



CITY OF VERNON
VERNON GAS & ELECTRIC

GENERAL ORDER 165

Effective date: 2/8/2012

General Order 165 – Inspection Cycles for Electric Distribution Facilities

1.0 Background

California Public Utilities Commission (CPUC) General Order 165 (GO 165) sets forth requirements for electric distribution and transmission facilities (excluding those facilities contained in a substation) regarding inspections in order to ensure safe, reliable electrical service. The electric distribution facilities subject to GO 165 include overhead and underground equipment, street lighting, and wood poles.

The City of Vernon (COV) is an industrial city primarily composed of businesses, warehouses, factories, and plants. The city, which is about five square miles, has about 100 residents and 1900 businesses. Although COV fits the description of “rural” according to the Definitions identified in GO 165 (see “5.0 Definitions”), for the purpose of this program City of Vernon Gas & Electric (VG&E) applies the definition of “Urban” based on daytime population density.

2.0 Purpose

The purpose of this document is to describe the inspection practices of electric distribution facilities of City of Vernon Gas & Electric.

3.0 Applicability

This program shall govern the inspection of VG&E electric distribution and transmission facilities.

This order does not apply to facilities of any communication infrastructure providers.

4.0 Good Utility Practice

Distribution facilities shall be designed, constructed, and maintained to support continuity of service and promote public safety. VG&E shall design, construct, and maintain its electric system by utilizing best industry practices while accounting for the specific needs of its customers.

5.0 Definitions

For the purpose of this General Order,

5.1 "**Urban**" shall be defined as those areas with a population of more than 1,000 persons per square mile as determined by the United States Bureau of the Census.

5.2 "**Rural**" shall be defined as those areas with a population of less than 1,000 persons per square mile as determined by the United States Bureau of the Census.

5.3 "**Patrol inspection**" shall be defined as a simple visual inspection, of applicable utility equipment and structures that is designed to identify obvious structural problems and hazards. Patrol inspections may be carried out in the course of other company business.

5.4 "**Detailed**" inspection shall be defined as one where individual pieces of equipment and structures are carefully examined, visually and through use of routine diagnostic test, as appropriate, and (if practical and if useful information can be so gathered) opened, and the condition of each rated and recorded.

5.5 "**Intrusive**" inspection is defined as one involving movement of soil, taking samples for analysis, and/or using more sophisticated diagnostic tools beyond visual inspections or instrument reading.

5.6 "**Corrective Action**" shall be defined as maintenance, repair, or replacement of utility equipment and structures so that they function properly and safely.

The term "year" is defined as 12 consecutive calendar months starting the first full calendar month after an inspection is performed, plus three full calendar months, not to exceed the end of the calendar year in which the next inspection is due. For wood pole intrusive inspections, the term "year" is identified as a calendar year.

6.0 Facility Inspection Program

6.1 Patrol – Routine Diagnostics

A Circuit Patrol includes a visual inspection and reporting of the condition of overhead and underground facilities. The circuit patrol will consist of a “drive-by” inspection performed on a routine (once a year) basis. It is intended to identify obvious safety and circuit reliability problems or hazards. In addition to routine Circuit Patrols, line crews are to perform on-going patrols in the course of routine activities.

6.2 Detailed Inspection

The Detailed Inspection consists of a more critical visual inspection and reporting of the condition of conductors/cables, transformers, capacitors, regulators, street lighting and other equipment/devices. Underground facilities such as vaults and manholes will be subject to a detailed inspection every three (3) years. Facilities located above ground such as overhead equipment and pad mounts or walk-in enclosures are subject to a detailed inspection every five (5) years.

6.3 Intrusive Inspection

Intrusive Inspections will be performed on wood poles on at least a 10 year cycle after 15 years of age.

6.4 Standards for Inspection

VG&E shall conduct inspections of its distribution facilities, as necessary, to ensure reliable, high quality, and safe operation, but in no case may the period between inspections (measured in years) exceed the time specified in Appendix A.

6.5 Record Keeping

VG&E shall maintain records for:

- A. At least (10) years of Patrol and Detailed Inspection activities;
- B. The life of the pole for intrusive inspection activities.

For all inspections, records shall specify the circuit, area, facility or equipment inspected, the inspector, the date of the inspection, and any problems (or items requiring corrective action) identified during each inspection, as well as the scheduled date of corrective action.

6.6 Reporting

By July 1ST VG&E shall make available an annual report for the previous year upon request. The annual report shall list four categories of inspections: Patrols, Overhead Detailed, Underground Detailed and Wood Pole Intrusive. The report shall denote the total units of work by inspection type for the reporting period and the number of outstanding (not completed) inspections within the same reporting period for each of the four categories. VG&E shall define its reporting unit basis; for example, circuit, location, facility/equipment. The total inspections due in the reporting period shall not include outstanding inspections from prior year. The total inspections required that were not completed in the reporting period shall not include outstanding inspections from prior years.

See Table 1 for Condition Rating;
See Table 2 for Inspection Cycles;
See Appendix A for inspection checklists.
See Appendix B for decayed/damaged tables.

CONDITION RATING

Table 1

Condition Rating	Description of Action Response Time	Period of Action
1	Requires immediate corrective actions	Within 1 year
2	Requires Urgent corrective action to eliminate or mitigate existing condition	Within 2 years
3	Requires timely corrective action to eliminate or mitigate existing condition	Within 3 years
4	Requires corrective action to eliminate or mitigate existing condition	Within 4 years
5	Condition of equipment contributes to safe, reliable operation	Next inspection interval

Table 1- Condition Rating

INSPECTION CYCLES

Table 2

	Patrol	Detailed	Intrusive
Transformers			
Overhead	1	5	-
Underground	1	3	-
Padmounted	1	5	-
Switching/Protective Devices			
Overhead	1	5	-
Underground	1	3	-
Padmounted	1	5	-
Regulators/Capacitors			
Overhead	1	5	-
Underground	1	3	-
Padmounted	1	5	-
Overhead Conductor and Cables			
Overhead Conductor and Cables	1	5	-
Streetlighting	1	X	-
Wood Poles under 15 years	1	X	-
Wood Poles over 15 years which have not been subject to intrusive inspection	1	X	10
Wood poles which passed intrusive inspection	-	-	20

Table 2- Inspection Cycles

7. INSPECTION METHODOLOGY AND REQUIREMENTS

The VG&E Inspection Plan through routine visual inspections reduces the risk of fire and further safety, reliability, and continuity of service. The goal of the VG&E inspection program is to promote safety through compliance to GO 95 and GO 128 requirements. Inspection intervals and reports satisfy the requirements specified in GO 165. The reporting procedures set forth and defined herein can be used to evaluate compliance with the VG&E plan. Inspection intervals will conform to GO 165 unless required more frequently by other Federal, State or local agencies or VG&E.

Presented herein are brief descriptions of the inspection methodologies, assumptions, requirements and key items to identify for each type of inspection. These items are provided for Circuit Patrol, Detailed Inspections of overhead and underground facilities and Intrusive Inspections of wood poles.

7.1 Circuit Patrol and Detailed Inspection for Overhead Structures and Equipment

As similarities exist for Circuit Patrol and Detailed Inspections related to inspection assumptions, patrol requirements and Inspector requirements, these areas are provided jointly.

Circuit Patrol and Detailed Inspection Assumptions:

The requirements for Circuit Patrol and Detailed Inspection are provided below:

- Circuit Patrols and Detailed Inspections shall be performed by qualified staff.
- Circuit Patrol is predominantly a "drive-by" inspection for all overhead facilities, attachments and equipment.
- Inspection results shall be recorded on VG&E-specified forms and recording formats.

Circuit Patrol and Detailed Inspection Requirements:

The following requirements serve as guidelines for the patrol:

1. Visual inspection of distribution circuits from the substation source to the end of the circuit shall be performed and shall include support structures, hardware, conductors, transformers (overhead), capacitors, switches, fuses, etc. to identify fire hazards or obvious problems impacting public safety, worker safety, or reliability.
2. Vegetation encroachments in violation of GO 95 clearance requirements shall be identified.
3. Circuit map discrepancies, as directed by supervision, shall be reported.

4. Minor maintenance activities to place guy guards, visibility strips, etc. as directed by supervision, shall be performed.

Responsibilities for Circuit Patrol and Detailed Inspections

Inspector Requirements

- Inspectors must meet minimum experience requirements or successfully completing training requirements.

Reporting:

- Inspection results shall be recorded on VG&E-specified forms or reporting formats (Appendix A). A condition rating for observations requiring corrective action or re-evaluation shall be provided.
- Reports shall be submitted to the Distribution Engineer as required by VG&E.
- Facilities patrolled (identified by circuit and patrol type) shall be reported.

Circuit Patrol Methodology

Circuit Patrol shall be performed on a circuit-by-circuit basis at least once per year as specified by GO 165.

VG&E has circuits serving critical customer and emergency response services.

Circuits shall be patrolled in order of priority to ensure public safety and reliability. The patrol is intended to identify obvious problems or hazards while performing a "drive-by" patrol and do not require the Inspector to enter properties unless facilities cannot be observed from public access locations.

Circuit Patrol Checklist

To aid the Inspector in identifying obvious problems or notable conditions during the Circuit Patrol, the following checklist is provided:

A. Condition of Poles and Structures

Identify/examine:

- Damaged/deteriorated pole (mechanical damage by vehicle, storm, fire, etc.)
- Broken or damaged components.
- Damaged down guys, guy guard or visibility signs missing (install as needed).
- Erosion or excavation around pole or anchor.
- Movement and cabinet security in pad mount transformer.

- Placement of vault lids and vent pipes.
- Vegetation clearance around poles or structures with non-exempt equipment.

B. Condition of Hardware and Apparatus

Identify/examine:

- Broken or damaged insulators.
- Pole switch indicating need for repair.
- Indication of equipment/transformers leaking oil.
- Bulged or discolored capacitor units.
- Blown fuses and broken fuse holders.
- Blown lightning arresters.
- Foreign objects interfering with operation.
- Obvious evidence of tracking or burning of pole or arms.

C. Conductors

Identify/examine:

- Inadequate ground clearances.
- Clearance from building, telecommunications, cable television or radio antenna, billboard signs, scaffolding or other line hazards.
- Crane or other excessive height equipment operating in close proximity.
- Trees touching or above primary conductors (overhangs) unless special encased tree cable guard is present.
- Hazardous tree conditions, vegetation encroachment, dead trees, foreign objects in line, etc.

D. General Conditions

Identify/examine:

- Unlocked substations, pole switches, etc.
- Verify circuit map accuracy.

Detailed Inspection Methodology

Detailed Inspections of overhead lines, and pad mounted equipment will be performed at least every five (5) years as directed by GO 165. The detail inspection has much the same emphasis as the Circuit Patrol except that it involves a more detailed examination of facilities in order to identify facilities and circuit problems or hazards which may compromise safety or circuit reliability. Detailed Inspections shall be visual-based from ground and do not require climbing unless directed by supervision and performed by qualified staff.

Detailed Inspection Checklist

To assist the Inspector in identification of problems or hazards during a Detailed Inspection, the following checklist is provided:

A. Condition of Pole and Structures

Identify/examine:

- Damaged/deteriorated pole (mechanical damage by vehicle, fire, woodpeckers, etc.)
- Crossarm broken or misaligned.
- Erosion or excavation around pole or anchor.
- Damaged down guys, guy guard missing (install guard where required).
- Padmount equipment movement and cabinet secured or locked.
- Covers, vault lids and vent pipes.
- Vegetation clearance around poles or structures with non-exempt equipment.

B. Condition of Hardware and Apparatus

Identify/examine:

- Broken, chipped, or contaminated insulators.
- Indication of excessive equipment/transformers leaking oil.
- Bulged or discolored capacitor units.
- Blown or dry fuses, lightning arresters, broken fuse holders.
- Street lights broken or damage.
- Foreign objects interfering with operation.

- Evidence of tracking or burning.

C. Conductors

Identify/examine:

- Inadequate ground clearances.
- Clearance from building, telecommunications, cable television or radio antenna, billboard signs, scaffolding or hazardous locations.
- Crane or other excessive height equipment operating in close proximity.
- Trees touching or above primary conductors (overhangs) unless special encased tree cable guard is present.

D. General Conditions

Identify / examine:

- Unlocked substations, pole switches, equipment, etc.
- Verify circuit map accuracy.
- Service Drops-Minimum Vertical Ground Clearance.

7.2 Detailed Inspection for Underground Facilities/Equipment and Pad mounted Transformers

Detailed Inspection Methodology for Underground Facility

Detailed Inspections are required for the underground vaults and switching Protective Devices on three (3) year inspection intervals and for the pad mounted equipment on a five (5) year inspection interval. The basic inspection criteria are similar to those of pad mounted equipment and are reported identically for each inspection cycle. The inspections shall be conducted in accordance with VG&E and GO 128 requirements and shall satisfy GO 165 inspection intervals.

Detailed Inspections of underground facilities and equipment requires that the inspector enter vaults, manholes, walk-in enclosures and open pad mounted transformers.

Underground Equipment and Pad mounted Transformer Inspection Assumptions

- Qualified electrical workers are allowed to open or to be exposed to energized equipment.
- An air quality (oxygen and gas) test shall be performed in accordance with standard OSHA policies before entering vaults and underground facilities.

- Observations shall be detailed on VG&E-specified inspection forms or formats.
- The General Foreman shall define the number of crew required to perform oil sampling, inspection of energized conductors, inspection of primary compartments of transformers and equipment.

Underground Equipment and Padmount Requirements:

- A thermal scan of all equipment, cable, terminations and splices will be conducted.
- All equipment and facility access shall be locked upon departure.
- Check for loose padmount hardware.
- Minor vegetation control around transformer shall be performed.
- Presence and visibility of high voltage signs shall be verified.

Padmount Checklist

The following is intended to assist the inspection crew in identifying key issues for padmount transformers:

Padmount Transformers

A. Site Inspection for Padmount Transformers

Identify/examine:

- Debris and visual hazards in or around structure.
- Corrosion of ground rods, grounding cable and grounding connections.
- Structure movement.
- Deterioration of concrete.
- Presence/legibility of high voltage signs and structure numbers.
- Exterior damage to structure.
- Missing hardware.
- Sufficient work space around equipment structure (eight foot clearance in front of padmounts) and 3 foot clearance from buildings.

- Signs of corrosion on grates, baffles, and on wells and seams.
- Opening in structure which may allow the passage of wire or other conducting material into the structure from the outside.
- Water inside the structure.
- Foreign debris.

B. Equipment Inspection for Pad mount Transformers

Identify/examine:

- Thermal scan for all hot spots on the equipment, cable, terminations, and splices.
- Signs of termination overheating or distortion.
- Signs of corrosion, oil leaks, and low oil levels.
- Scratches or abrasions to bare metal on equipment.
- Weld seams.
- Oil fill plug and side gauges.
- Fuse carriers for proper locking and sealing.
- Sufficient work space around equipment.
- Appropriate signs are present and legible.
- Contamination, tracking, or deterioration of insulating barriers.
- Electrical clearances are maintained between barriers, live parts, and other insulated components.
- Safety barrier installation and condition on live-front equipment.
- Signs of heating, arcing, or corrosion in live-front equipment.
- Locking devices are in place.
- Interior and exterior damage to tank or cabinet.
- Oil leaks on the cover, sides of the transformer or on the ground.

- Cabinet integrity (holes in cabinet, non-latching doors, approved locking devices in place, etc.).
- Name plates are legible to the operator.
- Securely locked or bolted down equipment upon departure.
- High voltage signs on outside of cabinets and 8 foot clearance decals.
- High voltage signs inside of door on live front equipment.
- Cable tags.

Underground Facilities and Equipment

A. Site Inspection for Underground Facilities and Equipment

Identify/examine:

- Missing hardware.
- Foreign debris in or around structure.
- Corrosion of ground rods, grounding cable and grounding connections
- Corrosion of grounds rods and cable racks.
- Adequacy of cable clearances.
- Visual hazards.
- Structure movement.
- Presence and legibility of high voltage signs and structure numbers.
- Exterior or internal damage to structure.
- Sufficient work space around equipment structure (eight foot clearance in front of padmounts) and 3 foot clearance from buildings.
- Deterioration of concrete.
- Signs of corrosion on grates, baffles, and on welds and seams.
- Opening in structure which may allow the passage of wire or other conducting material into the structure from the outside.

- Water inside the structure and pumping requirements.
- Broken or missing vent pipes.
- Cable tags and switch tags.

B. Equipment Inspection for Underground Facilities and Equipment

Identify/examine:

- Thermal scan for all hot spots on the equipment, cable, termination's, and splices.
- Signs of termination overheating or distortion.
- Signs of corrosion, oil leaks, and low oil levels.
- Oil fill plug and site gauges.
- Scratches or abrasions to bear metal on equipment.
- Contamination, tracking, or deterioration of insulating barriers.
- Electrical clearances between barriers, like parts, and other insulated components.
- Weld seams.
- Fuse carriers for proper locking and sealing.
- Sufficient work space around equipment.
- Cable and equipment signs.
- Safety barrier installation and condition on live-front equipment.
- Signs of heating, arcing, or corrosion in live-front equipment.
- Locking devices.
- Interior and exterior damage to tank or cabinet.
- Cabinet integrity (holes in cabinet, non-latching doors, approved locking devices in place, etc.).

- Legibility of name plates.
- Security of equipment.
- High voltage signs on outside of cabinets.
- High voltage signs inside of door on live front equipment.

7.3 Intrusive Inspections on Wood Pole Structures

Intrusive Inspection Methodology

Intrusive inspections shall be performed on wood pole structures on at least a 10-year cycle for poles over 15 years of age and at each 20-year period, thereafter.

Intrusive Inspection Assumptions

- Intrusive Inspection shall be performed concurrently with a Detailed Inspection to identify overhead structure issues detailed previously in Section 7.1.
- Inspections are to be done by qualified personnel trained in recognizing both biological and non-biological degradation and have the ability to accurately assess both.
- Intrusive inspections shall be performed below grade on all wood structures as defined in GO 165 unless poles are set in concrete or asphalt.
- Poles in concrete or asphalt shall be intrusively inspected at the ground line area.
- A minimum of two borings shall be taken per structure to assess internal condition of each structure.
- Serviceability of decayed/damaged structures shall be defined as per VG&E specifications (Appendix B).
- Record keeping will be done on a per structure basis on VG&E-specified forms (Appendix A).

Inspector Qualifications

- Inspectors shall have a minimum of one (1) year experience in utility pole inspection.

- Inspectors shall have completed formal training in the inspection and evaluation of in-service utility poles.

Intrusive Patrol Inspection Equipment

- Hammer and/or small hatchet to sound the poles as well as investigate depth of external decay and/or mechanical damage.
- Means to excavate one quadrant of the pole a minimum of 12 in. below the groundline.
- Appropriate boring device. Some examples are:
 - Resistograph Drill System.
 - Gas powered or electric ½ drive drill with a 3/8 in. x 18 in. auger bit.
 - Increment bore with a minimum bit length of 12 in.
 - Means to measure remaining shell thickness.
 - Bore hole sterilization substance.
 - Treated 7/16 in. hardwood plugs.

Intrusive Patrol Procedures

All wood structures 15 years and older will be minimally intrusively inspected by the following criteria:

- If not in concrete or asphalt, excavate to a minimum depth of 12 in below groundline, the excavation occurring nearest the largest check and/or near below groundline attachments. If in concrete or asphalt, go to the next step.
- Poles will be sounded with a hammer from a minimum of 6ft above groundline to the bottom of the excavation, listening for the presence of voids and/or unsound wood.
- A minimum of two borings will be taken; one at the bottom of the excavation, the other 90° from the first boring and at groundline. If pole is set in concrete or asphalt, then both borings will be taken at groundline. Additional borings shall be taken if necessary to determine the condition of the structure.
- Each hole shall be probed with an instrument to determine the presence of internal decay and/or insect damage.

- If damage exists, the damage will be evaluated and a determination shall be made as to serviceability of the structure and the pole will be rated at this time (according to Appendix B).
- Inspection holes shall be sterilized by utilizing a VG&E-approved material.
- Inspection holes will be plugged by a 7/16 in. hardwood treated dowel.
- Report the following information in VG&E-approved formats:
 - Facility number.
 - Manufacturer.
 - Manufacture date.
 - Original treatment.
 - Pole length.
 - Pole class.
 - Wood species.