel performing scheduled maintenance on the Distribution System should record their time actually performing maintenance activities under the appropriate work request number set up by their Distribution Planning/ARC in their respective area. Operations Personnel performing maintenance activities that have not been scheduled should charge the DM2105 activity along with appropriate work order number.

For Transmission and Sub-transmission utilize activity TM2100. STORMS work request numbers are created when the work has been scheduled by Distribution Planning/ARC. Work orders or work request numbers can be obtained from the Operations Supervisor or from the Distribution Planning/ARC.

VI. COMPLETION

The replacement/repair of an identified maintenance problem code after completion in the field must be updated in the database. The completion of the maintenance problem codes can be done through the edit screen found on the desktop computer. Field personnel that perform the work are required to complete the work order form providing the date completed, and employee ID number. The work order form is returned to the T&D Supervisor who will close out the completed maintenance problem codes in the database at their desktop computer or designate the inspector or clerk to perform the close out. Additional maintenance problems that may be discovered and completed by personnel must be noted on the work order ticket so they can be recorded as work completed on that specific facility.

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

VII. DEFINITIONS

Desktop Computer: A personal computer that is connected to the National Grid network and used to download the Hand Held device and retrieve the information in the form of reports.

Elevated Equipment Voltage Test: An A.C. rms voltage difference between utility equipment and the earth, or to nearby grounded facilities that exceeds the highest perceptible voltage levels for humans.

Hand Held Computer: An electronic data recording device that is used in the field to create a record of conditions found.

Hand-Hole: An enclosure identified for use in underground systems, provided with an open or closed bottom, and sized to allow personnel to reach into, but not enter, for the purpose of installing, operating, or maintaining equipment or wiring or both.

Infrared Inspection: An inspection conducted to detect abnormal heating conditions associated with separable connectors. An infrared inspection is required before work begins in an enclosed space, enclosure, padmounted transformer or padmounted switchgear.

Inspector: An underground qualified worker who can identify deficiencies or non-standard construction conditions on National Grid facilities.

Attachment 2 - NG-USA EOP UG006 Underground Inspection and Maintenance

Manhole: An enclosure identified for use in underground systems, provided with an open or closed bottom, and sized to allow personnel to enter, for the purpose of installing, operating, or maintaining equipment or wiring or both.

Patrol: An assessment of National Grid facilities for the purpose of determining the condition of the facility and any associated components.

Service Box: See Hand-hole

Submersible Equipment: Electric equipment such as transformers and switches that, are generally located within a Hand-hole, Manhole, or Vault.

URD: Underground Residential Distribution

UCD:Commercial DistributionUnderground Distribution Facilities: Manholes, vaults, hand-holes and service boxes, padmounted equipment and the components and equipment contained in these structures. (See GENERAL INFORMATION above).

User: An individual who the program administrator has authorized to use the inspection reporting program.

Vault: An enclosure, above or below ground, which personnel may enter and which is used for the purpose of installing, operating, or maintaining equipment or wiring or both.

VIII. RESPONSIBILITIES

Distribution Engineering Services

1. Update program as necessary.
2. Provide field support and training as requested.
3. Report System Maintenance progress monthly by Region.

Field Operations

1. Ensure the Underground Maintenance Program as outlined in this EOP is implemented properly and timely.
2. Select circuits to be patrolled for a running five-year cycle and ensure that the circuits scheduled for patrol are completed each year.
3. Provide qualified personnel as the inspectors, to provide consistent and accurate identified maintenance concerns/problems.

Distribution Inspector

1. Demonstrate the ability to identify maintenance concerns and the aptitude to become proficient in the use of a hand held computer and desktop computer.
2. Demonstrate the understanding and requirements of this EOP.
3. Possess the ability to do walking patrols, collect information on a hand held, download to a desktop computer, edit data, provide requested information/reports/work tickets to supervision, and track/close out work completed in the database.

C&MS

1. At the request of Field Operations obtain, schedule and manage contractors to perform inspections and perform required maintenance.

Distribution Network Strategy

Attachment 2 - NG-USA EOP UG006 Underground Inspection and Maintenance

1. Provide inspectors where applicable.
2. Provide input into program revisions.
3. Provide program management.
4. Ensure program is completed annually as required.
5. Ensure inspectors are trained.

Process and Systems

1. Provide and support database.

T&D Technical Training

1. Provide training upon request.

IX. TRAINING

1. Distribution Engineering Services with assistance from the database vendor will provide training on the utilization of handheld computers and the selected database.
2. Distribution Engineering Services along with the training department will provide training for the identification of A, B, C, and E maintenance items to the qualified employee who will be performing the inspections.

Attachment 3- NG-USA EOP UG 001 Infrared – Non-Contact Thermometer Inspection Requirement for Underground Equipment

nationalgrid ELECTRIC OPERATING PROCEDURES	Doc No.: NG USA EOP – UG 001
	Page: Page 42 of 2
	Date: 03/20/03
SUBJECT: Infrared - Non-Contact Thermometer Inspection Requirement for Underground Equipment	SECTION: Underground

INTRODUCTION

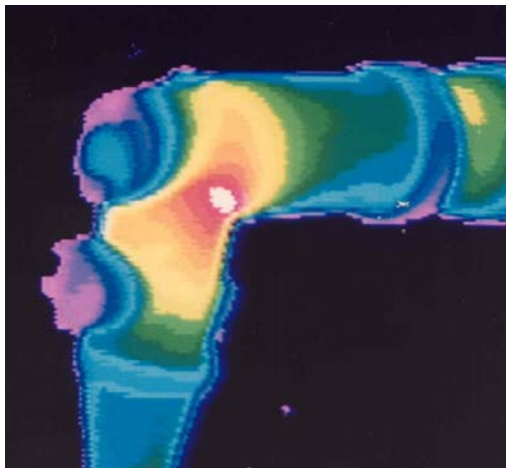
This procedure establishes work practices for infrared, non-contact thermometer inspection of distribution voltage separable connectors in underground operations.

An infrared inspection of separable components is required before work begins in an enclosed space, padmounted transformer or enclosure.

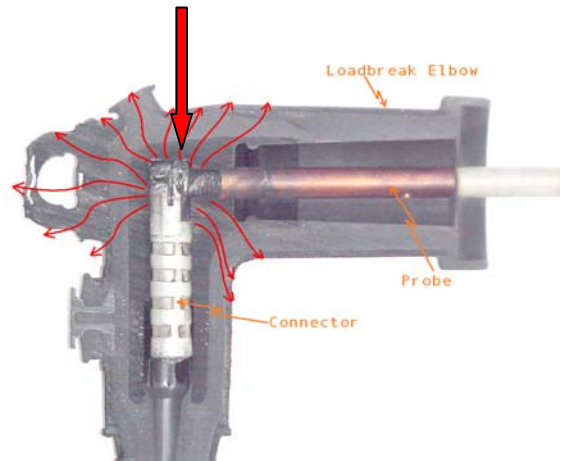
GENERAL INFORMATION

IR Guns (infrared, non-contact thermometers) can identify faulty or failing separable connectors if the connector is carrying electric current. The IR gun can detect heat generated by a poor, current carrying connection.

Separable connectors include 200A elbows, 600A modular T bodies, and Y and H connectors.



Defective 200A Elbow – Real Time IR Scan



Cutaway showing connector defect and heat path

HAZARDS

1. The laser light used to aim this device can damage eyesight. Never point the unit at another person or yourself. Avoid direct exposure via reflective materials such as glass or mirrors.
2. Components not carrying current produce no heat. Defects will not be identified. A normal temperature reading does not guarantee the equipment is free of defects. Take all necessary precautions and use added safeguards as appropriate.
3. This unit is not insulated. Never touch energized equipment during the inspection.

PROCEDURE

1. Complete all entry requirements and a visual hazard inspection before beginning an infrared

Attachment 3- NG-USA EOP UG 001 Infrared – Non-Contact Thermometer Inspection Requirement for Underground Equipment

2. temperature inspection on the underground distribution equipment in the manhole or vault.
3. Inspect each separable connector. Compare the connector temperature to the temperature of the cable on the same phase. Connectors with elevated temperature may indicate a connector defect.



4. Use the following table to compare connector temperature rise to the ambient temperature.

Delta Temp ° F	Work Conditions
Less than 10 ° F	Normal, begin work, may operate elbows
11 to 20 ° F	Do not operate elbows. Schedule component repairs and use added safeguards as appropriate
More than 20 ° F	Schedule immediate repairs. Stability and reliability concern.

ADDITIONAL INFORMATION

1. Use only National Grid approved equipment.
2. The IR Gun is available through Supply Chain: Stores code 487300 New England/Symbol Number 0811144 New York
3. National Grid EOP Training Supplement dated March 2003.

Attachment 3- NG-USA EOP UG 001 Infrared – Non-Contact Thermometer Inspection Requirement for Underground Equipment

3a - Infrared Non-Contact Thermometer

INTRODUCTION

This material is intended to supplement EOP UG001, “Infrared, non-contact thermometer inspection requirement for underground equipment.”

An infrared inspection of separable components is required before work begins in an enclosed space, padmounted transformer or enclosure.

This training material contains references specific to the Raytek ST-80, the model presently purchased by Supply Chain. The procedures are applicable to all models approved for purchase.



TRAINING OUTLINE

1. Complete a sign in sheet to document training. Forward the sign in sheet to Mike Pazzanese, Millbury Training Center, Lines. Review EOP UG006, “Infrared, non-contact thermometer inspection requirement for underground equipment.”
2. Discuss PART 1 of this document with the group.

Attachment 3- NG-USA EOP UG 001 Infrared – Non-Contact Thermometer Inspection
Requirement for Underground Equipment

PART 1 – Required Training

APPLICATION

Before work begins in an enclosed space, padmounted transformer or enclosure, a temperature scan must be completed on all distribution voltage underground, separable connectors.

Infrared non-contact thermometers measure the surface temperature of a solid object. Loose or deteriorated mechanical connections are resistors to electric current flow. This resistance generates heat that can be detected with a temperature scan.

The cable or component being inspected must be carrying current (load) to produce a temperature rise. Temperature rise is proportional to the amount of current passing through the defective component. Low current produces less heat. A low temperature reading is not a guarantee of good equipment condition.

Optional temperature scans can be useful. It is possible to detect “hot spots” on secondary or ground connections, identify overloaded equipment and determine the oil level in a transformer.

Definition: Separable Components include, but are not limited to, 200A elbows and 200A WYE joints as well as 600A modular “T” joints and “I”, “Y” or “H” joints.

LASER SAFETY

The laser light used to aim this device can damage eyesight. Never point the unit at another person or yourself. Avoid direct exposure via reflective materials such as glass or mirrors.

Only infrared units with low level lasers are approved for use at National Grid. This does not completely remove the hazard to eyesight. Always exercise caution when aiming these devices.

The low level laser also results in a weaker targeting light. Use care in brightly lit areas as the target may be difficult to see.

Keep the unit away from children and in the storage case when not in use.

STORAGE and CARE

Store the instrument in its original protective case.

Units approved for service at National Grid require no calibration.

Troubleshoot problems using the manufacturers instructions included with each unit. Contact the Central Laboratory if an instrument requires service.

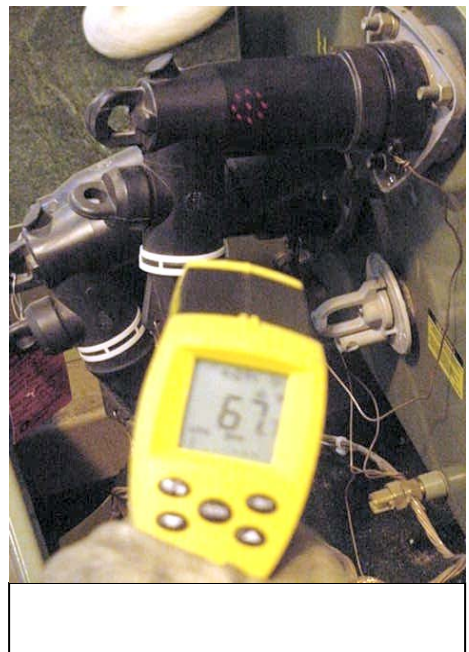
**Attachment 3- NG-USA EOP UG 001 Infrared – Non-Contact Thermometer Inspection
Requirement for Underground Equipment**

TARGETING and TEMPERATURE MEASUREMENT

The Raytek ST-80 uses laser light to target the measurement area. The laser light forms a circle of points.

The temperature reading is the average temperature within the target circle. To accurately measure an object's temperature, that object must completely fill the target circle. Measuring the temperature of a small object like cable requires the user to be very close to the cable. These instruments are not insulated, all appropriate caution must be taken near live components.

Definitions: The Target Spot Size increases as the distance between the instrument and target object increases. The smaller the target, the closer one must hold the unit to that target. This is called Cone Effect.



Exercises for the trainer:

- 1. Target a close object and then target a distant object to demonstrate cone effect.**
- 2. Measure the temperature of a wall or desk. Measure the temperature of a cup of coffee.**

**Attachment 3- NG-USA EOP UG 001 Infrared – Non-Contact Thermometer Inspection
Requirement for Underground Equipment**

PROCEDURE

1. All work must be done in accordance with National Grid Safety Manual and safe work practices:
 - Always conduct a pre-job briefing.
 - Wear all Personal Protective Equipment (PPE) as required.
 - Use Class 2 rubber gloves when opening and working on energized equipment.
 - Use only instruments approved by National Grid.
 - User must be familiar with the proper use and limits of this device.
 - Complete all entry requirements for an enclosed space, perform a visual hazard inspection of the work area on the underground distribution in the manhole, vault or pad-mounted equipment

2. Inspect all distribution voltage separable components which are carrying current in the following situations:
 - Upon entering a manhole or vault containing separable components
 - Prior to switching energized separable elbows
 - Prior to working on or near energized underground pad-mounted equipment

3. Compare ambient cable temperature to component temperature of the same phase. Components with elevated temperature may indicate a potential defect within the component.

Delta Temp ° F	Work Conditions
Less than 10 ° F	Normal, begin work, may operate elbows
11 to 20 ° F	Do not operate elbows. Schedule component repairs and use added safeguards as appropriate
More than 20 ° F	Schedule immediate repairs. Stability and reliability concern.

**Attachment 3- NG-USA EOP UG 001 Infrared – Non-Contact Thermometer Inspection
Requirement for Underground Equipment**

PART 2

GENERAL FEATURES

The Raytek ST-80® is a full featured model with an extended temperature range and a 50:1 spot ratio; this allows the user to increase the distance from the target and measure a smaller spot area. The common features of The Raytek ST-80 are:

- 9volt alkaline or NiCad battery with 20-40 hour life
- Displays of MAX, MIN, DIF and AVG temperature with resolution of 0.1°F
- LCD backlight
- Circular laser sighting with high/low alarm
- Distance to spot size of 50:1 with a trigger lock
- Temperature range of –25 to 1400° F with an ambient operating range of 32 to 150°F
- Accuracy of units are 1% or+/-2°F @ 73°F of ambient operating temperature and up to =/-5°F @ -25 to -15°F
- Unit requires no calibration
- Weighs less than 11oz.
- Hard Carrying case

APPROVED INSTRUMENTS, CALIBRATION AND STORAGE

- Use hand held, infrared non-contact instruments that have been approved by National Grid Work Methods. Listed on page 8
- Contact The Central Laboratory if instruments requires service
- Store the instrument in its original protective case
- Field check the battery and operation before each use; to change battery, insert it with the positive side toward the rear of the battery compartment

UNIT FUNCTIONS

The unit can be changed from F° to C° by sliding switch near battery compartment to C and also can be locked on for continuous measurement by sliding adjacent lock switch to on.

	Function	Action
1	Mode	Advance mode cycle
2	Log	To store data
3	Set	Set high/low alarms
4	Up/down keys	Adjust values or log locations
5	Laser/light	Activate laser and backlight

**Attachment 3- NG-USA EOP UG 001 Infrared – Non-Contact Thermometer Inspection
Requirement for Underground Equipment**

LIMITATIONS

- **The non-contact thermometer is ONLY an additional tool as part of your safety process**
- **Condition of component and environment must be considered**
- **Cable or component MUST be carrying current (load)**
- **All existing work practices and safety equipment MUST be deployed**
- **Distance from any object affects the size of the spot measured**
- **Ensure object fills entire field of view**

TROUBLESHOOTING the Raytek ST-80

Code	Problem	Action
--- (on display)	Target temp. is over or under	Target within spec's
Battery icon appears	Low Battery	Check/replace battery
Blank Display	Possible dead battery	Check/replace battery
Laser doesn't work	Low or dead battery	Replace battery
Laser doesn't work	Ambient temp. above 104°F	Use in area with <temp.
ERR	Possible damage by EMF	Contact distributor

4 -Inspection List4.a - Underground Inspection Log Form



Underground Inspection Log

Date:						Inspector:						
Division:		BSW	<input type="checkbox"/>	SN	<input type="checkbox"/>	BSS	<input type="checkbox"/>	OS	<input type="checkbox"/>	Feeder:		
Town:						Street:						
Handhole	<input type="checkbox"/>	Manhole	<input type="checkbox"/>	Net Protect	<input type="checkbox"/>	Net XFMR's	<input type="checkbox"/>	Switchgear	<input type="checkbox"/>	Transformer	<input type="checkbox"/>	
Vault	<input type="checkbox"/>	EV	<input type="checkbox"/>	Submersible	<input type="checkbox"/>	Anodes	<input type="checkbox"/>	Pull Box	<input type="checkbox"/>	Trench	<input type="checkbox"/>	Number <input type="text"/>

Manholes, Handholes, Vault Structures						EV Test Required		<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
Water (in hole) <input type="checkbox"/> Yes <input type="checkbox"/> No						EV Found Voltage:		<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
Gas Monitor Readings											
						Voltage Action Taken:		<input type="checkbox"/>	Repaired		
								<input type="checkbox"/>	De-Energized		
Lower Explosive Limit (LEL)		<input type="text"/>	Alarm Setting		10% or above						
Oxygen (O ₂)		<input type="text"/>	%		% below 19.5, above 23.5						
Carbon Monoxide (CO)		<input type="text"/>	ppm		35 ppm						
Hydrogen Sulfide (H ₂ S)		<input type="text"/>	ppm		10 ppm						

Supervisor's Name:	<input type="text"/>
Action Taken:	<input type="text"/>
Additional Comments:	<input type="text"/>

The underground distribution facility maintenance items identified through this patrol are separated into four priority categories A, B, C, and E priority. The problem codes identified default to the appropriate priority. The default priority can be adjusted by the individual performing the inspection based on actual field conditions. These priority categories are defined as follows:

A Priority - An identified facility/component that must be repaired/replaced as soon as practicable.

B Priority - An identified facility/component condition that shall be considered for repair/replacement as the feeder is scheduled for maintenance by Distribution Planning and Engineering. These identified conditions will be corrected as preventive maintenance and or facility life extension.

C Priority - An identified facility/component condition that is being trended and reviewed by Distribution Planning and Engineering that may require replacement through the engineering process (Requires project/Capital expenditures). Non-capital conditions identified under this priority will be corrected at the discretion of field operations.

E Priority - An identified facility/component that must be replaced/repared immediately to address public safety or system reliability. The inspector shall notify the appropriate operations department for immediate response and corrective action any time an E priority is found during an inspection.

ALL "E" PRIORITY CONDITIONS SHALL BE CORRECTED IMMEDIATELY UPON NOTIFICATION.

ALL "A PRIORITY" CONDITIONS IDENTIFIED PRIOR TO NOVEMEBR 1ST MUST BE REPAIRED/CORRECTED BY NOVEMBER 30th.

Code	Description	DP	Notes	Code	Description	DP	Notes
600	Handholes - Broken/damaged/unsecured	B		672	Transformer - Bushing Broken/Cracked	B	
602	Handholes - Missing nomenclature	C		673	Transformer - Door Broken/damaged/unsecured	A	
603	Handholes - Secondary needs repair	B		675	Transformer - Elbows tracking/burned	B	
604	Handholes - Other (use comments)	B		676	Transformer - Excessive vegetation	C	
605	Infrared Inspection - Separable Components	B		680	Transformer - Missing Ground	A	
610	Manhole - Bonded	B		681	Transformer - Missing nomenclature	A	
611	Manholes - Cable/Joint leaking	A		682	Transformer - Mud/debris	C	
612	Manholes - Cables bonded	B		684	Transformer - Oil Weeping	A	
614	Manholes - Cracked/broken	B		685	Transformer - Pad broken/damaged	B	
615	Manholes - Fire proofing	C		686	Transformer - Protection (ballards) damaged	B	
616	Manholes - Improper grade	B		687	Transformer - Rusted/ Paint peeling	C	
617	Manholes - Missing nomenclature	A		690	Trench - Exposed Cable	A	
620	Manholes - Re-rack	B		692	Trench Path - Sunken	B	
621	Manholes - Ring/cover repair/replace	B		700	Vaults - Cable missing bond	A	
630	Network Protector - Barriers broken/damaged	A		702	Vaults - Cracked/broken	B	
632	Network Protector - Oil leak	A		703	Vaults - Damaged/broken cover	B	
633	Network Protector - Worn/damaged gasket	A		704	Vaults - Damaged/broken door	B	
635	Network transformer - Bushing Broken/Cracked	B		705	Vaults - Damaged/broken ladder	A	
637	Network transformer - Low oil	B		706	Vaults - Improper grade	B	
638	Network transformer - Missing Ground	A		707	Vaults - Improper nomenclature	A	
639	Network transformer - Missing nomenclature	A		708	Vaults - Light not working	B	
642	Network transformer - Oil Weeping	A		713	Vaults - Ventilation failure	B	


643	Network transformer - Rusted/ Paint peel	C		720	Submersible equip. - Excess corrosion	C	
651	Switchgear - Barrier broken/damaged/unsecured	A		721	Submersible equip. - Physical damage	C	
652	Switchgear - Base broken/damaged	B		722	Submersible equip. - Leaking	C	
654	Switchgear - Cable Not Bonded	A		730	Anodes - Missing	C	
656	Switchgear - Door Broken/Damaged	A		731	Anodes - Need replacement	C	
657	Switchgear – Excessive vegetation	C		950	EV Handhole		See EOP G016
659	Switchgear - Missing ground	A		951	EV Manhole		See EOP G016
660	Switchgear - Missing Nomenclature	A		952	EV Switchgear		See EOP G016
661	Switchgear – Other	C		953	EV Transformer		See EOP G016
662	Switchgear - Rusted/Paint peeling	C		954	EV Vault – Cover/Door		See EOP G016

Attachment 5 - EOP Database of Cable Splices



Underground Trouble Report

Create/Edit - Trouble/Splice Log

Failure Date:  Emp. Name: Emp. ID:
Division: District: Town:
Trans. Circuit: Dist. Circuit: Voltage:
Other: Other:

From Location

Street: Manhole/Pole: Suffix:

To Location

Street: Manhole/Pole: Suffix:

Trouble

Failed: Manhole Cover Dislodged (Explain in Notes)
Other: Gas Found (Explain in Notes)

Failed/ Removed

Cable: Joint/ Termination:
Other: Other:
Size: Cu Al Size Other:

Installed


Cable: Joint/ Termination:
Other: Other:
Size: Cu Al Size Other:

Notes:

Save

Clear

Create/Edit - Trouble/Splice Log

Failure Date: <input type="text"/>		<input type="text"/>
Division: <input type="text"/>	<input type="text"/>	<input type="text"/>
Trans. Circuit: <input type="text"/>	<input type="text"/>	<input type="text"/>
Other: <input type="text"/>	<input type="text"/>	<input type="text"/>
From Location		
Street: <input type="text"/>	<input type="text"/>	Suffix: <input type="text"/>
To Location		
Street: <input type="text"/>	<input type="text"/>	Suffix: <input type="text"/>
Trouble		
Failed: <input type="text"/>	<input type="text"/>	(Explain in Notes)
Other: <input type="text"/>	<input type="text"/>	Gas Found <input type="checkbox"/> (Explain in Notes)
Failed/ Removed		
Cable: <input type="text"/>	Joint/ Termination: <input type="text"/>	
Other: <input type="text"/>	Other: <input type="text"/>	
Size: <input type="checkbox"/> Cu <input type="checkbox"/> Al <input type="text"/>	Size Other: <input type="text"/>	
Installed		
Cable: <input type="text"/>	Joint/ Termination: <input type="text"/>	
Other: <input type="text"/>	Other: <input type="text"/>	
Size: <input type="checkbox"/> Cu <input type="checkbox"/> Al <input type="text"/>	Size Other: <input type="text"/>	
Notes: <input type="text"/>		
<input type="button" value="Save"/> <input type="button" value="Clear"/>		

Calendar - Microsoft Internet ...

December 2005

< >

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Create/Edit - Trouble/Splice Log

Failure Date: Emp. Name: Emp. ID:

Division: District: Town:

Trans. Circuit: Dist. Circuit: Voltage:

Other:

From Location

Street: Manhole/Pole: Suffix:

To Location

Street: Manhole/Pole: Suffix:

Note: A dropdown menu is open for 'From Location' with options: Unknown, Bay State South, Bay State West, North & Granite, Ocean State, NY - Western, NY - Central, NY - Eastern, NY - System.

Trouble

Failed: Manhole Cover Dislodged (Explain in Notes)

Other: Gas Found (Explain in Notes)

Failed/ Removed

Cable: Joint/ Termination:

Other: Other:

Size: Cu Al Size Other:

Installed

Cable: Joint/ Termination:

Other: Other:

Size: Cu Al Size Other:

Notes:

Create/Edit - Trouble/Splice Log

Failure Date: Emp. Name: Emp. ID:
Division: District: Town:
Trans. Circuit: Dist. Circuit: Voltage:
Other: Other:

From Location

Street: Manhole/Pole: Suffix:

To Location

Street: Manhole/Pole: Suffix:

Trouble

Failed: Manhole Cover Dislodged (Explain in Notes)
Other: Gas Found (Explain in Notes)

Failed/ Removed

Cable: Joint/ Termination:
Other: Other:
Size: Cu Al Size Other:

Installed

Cable: Joint/ Termination:
Other: Other:
Size: Cu Al Size Other:

Notes:

Create/Edit - Trouble/Splice Log

Failure Date: Emp. Name: Emp. ID:
Division: District: Town:
Trans. Circuit: Dist. Circuit: Voltage:
Other: Other:

From Location

Street: Manhole/Pole: Suffix:

To Location

Street: Manhole/Pole: Suffix:

Trouble

Failed: Manhole Cover Dislodged (Explain in Notes)
Other: Gas Found (Explain in Notes)

Failed

Network Protector Joint/ Termination:
Switch
Termination
Transformer Other:
Other:
Size: Cu Al Size Other:

Installed

Cable: Joint/ Termination:
Other: Other:
Size: Cu Al Size Other:

Notes:

Create/Edit - Trouble/Splice Log

Failure Date: Emp. Name: Emp. ID:
Division: District: Town:
Trans. Circuit: Dist. Circuit: Voltage:
Other: Other:

From Location

Street: Manhole/Pole: Suffix:

To Location

Street: Manhole/Pole: Suffix:

Trouble

Failed: Manhole Cover Dislodged (Explain in Notes)
Other: Gas Found (Explain in Notes)

Failed/ Removed

Cable: Joint/ Termination:
Other: Other:
Size: Cu Al Size Other:

- 200A Premold
- 600A Premold
- Cold Shrink
- Hand Applied Lead
- Hand Applied Non Lead
- Heat Shrink
- T-Body
- Other

Installed

Cable: Joint/ Termination:
Other: Other:
Size: Cu Al Size Other:

Notes:

Attachment 5.a - Underground Trouble and Log Form



Underground Trouble / Splice Log

Name:					Emp ID:														
Date:					District:														
Division:	BSW	<input type="checkbox"/>	BSN	<input type="checkbox"/>	BSS	<input type="checkbox"/>	OS	<input type="checkbox"/>	District Circuit:										
Town:					Trans. Circuit:														
Other:					Other:														
Voltage:																			
<input type="checkbox"/>	5 kV Class	<input type="checkbox"/>	<input type="checkbox"/>	15 kV Class	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	25 kV Class	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	35 kV Class	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Network Sec	<input type="checkbox"/>		
<input type="checkbox"/>	Other Sec/ St Lt	<input type="checkbox"/>	Other:							<input type="checkbox"/>									
From Location Street:			Manhole/Pole:			Suffix:													
_____			_____			_____													
To Location Street:			Manhole/Pole:			Suffix:													
_____			_____			_____													
Trouble Failed																			
<input type="checkbox"/>	Cable:	<input type="checkbox"/>	<input type="checkbox"/>	Joint:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Switch:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Terminator:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Transformer:	<input type="checkbox"/>	<input type="checkbox"/>	Other:
<input type="checkbox"/>	Network Protector:	<input type="checkbox"/>	<input type="checkbox"/>			*Manhole Cover Dislodged:			<input type="checkbox"/>	<input type="checkbox"/>		*Gas Found:		<input type="checkbox"/>	*Explain in Notes				
Failed/Removed Cable:																			
<input type="checkbox"/>	EPR:	<input type="checkbox"/>	<input type="checkbox"/>	VC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	PILC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	XLP:	<input type="checkbox"/>	Other:					
Size																			
<input type="checkbox"/>	Cu:	<input type="checkbox"/>	<input type="checkbox"/>	Al:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<#2:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Failed Joint/Termination:																			
<input type="checkbox"/>	200A Premold:	<input type="checkbox"/>	<input type="checkbox"/>	600A Premold:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cold Shrink:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hand Applied Lead:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hand Applied Non Lead:	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Heat Shrink:	<input type="checkbox"/>	<input type="checkbox"/>		T-Body:		<input type="checkbox"/>	<input type="checkbox"/>			Other:								
Installed Cable																			
<input type="checkbox"/>	EPR:	<input type="checkbox"/>	<input type="checkbox"/>	VC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	PILC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	XLP:	<input type="checkbox"/>	Other:					
Size																			
<input type="checkbox"/>	Cu:	<input type="checkbox"/>	<input type="checkbox"/>	Al:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<#2:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Installed Joint/Termination																			
<input type="checkbox"/>	200A Premold:	<input type="checkbox"/>	<input type="checkbox"/>	600A Premold:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cold Shrink:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hand Applied Lead:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hand Applied Non Lead:	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Heat Shrink:	<input type="checkbox"/>	<input type="checkbox"/>		T-Body:		<input type="checkbox"/>	<input type="checkbox"/>			Other:								

Attachment 6 - Quality Assurance Program

The quality assurance/quality control (QA/QC) approach most suitable for application to the Asset Inspection/Testing Program is the *Statistical Process Control (SPC)* Method. SPC is specifically designed for implementation on a continuous stream of products (data) created over long periods of time (e.g.: manufacturing assembly lines). Features of SPC that will heighten the integrity and efficiency of the Inspection/Test Program include:

- verifying the integrity of inspection/surveillance results at reasonable time intervals
- providing “early warning” of results that are unacceptably inconsistent and/or trending towards unacceptable quality levels
- enabling the determination of root-cause(s)/corrective action to restore process integrity prior to the significant accumulation of suspect inspection/test results

Sampled/Audited Non-Compliances:

Literature indicates that processes are always subject to a certain amount of variation due to “chance”; that such variation is inevitable. “Natural variation” has generically been quantified by industry as being 3 Standard Deviations (or 3σ)¹. Variations beyond 3σ are considered “*special causes*” and prompts the investigation for its root-cause and corrective action.

Sample/Audit Sizes:

Literature also indicates that sample sizes should be on the order of $1/p$ ²; where “*p*” is the targeted maximum fraction of non-compliances. Thus, for $p = 5\%$, $1/p = 20$ Samples

Compliance Determination - Inspections:

There are many generic attributes assessed in the course of inspecting an asset; some being subjective and based on experience and judgment.

Therefore, it is unreasonable to expect an exact correlation between the results of Inspections and those of Audits.

Instead, Inspection compliance will be based on Inspection results:

- precisely matching
- or*
- being conservative with respect to Audit results.

The following is a brief description of the two-step process used for Asset Inspection Compliance evaluations:

1. Comparison review of *each* individual attribute identified as an issue for an Asset (i.e.: designation of appropriate Maintenance Codes). The chart below illustrates the three possible outcomes for each Maintenance Code identified during Inspections and/or Audits.

2. Final Rating of an Asset's Inspection. The following chart illustrates the full spectrum of Inspection versus Audit Comparison possibilities:

- should all comparisons be any or all of Cases 1, 2 or 3, Inspection results were in agreement or conservative with respect to Audits. As such, the respective Inspection is deemed compliant
- should any comparison be Case 4, 5, 6 or 7, Inspection results were not in agreement nor conservative with respect to Audits; the respective Inspection is deemed non-compliant

Treatment of Code-by-Code Comparisons:

Asset xxxxxx	Maintenance Codes		Possible Outcomes	Disposition	Key
	Inspection A	Audit B			
			A = B	Match (Compliance)	0
			A is a Code & B is Null	Inspection Conservative	1
			A is Null & B is a Code	Inspection Non-Compliance	2

**Audit Summary Labels applied to Assets;
Summary Treatment of Inspection vs. Audit Code:**

Key --->	Key Assigned:			Label:
	2	1	0	
Case 1:	N	N	Y	Compliance
Case 2:	N	Y	Y	Compliant & Conservative -1
Case 3:	N	Y	N	Compliant & Conservative - 2
Case 4:	Y	N	Y	Non-Compliance - 1
Case 5:	Y	Y	Y	Non-Compliance - 2
Case 6:	Y	Y	N	Non-Compliance - 3
Case 7:	Y	N	N	Non-Compliance - 4

The following is a pictorial representation of the effect of this two-step process.

Each rectangle is viewed as containing the Maintenance Codes identified in the Inspection and the follow-up Audit; Codes appearing in

- both the Inspection and Audit rectangles are matches
- the Inspection rectangle but absent from the Audit rectangle are “Unmatched Inspection Codes”
- the Audit rectangle but absent from the Inspection rectangle are “Unmatched Audit Codes”

The treatment of the appearance of those three possibilities in rating the Inspection Compliance of the respective Asset is addressed in the “Label” column of this pictorial.

	Inspection	Audit	LABEL
			LABEL
Case 1			Compliant
Case 2			Compliant /Conservative - 1
Case 3			Compliant /Conservative - 2
Case 4			Non-Compliant - 1
Case 5			Non-Compliant - 2
Case 6			Non-Compliant - 3
Case 7			Non-Compliant - 4

Compliance Determination – Elevated Voltage Tests:

Similar to the Quality rating of Asset Inspections; to be compliant, Elevated Voltage (EV) Testing needs to provide results that

- precisely match Audit results
- or*
- are conservative with respect to Audit results.

Unlike Asset Inspections, only three “attributes” are assessed for EV Testing

- a) Voltage Test is Required
- b) Test indicated presence of Voltage
- c) Voltage measured was equal to/conservative with respect to the Audit

The level of compliance for each EV Test is quantified in Step 2 as described below

Step 1:

- a.) Voltage Test Req'd
- b.) Voltage Detected

Test	Audit	Compliance Evaluation
No (=0)	No (=0)	Compliant
No (=0)	Yes (=1)	Non-Compliant
Yes (=1)	No (=0)	Compliant
Yes (=1)	Yes (=1)	Compliant

c.) Voltage Level Measured

Comparison	Compliance Evaluation
Test > Audit	Compliant
Test = Audit	Compliant
Test < Audit	Non-Compliant

Step 2:

Compliance Rating Convention:

Attribute:	Audit Finding:	Score:
Voltage Test Req'd	Compliant	1
Voltage Test Req'd	Non-Compliant	0
Voltage Detected	Compliant	1
Voltage Detected	Non-Compliant	0
Voltage Level Measured	Compliant	1
Voltage Level Measured	Non-Compliant	0

Rating = 100 * Σ Score / 3

Special Circumstance:

Explanation:

Each of the 3 attributes (Test Req'd, Voltage Detected, Am't Measured) are generally evaluated independently and then combined to provide an over-all compliance rating

However, IF

- 1.) Inspection/Test records indicate that "Voltage Test Req'd" was "No" and
- 2.) Audit records indicate that "Voltage Test Req'd" was "Yes"

Inspection Compliance for Voltage Detected and Mount Measured will be considered Non-Compliant and the Inspection/Test of the Asset Non-Compliant in total

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

nationalgrid ELECTRIC OPERATING PROCEDURES	Doc No.: NG-USA EOP G009
	Page : 75 of 20
	Date: 01/01/05
SUBJECT: Personal Injury Accidents/Newsworthy Event Reports	SECTION: General

GENERAL INFORMATION:

National Grid USA companies are required by state regulatory agencies to report all employee personal injury accidents and deaths, as well as all public injuries associated with the Company's electric facilities. Additionally, some states require notification on unusual events that receive media attention.

PROGRAM ADMINISTRATOR:

Distribution Engineering Services

SCOPE:

- I. New York PSC Requirements
- II. Massachusetts DTE Requirements
- III. Rhode Island PUC Requirements
- IV. New Hampshire PUC Requirements
- V. Responsibilities
- VI. Training
- VII. Exhibits

APPLICABILITY:

This procedure shall apply whenever the following occur: employee personal injury accidents and deaths, public incidents (injuries) with company facilities, and unusual or major events.

I. NEW YORK PSC REQUIREMENT

A. Reports of Personal Injury Accidents and Media Events – New York

A telephone report shall be made immediately (within one hour except as noted in the following paragraph) for each electric system accident resulting in major media attention, injury or death to a non-employee and each electric system accident resulting in inpatient hospitalization or death of an employee or contractor employed by National Grid. A standardized PSC report form included in Attachment A must be filed. Dispatch shall be notified of all shock incidents by the field or control centers. These shall include personal shocks as well as animal (pets) shocks reported to the Company.

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

Telephone reports for motor vehicle accidents and shocks, except those involving a fatality or major media attention, are not required. Notification for these events are to be done by e-mail as noted in Attachment C. Immediate notification must be made for events involving a fatality or major media attention.

Immediate telephone notices should include the following information:

1. The location of the accident.
2. The date and time of the accident.
3. Whether or not the injured party is a company employee or contractor employed by National Grid or a member of the public.
4. The name, approximate age, and sex of the injured party.
5. A description of the injuries sustained and the status of the injured party.
6. A description of the accident and its cause.
7. The date and time National Grid received notification of the incident.
8. The date and time the first utility personnel arrived on scene.
9. The date and time the first QUALIFIED utility personnel arrived on scene (i.e., capable of addressing the safety hazard).
10. Whether Emergency Response operations were affected until utility personnel arrived.

NOTE: If information is incomplete, report what is available and fill in details later.

Telephone reports are to be made to the PSC Office of Electricity and Environment in Albany at (518) 473-0763. When notification by telephone is required after business hours, please refer to the after hour's contact list (Attachment C). The Company shall also follow up all telephone reports with an e-mail or faxed report.

Contacts are to be made by the respective Regional Control Centers and/or Dispatch. All shock incidents shall be e-mailed or faxed to the PSC daily by Dispatch as noted in Attachment C.

NOTE: When any PSC notification is required, Distribution Engineering Services in Syracuse must also be notified immediately afterwards. Follow up the immediate telephone notice by e-mail to the PSC as noted in attachment C or fax at (518) 474-6537. All information regarding the incident and PSC contact should be faxed to

DES at (315) 428-5983. Attention: Director – Distribution Engineering Services. Additionally, a copy of all notifications shall be faxed to the Manager Corporate Safety and Health at (315)460-1127.

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

Monthly reporting requirements: By the 10th of each month Corporate Safety and Health shall file with the PSC written reports of all accidents specified by this procedure when company employees are involved. By the 10th of each month the Director Dispatch and Control New York shall file with the PSC written reports of all accidents specified by this procedure when the public is involved. New York PSC Form A will be utilized (Attachment B), with a copy sent to the Manager of Claims at fax number (518)433-3964 and Director Distribution Engineering Services at fax number (315)428-5983.

B. Reports of Other Unusual Events:

1. Media Attention:

Immediate telephone notice shall be made by the Regional Control Centers and/or Dispatch for any other unusual event associated with National Grid that will most likely result in media attention. Examples of reportable events are fires, manhole explosions, major equipment damage, opening of regional storm centers, outages affecting high profile customers such as hospitals or shopping malls, etc.

2. Major Media Events:

Immediate telephone notification shall be made by the Regional Control Centers and/or Dispatch for major events associated with Niagara Mohawk electric system that will likely result in considerable media attention. Examples of major events would include load shedding, catastrophic storm emergencies, opening of system storm room, boiler explosions, substation fires, or natural events such as floods or fires that threaten damage to facilities. This notice should be provided during business hours to the PSC Energy and Water Division at (518) 473-0763. When notification is required after business hours, please refer to Attachment C.

3. Security

Serious threats to critical company facilities require immediate notification. Threat notices received from NYISO and government entities also require notification.

Refer to Attachment C for notification information.

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

****NOTE**** When any PSC notification is required, follow up the immediate telephone notice by e-mail to the PSC as noted in Attachment C or fax at (518) 474-6537. Distribution Engineering Services in Syracuse must also be notified immediately afterwards. All information regarding the incident and PSC contact should be faxed to DES at (315) 428-5983. Attention: Director – Distribution Engineering Services.

II. MASSACHUSETTS DTE REQUIREMENTS

A. In compliance with the requirements of Massachusetts G.L. CI 164 S.95, National Grid shall report within a 24 hour period an accident to employees or the public in regards to National Grid electric facilities where the individual is injured, rendered insensible or killed. The notification shall be made utilizing the Massachusetts DTE Outage Reporting Protocol (ORP) website as described in Attachment D. The Accident Report Program shall be the form utilized. The following information is required:

1. Date
2. Company name
3. Contact person
4. Telephone number
5. Accident date and time
6. Location of incident
7. Detailed description of accident

The notification/report is to be completed and submitted by the appropriate Regional Control Center upon receiving the appropriate information from Company personnel. Additionally a copy of the submittal shall be faxed to the Manager Corporate Safety and Health at (315)460-1127.

B. Exceptional or non-routine events due to elevated equipment voltage that required reporting to OSHA or other government organizations due to injuries or other substantive impacts are required to be submitted to the DTE within one to three days. Events involving a fatality or injury (human or domestic animal) should be reported immediately. The notification shall be made utilizing the Massachusetts DTE Outage Reporting Protocol (ORP) website as described in Attachment D. The Accident Report Program shall be the form utilized. The following information is required:

1. Date
2. Company name
3. Contact person
4. Telephone number
5. Accident date and time
6. Location of incident
7. Detailed description of accident

The notification/report is to be completed and submitted by the appropriate Regional Control Center upon receiving the appropriate information from Company personnel. Additionally a copy of the submittal shall be faxed to the Manager Corporate Safety and Health at (315)460-1127.

C. The Massachusetts DTE requires initial notification of all manhole events (i.e., explosions, fires and smokers) to be submitted as soon as possible but no later than 24 hours after the event. Manhole event definitions are as follows:

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

1. Smoking Manhole – A manhole event in which smoke is visible, but no visible flame is escaping from the edge of the manhole cover or from holes in the cover.
2. Manhole Fire – A manhole event in which the cover remains seated in its frame and there is visible flame escaping from the cover’s edge or from holes in the cover.
3. Manhole Explosion – A manhole event in which a release of energy from the manhole occurs and the manhole cover is dislodged from its frame, or debris such as cement and dirt is projected into the air although the manhole cover remains seated.

Additionally, all events involving dislodged manhole covers should be submitted to the DTE as soon after the event as possible. The notification shall be made utilizing the Massachusetts DTE Outage Reporting Protocol (ORP) website as described in Attachment E. These required reports involving cover dislodgement should contain the following information:

1. Event record number
2. Location of failure
3. Date and time of failure
4. Weather conditions for previous 24 hours
5. Manholes involved in event
 - a. Number and location
 - b. Manhole size
 - c. Manhole cover type (solid or slotted)
 - d. Whether manhole cover was dislodged
6. Failed equipment type (cable, splice, etc.)
 - a. Feeder number for primary cable failure
 - b. Voltage
 - c. Cable type and age
 - d. Cable loading
 - e. Other equipment involved and age
7. Supply substation identification
8. Event type (smoke, fire, explosion)
9. Manhole entry
 - a. Date of most recent manhole inspection (attach inspection sheet)
 - b. Date of most recent manhole entry and reason (e.g. maintenance)
 - c. at this location in the past five years
 - d. Gas detected in manhole
10. Sequence of occurrences during the event
 - a. Number of customers interrupted
 - b. Duration of interruption
 - c. Personal injuries and/or property damage
 - d. Related outages
11. Summary of initial investigation into cause of failure

The initial notification/report is to be completed and submitted by the appropriate Regional Control Center upon receiving the appropriate information from Company personnel. The final manhole cover dislodgement report is to be completed by the appropriate Field Operations Supervisor and to be sent as soon as possible after the event when the information required by the DTE is available.

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

III. RHODE ISLAND PUC REQUIREMENTS

- A. In compliance with the requirements of R.I.G.L. 39-4-1, National Grid shall report within a 24 hour period any accident with loss of human life, or serious injury within the state directly or indirectly arising from or connected to maintenance or operation of National Grid facilities.

The notification shall be made by use of the Rhode Island PUC Accident Report, Form A (Attachment F). The report shall be faxed to Rhode Island PUC contact Al Contente and a telephone contact be made to him using one of the following numbers: Office: 401-780-2121, fax: 401-941-4885, Cell Phone: 401-465-2575 or pager: 401-763-8967.

The following information is required:

1. Date
2. Time
3. Place
4. Name
5. Description of incident.

The report is to be completed and submitted by the appropriate Regional Control Center upon receiving the appropriate information from company personnel. Additionally a copy of the submittal shall be faxed to the Manager Corporate Safety and Health at (315)460-1127.

IV. NEW HAMPSHIRE PUC REQUIREMENTS

- A. In Compliance with the requirements of New Hampshire Administration Rules PUC 306.06, National Grid, shall report to the commission as soon as possible after each accident happening in connection with the operation of it's property, facilities or service, wherein any person shall have been killed or seriously injured or any serious property damage shall have been caused. The initial report may be preliminary, but if so, shall be followed later by as full a written statement as possible of the cause and details of the accident and the precautions taken, if any, to prevent similar accidents. Fatalities involving automobile hits must be reported, as well as electrical contacts.

Immediate notice is to be made by telephone utilizing the Commission Protocol Roster (Attachment H), if unable to make contact, utilize the general telephone number and leave a voice mail message providing:

1. Utility and the name and return telephone number of the individual reporting.
2. Stating that an accident occurred requiring notification and will be reported upon when the commission next opens.

If during PUC working hours a contact cannot be made to an individual at the PUC, a message is to be left at the Commission general phone number 603-271-2431. The individual calling shall provide name and contact number as well as all information noted below.

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

The following information is required to be provided:

1. Name of utility
2. Name of individual making report and telephone number
3. Brief description of accident and location
4. A description of any known fatalities, personal injuries and damages
5. Any other known information relevant to the cause of the accident and the extent of damages.
6. The time at which the accident occurred and the time the utility was first notified.

A written report is required within 10 days of the accident utilizing Form E-5 (Attachment G). Field Operations shall complete and send report. Additionally, a detailed written report referencing the original E-5 report number is required within 60 days of notification. The report shall include any supportive documentation not provided in its original E-5 report. Field Operations shall complete and send report.

The initial notification shall be completed by the appropriate Regional Control Center upon receiving the appropriate information from company personnel. Additionally a copy of the submittal shall be faxed to the Manager Corporate Safety and Health at (315)460-1127.

B. Reports of Other Unusual Events

1. Media Attention/Major Event – Any accident or event listed below requires immediate reporting to the NHPUC.
 - a. Involves power line clearances
 - b. Involves aircraft, trains or boats
 - c. Results in closure of state highway
 - d. Is likely to be, or has been, reported in network television
 - e. Involves an electrical contact in which a piece of equipment has been damaged
 - f. Involves consequences of a magnitude or severity comparable to those described a-e above.

If during PUC working hours a contact cannot be made to an individual at the PUC, a message is to be left at the Commission general phone number 603-271-2431. The individual calling shall provide name and contact number as well as all information noted below.

The following information is required to be provided:

1. Name of utility
2. Name of individual making report and telephone number
3. Brief description of accident and location
4. A description of any known fatalities, personal injuries and damages
5. Any other known information relevant to the cause of the accident and the extent of damages.
6. The time at which the accident occurred and the time the utility was first notified.

A written report is required within 10 days of the accident utilizing Form E-5 (Attachment G). Field Operations shall complete and send report. Additionally, a detailed written report referencing the original E-5 report number is required within 60 days of notification. The report shall include any

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

supportive documentation not provided in its original E-5 report. Field Operations shall complete and send report.

The initial notification shall be completed by the appropriate Regional Control Center upon receiving the appropriate information from company personnel.

C. Additional Reporting Requirements

1. National Grid is required to report on all accidents involving company pole and anchor facilities located within the public right of way. The company is to utilize Form E-5 (Attachment F) together with all applicable supportive documentation. Submission of such information is required within 10 business days following the conclusion of each calendar quarter. Field Operations shall complete and send report.

V. RESPONSIBILITIES:

A. Distribution Engineering Services:

1. Update procedures as necessary.
2. Provide Field Operations personnel with training when requested.

B. Field Operations Management:

1. Ensure the components of the procedure are implemented.
2. Provide procedure revision input as necessary.
3. Review the procedure with employees.

C. Employee:

1. Demonstrate the understanding of the procedure.
2. Comply with the requirements of the procedure.

VI. TRAINING:

Initial: Provided in appropriate National Grid training programs for Engineering Services and Field Operations personnel and as requested.

VII. EQUIPMENT:

Not applicable.

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsorthy Events Report

ATTACHMENT A

FAX TRANSMITTAL TO

NYS PUBLIC SERVICE COMMISSION
TELEPHONE - (518) 473-0763

FAX (PSC): (518) 474-6537

FAX (DES): (315) 428-5983

FROM

NIAGARA MOHAWK, A NATIONAL GRID COMPANY
REGIONAL CONTROL
(CIRCLE ONE)

WEST

CENTRAL

EAST

CONTACT -
FAX -

(SHIFT SUPERVISOR)

REPORT OF PERSONAL INJURY/NEWSWORTHY EVENT

SENT BY:

DATE:

NUMBER OF PAGES INCLUDING COVER SHEET:

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

NOTIFICATION DATA SHEET:

The following information is to be reported to the New York State Public Service Commission by telephone and followed up by e-mail or facsimile. When using facsimile please use the fax cover sheet specific to this procedure and fax to PSC and DES.

PSC: (518) 473-0763 (Telephone)

PSC: (518) 474-6537 (FAX)

DES: (315) 428-5354 (FAX)

PERSONAL INJURY DETAILS

Location of Incident:

Date and Time of Incident:

Company Employee: Yes/No (circle one)

Name of Injured Party: (UNKNOWN)*

Description of Injury and Status of Injured Person:

(UNKNOWN)*

Initials of Person Preparing Report:

*NOTE: If information is not available from the field, circle (UNKNOWN).

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsorthy Events Report

PSC: (518)473-00763 (Telephone)

PSC: (518)474-6537(FAX)

DES: (315)428-5354(FAX)

NEWSWORTHY EVENT REPORTS

Location of Event

Date and Time of Event

Date and Time of Restoration (Estimated)*

Amount of Load Reduction (Estimated)*

or

Amount of Load Interrupted (Estimated)*

Customers Affected From Interruption (Estimated)*

Description of Events Leading to Occurrence

System(s) Affected:

Effect on System(s):

*If information is estimated, circle estimated.

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

**PSC NOTIFICATION FORM
ACCIDENTS WITH INJURIES
INVOLVING UTILITY FACILITIES
(Including Vehicular Accidents)**

Complete the following form and fax to 518-474-6537 or E-Mail as noted in Attachment C to the PSC.
Note – The PSC shall be notified by telephone within one (1) hour for any vehicular or other accidents resulting in death, involving utility facilities):

Utility Name:	
Date/Time of accident:	Date: _____ Time: _____ : _____ AM/PM
Location of accident:	
Is injured a utility employee?	Yes/No
Description of injury/Status of Injured: (if known)	
Description of accident/Cause of accident (if known):	
Time utility notified of accident:	Time: _____ : _____ AM/PM
Time first utility personnel Arrived:	Time: _____ : _____ AM/PM
Time first qualified utility personnel arrived to address safety hazard	Time: _____ : _____ AM/PM
Were wires down?	Yes/No
Was rescue operation affected until utility personnel arrived?	Yes/No
Were customers interrupted? How many?	
Was there media coverage?	Yes/No/Information not available
Form Completed By:	Name: Title: Telephone:

Please contact _____ at _____ with any questions.

(Name/Title)

(Telephone #)

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

ATTACHMENT B

FORM A	ACCIDENT REPORT	Chronological No. of Accident	
Name of Corporation or Municipality Reporting		National Grid	Do not use this space
Address 300 Erie Boulevard W., Syracuse, NY 13202			
Date of Accident			
Precise Location of Accident			
Name		PERSON INJURED	Age
Address		Sex	
Occupation		Employee of Company	
Regularly or Temporarily Employed		Length of Service	
Nature and Extent of Injury			
Taken After Injury To		Is Death Probable?	
Probable Duration of Disability			
Name of Attending Physician		Address	
Names of Witnesses		Addresses	
Was Injured Person Obeying Instructions at Time of Accident?		Instructions Given by Whom?	
Was Accident Due to Negligence of Injured Person?		Official Capacity	
Give an exact and detailed description of accident and its cause, supplementing by sketch if same makes explanation clearer; together with statement of extent of damage to equipment and action taken to prevent accidents in future.			
Signature of Person Reporting Accident		Manager - Safety Official Capacity	
Date _____			

DO NOT WRITE IN THIS SPACE

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

**ATTACHMENT C
PSC ELECTRIC EVENT NOTIFICATION REQUIREMENTS**

In accordance with the Electric Safety Standards, Case 04-M-0159, utilities are required to notify the Department of various events involving their systems. This document outlines the requirements for contacting Staff to maintain compliance with Appendix B of the Safety Standards Order.

Type of Event	Notify
I. System Control	
<ul style="list-style-type: none"> ▶ All transmission lines outage 230kV and above, overhead or underground, if the line fails to reclose. ▶ Outages of a major tie to another control area. ▶ Any event which affects major transmission customers or which trigger event or disturbance recorders. ▶ Initiation of load shedding procedures, voltage reduction, or emergency operations procedures to maintain the adequacy of the electric system. ▶ Activation of Alternate Control Center (for other than routine test purposes), or loss of data communications with NYISO or other NYS transmission owner control centers. ▶ All tree related outages and structure collapses on 115kV and above circuits. 	Transmission Staff
II. Loss of Electric Service	
<ul style="list-style-type: none"> ▶ Loss of electrical service to customers resulting from load shedding/emergency operation procedures. 	Transmission and Distribution
<ul style="list-style-type: none"> ▶ Loss of electrical service to 5,000 customers or more lasting 30 minutes or more resulting from a transmission line outage. 	Transmission and Distribution
<ul style="list-style-type: none"> ▶ Loss of electrical service to 5,000 customers or more lasting 30 minutes or more resulting from a distribution line outage. ▶ Any loss of a distribution system network. 	Distribution Staff
III. Personal Injury Accidents	
<ul style="list-style-type: none"> ▶ All electric system accidents that result in injury or death to a non-employee and/or inpatient hospitalization or death to an employee or contractor employed by the utility, including accidents that occur at generating plants. 	Distribution Staff
IV. Shock Incidents and Motor Vehicle Accidents	
<ul style="list-style-type: none"> ▶ All electric shock incidents. ▶ Motor vehicle accidents involving utility facilities in which there is a personal injury. 	Distribution Staff
V. Unusual and Media Attention Events	
<ul style="list-style-type: none"> ▶ Major events that will likely result in widespread media attention, such as catastrophic storm emergencies, opening of system storm center, substation fires, nuclear radiation releases, or natural events such as floods or fires that threaten to damage facilities. 	Transmission and Distribution
<ul style="list-style-type: none"> ▶ Events that will likely result in local media attention, such as manhole explosions, opening of a regional storm center, and outages affecting high profile customers (like a hospital or shopping mall). 	Distribution Staff
VI. Security	
<ul style="list-style-type: none"> ▶ Serious threats to critical company facilities. ▶ Threat notices received from NYISO and government entities. 	Howard Tarler or Michael Worden

ATTACHMENT C (cont'd)

PSC ELECTRIC EVENT NOTIFICATION REQUIREMENTS

When and How Notifications Should Be Made

- All notifications to be made by **telephone within one hour of the incident** unless otherwise specified.
- **Notifications regarding system control incidents (Category I), major events (Category V), and critical facility security events (Category VI) require immediate telephone notification regardless of the time of day.**
- Other notifications between the hours of 10 p.m. and 6 a.m. shall be made within one hour via e-mail and reported by telephone the following morning by 8:30 a.m.
- Reports for loss of electric service after business hours should be delayed to the following morning unless they receive significant media attention.
- Reports for accidents and shocks involving personal injury, except those involving a fatality or major media attention, occurring after business hours shall be made the next business day by 8:30 a.m.
- Reports for shocks that do not involve personal injury or vehicular accidents that do not involve a fatality may be submitted by e-mail only and do not require telephone notification unless they involve major media attention.
- All telephone notifications should be followed up with an e-mail report.

Contact Information

During Business Hours (Monday – Friday, 8:30 a.m. – 4:45 p.m.): **518-473-0763**
Contact Department and email transmission and/or distribution staff list (below).

Reporting After Business Hours (Transmission Staff):

Contact and email both individuals.

- | | | | |
|-----------------|------------------------------------|---|-------------------------------|
| ▶ Howard Tarler | H: 518-489-9134 | P(NYS): 518-343-1862 | howard_tarler@dps.state.ny.us |
| ▶ Ed Schrom | H: 518-355-4434
C: 518-461-8839 | P(NYS): 518-342-4717
P(Nation): 800-539-4975 | edward_schrom@dps.state.ny.us |

Reporting After Business Hours (Distribution Staff):

Contact only one individual, starting at top of list, and email all on list

- | | | |
|------------------|--------------|----------------------------------|
| ▶ David Reulet | 518-581-9544 | david_reulet@dps.state.ny.us |
| Patrick Maher | 518-399-5235 | patrick_maher@dps.state.ny.us |
| Karl Roenick | 518-371-4162 | karl_roenick@dps.state.ny.us |
| Christian Bonvin | 518-283-8283 | christian_bonvin@dps.state.ny.us |
| Michael Worden | 518-475-3072 | michael_worden@dps.state.ny.us |
| Kin Eng | 518-461-3035 | kin_eng@dps.state.ny.us |
| | | jeanne_harder@dps.state.ny.us |

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

ATTACHMENT D

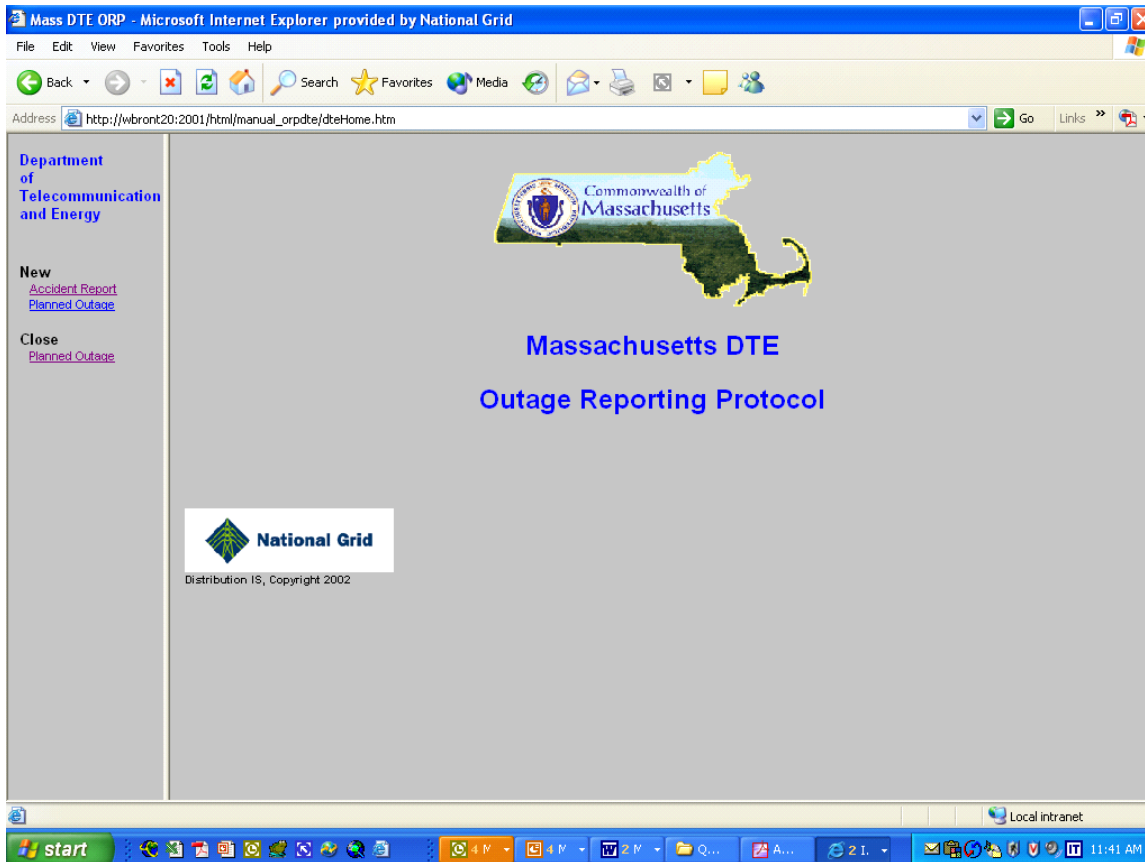
The manual outage reporting application can be accessed from the following URL
(By clicking the following link or pasting this link in the Internet Browser address bar)

http://nyhcbapp25:2001/html/manual_orpdte/main.htm

This application can presently **only** be accessed by Users that have access to IDS
(Interruption Disturbance System).

Main Screen:

(Figure: 1.0)



The Menu options are on the Left divided into

New	
Accident Report	Create a new Accident Report
Planned Outage	<i>Create a new Planned Outage Report</i>
Close	
Planned Outage	<i>Close a Planned Outage</i>

Attachment 7 - NG-USA EOP G009 Personal Injury Accident/Newsworthy Events Report

ATTACHMENT E

Accident Report

The DTE requires National Grid to report within 24 hours of the accident any event involving electricity that causes personal injury or death. On August 24, 2001, the Mass DTE implemented a revised outage reporting protocol ("ORP"), which allowed the companies to submit outage and accident reports through a website.

1. To create a new accident report:

**You need to be an IDS user in order to use the manual ORP application to fill out an accident report.*

When you select "Accident Report", the application will automatically fill in your name in the "Report Filed by" from the IDS user list.

(Figure: 3.0) Manual ORP for Accident reporting screen

The screenshot shows a web browser window titled "Mass DTE ORP - Microsoft Internet Explorer provided by National Grid". The address bar shows the URL "http://wbront20:2001/html/manual_orpdte/dteHome.htm". The main content area is titled "Accident Report" and contains the following fields and buttons:

Report Filed By:	Viglione, Chanh T.	Report Date:	07/27/2004
Company:	Mass Electric		
Contact Person:	James Bouford	Telephone Number:	508-421-7648
Accident Date & Time(0001-2400 hrs):	07/27/2004		
Location of Incident:	<input type="text"/>		
Detailed description of accident (fatalities, injuries and third-party property damage):	<input type="text"/>		

At the bottom of the form are two buttons: "Submit Report" and "Clear Form".

Some of the values are populated by default and some are mandatory

I.e.: **Accident Date & Time**

Once data has been entered, hit the "Submit Report" button. The report will be sent to the Massachusetts DTE.



Issued by Work Methods #04-09

NY and NE


UG Equipment Failure Analysis Program

Delivery Engineering Services and the Worcester Laboratory have teamed up to develop a new program aimed at investigating underground equipment failures. Power cables and their accessories are relatively inaccessible and repair or replacement of cable systems can be expensive. By identifying the causes of failure, mitigating actions can be developed and implemented. The information from this program will also be used to identify material or design issues associated with the cable and accessories that National Grid USA is presently purchasing.

Underground cable, splices, or terminations that have failed in service or under test conditions should be sent to the Worcester Laboratory for analysis. If possible, the failure should be kept intact so that any clues to the cause of the failure are not disturbed. Once the root cause of the failure has been determined, a follow-up report will be issued to the reporting division explaining the cause of the failure and any recommended remedial actions. The laboratory will also maintain a failure database to identify any trends in locations / failures.

To assist the lab with the identification of the failed equipment, a new cable failure tag has been created. Field supervisors will be receiving the tag shortly. The tag should be filled out as completely and accurately as possible and attached to the piece of equipment that is being sent for analysis.

DATE OF FAILURE: _____
LOCATION (MH / POLE #, STREET NAME, CITY/TOWN)

CIRCUIT # : _____ PHASE : _____
VOLTAGE : _____  **National Grid**
REPORTED BY : _____ NG0011 (01.04)

SITE CONDITIONS
 WATER IN MANHOLE FAILURE UNDER WATER
 DRY EARTH (DIRECT BURIED)
 WET EARTH (DIRECT BURIED)
UNUSUAL CONDITIONS / OBSERVATIONS

Send failed cable, splices & terminations to:

**Massachusetts Electric Company
Worcester Engineering Laboratory
939 Southbridge Street
Worcester, MA 01609**

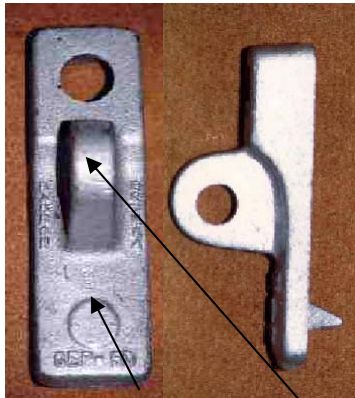


Issued by Work Methods #04-21

**Safety
Standards
Work Methods**

POLE EYE PLATE FOR GUYING

For one 6M, 10M & 12.5M guy, use:
ITEM ID 5994050
15,000 lbs Ultimate Strength



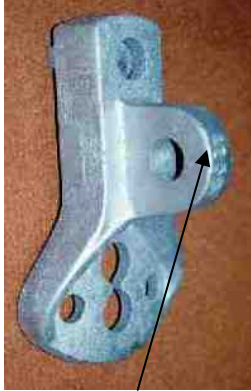
Drive the spur into the pole with a hammer blow at this point only.

Do not hit eye with hammer

For one 16M or dual 6M or 10M guy (see Note 1), use:
ITEM ID 3503425
20,000 lbs Ultimate Strength



For dual 12.5M guy (see Note 1), use:
ITEM ID 9200396
28,000 lbs Ultimate Strength



Identifying part number 1258

In order to meet the strength requirements of standard guy wire, three pole eye plates will be utilized when fiberglass strain insulators need to be installed.

- For one 12.5M (previously referred to as 13M), 10M and 6M guy, use Item 5994050 with one 3/4" thru bolt and 3" square curved washer. Drive the spur into the pole with a hammer blow below the eye. Never use a hammer blow on the eye as the plate may crack and/or split in two.
- For one 16M or dual 6M and 10M guy, use Item 3503425 with one 3/4" thru bolt with 3" square curved washer and two 1/2" x 4" lag screws.
- For a dual 12.5M guy, use Item 9200396 with one 3/4" thru bolt with 3" curved square washer and two 1/2" x 4" lag screws.

Note 1: Dual guy means one guy strand installed around a fiberglass insulator roller creating two down guys with twice the holding strength of a single down guy.

Note 2: Per the National Electrical Safety Code, the maximum load on guys and attachments shall not exceed 90% of their ultimate strength.

8/2/04 - JCT

Attachment 8.c - Work Methods Bulletin #03-04 Heat Shrink Splice Failures

Issued by Standards #03-04

**Safety
Standards
Work Methods**

Heat Shrink Splice Failures

An increasing number of heat shrink splices are failing in service and during acceptance tests. Failure analysis revealed the following installation problems were common.

1. Incomplete shrinking of the tubes: Air voids between the tubes will cause electrical stress failures. Incomplete tube shrinking is the most common failure mode observed (see Figure 1). Smaller air voids are created when water drips onto the tube during the shrinking process. Cover your workspace as needed.
2. Poor conditions for splicing: The second most common cause found for heat shrink splice failure was water or foreign material in the joint. Maintain a clean work space in the manhole. Water, grease, dirt or debris will cause a splice to fail. Before putting on the tubes, thoroughly clean the cable. Leave the tubes in their plastic covers even on the cable.
3. Cable end preparation: The semicon cutbacks must be smooth and the insulation surface thoroughly cleaned. A jagged semicon cutback is an electrical stress point which will eventually fail. When semicon material is not cleaned from the insulation, tracking will occur along the insulation surface causing the splice to fail (see Figure 2).
4. Neutral connections: Bonding connections must be solid. Oversized connectors, wrong tools and too little pressure led to bad crimps in many splices investigated. Use the correct connector and crimping tools.

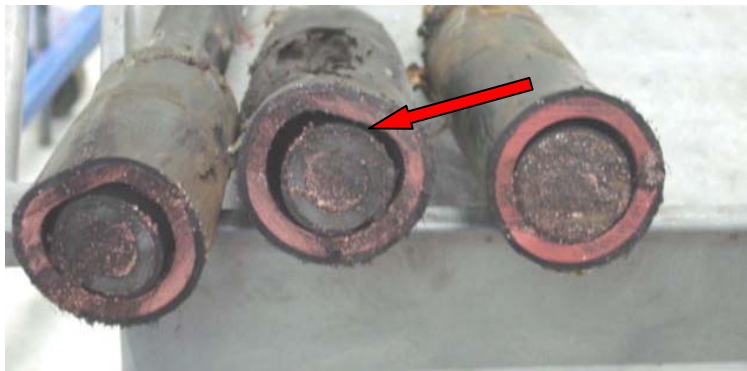


Figure 1: Voids between tubes

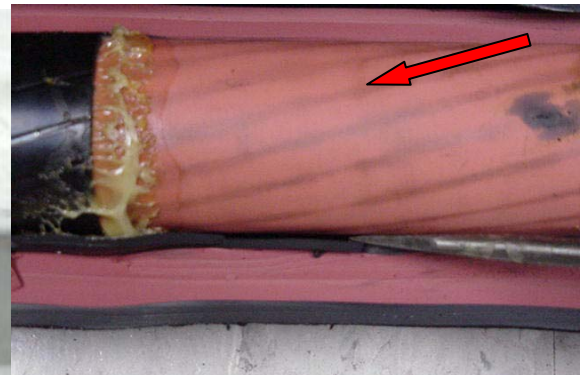


Figure 2: Semicon material