

FOUNDATIONS			
Component Classification Categories			
Criticality	I	X	Lines 69 kV and above
Duty Cycle	Heavy Load	N/A	
	Normal Load	N/A	
Service Condition	In Service	X	
	Spare	N/A	
Condition Monitoring Tasks			
None		N/A	
Time Directed Tasks			
None		N/A	
Failure Finding Tasks			
Visual Inspection - Comprehensive Aerial		4Y	1a-e Cycle aligned with FEG schedule
Visual Inspection - Standard Aerial		1Y	1a-e
Visual Inspection - Ground Patrol		1Y	1a-e Lines/structures not accessible for <i>Visual Inspection - Standard Aerial</i> . As needed inspection of lines and structures as needed for ground line and low height defects which engineering has determined to be difficult to identify during the comprehensive aerial visual inspection. Ground patrol inspections shall be on a staggered cycle with respect to the comprehensive aerial inspection. The cycle should be aligned with the vegetation management cycle as much as possible.
Wood Pole Ground Line Inspection		10Y	1a, 1c-d
Hydrographic Survey		N/A	
Condition Directed Tasks			
Underwater Diving Inspection		N/A	

This document is intended to depict maintenance activities for ComEd and are consistent with the North Star maintenance guidelines for Exelon Utilities. It is not intended to be used as "Evidence of Compliance" for regulatory audits or in support of regulatory Readiness Evaluations. Evidence of Compliance documents shall be owned and maintained at the individual OpCo level.

OHT FOUNDATION FAILURE MODES

FAILURE MODE	FAILURE CAUSES	MAINTENANCE TASKS
1. Fails to Support Structure	1a. Soil Erosion / Undermine at foundation/base	Visual Inspection - Standard Aerial (with and without Thermography)
1. Fails to Support Structure	1a. Soil Erosion / Undermine at foundation/base	Visual Inspection - Comprehensive Aerial
1. Fails to Support Structure	1a. Soil Erosion / Undermine at foundation/base	Visual Inspection - Ground Patrol (1 yr, 5 Yr)
1. Fails to Support Structure	1a. Soil Erosion / Undermine at foundation/base	Wood Pole Ground Line Inspection
1. Fails to Support Structure	1b. Buried foundation / Steel Corrosion	Visual Inspection - Standard Aerial (with and without Thermography)
1. Fails to Support Structure	1b. Buried foundation / Steel Corrosion	Visual Inspection - Comprehensive Aerial
1. Fails to Support Structure	1c. Buried foundation / Steel Corrosion	Visual Inspection - Ground Patrol (1 yr, 5 Yr)
1. Fails to Support Structure	1c. Foundation Displacement from Original Installation	Visual Inspection - Standard Aerial (with and without Thermography)
1. Fails to Support Structure	1c. Foundation Displacement from Original Installation	Visual Inspection - Comprehensive Aerial
1. Fails to Support Structure	1c. Foundation Displacement from Original Installation	Visual Inspection - Ground Patrol (1 yr, 5 Yr)
1. Fails to Support Structure	1c. Foundation Displacement from Original Installation	Wood Pole Ground Line Inspection
1. Fails to Support Structure	1d. Excavation Encroachment	Visual Inspection - Standard Aerial (with and without Thermography)
1. Fails to Support Structure	1d. Excavation Encroachment	Visual Inspection - Comprehensive Aerial
1. Fails to Support Structure	1d. Excavation Encroachment	Visual Inspection - Ground Patrol (1 yr, 5 Yr)
1. Fails to Support Structure	1d. Excavation Encroachment	Wood Pole Ground Line Inspection
1. Fails to Support Structure	1e. Concrete Damage / Exposed Rebar	Visual Inspection - Standard Aerial (with and without Thermography)
1. Fails to Support Structure	1e. Concrete Damage / Exposed Rebar	Visual Inspection - Comprehensive Aerial
1. Fails to Support Structure	1e. Concrete Damage / Exposed Rebar	Visual Inspection - Ground Patrol (1 yr, 5 Yr)
1. Fails to Support Structure	1f. Loss of Structural Fill - Island Structures	Hydrographic Survey
1. Fails to Support Structure	1f. Loss of Structural Fill - Island Structures	Underwater Diving Inspection

OHT FOUNDATION MAINTENANCE TASK DEFINITION

TASK	DEFINITION
Hydrographic Survey	<p>Survey scope includes:</p> <ul style="list-style-type: none"> -- Locate and plot conditions of underwater surfaces -- Evaluate for evidence of riverbed scour -- Locate and record tidal positions of water
Underwater Diving Inspection	<p>Underwater divers inspect the surface of the sheet piling for evidence of erosion, pitting, and undermining and documented the inspection using underwater still and video photography. Underwater divers also measure the extent of riverbed scour upstream and downstream of structures.</p>
Visual Inspection - Comprehensive Aerial	<p>Inspection performed aerially where accessible by helicopter. The speed of inspection averages 1.5 mph. Scope of the inspection includes:</p> <ul style="list-style-type: none"> -- Verify foundation deflection and rotation, structure shall be upright and plumb -- Verify area surrounding foundation is stable / intact -- Verify condition of exposed concrete foundation -- Verify location of meandering waterways near structure foundations -- Verify condition of exposed concrete in areas of recent construction
Visual Inspection - Ground Patrol	<p>Inspection performed from ground level. Scope of the inspection includes:</p> <ul style="list-style-type: none"> -- Verify foundation deflection and rotation, structure shall be upright and plumb -- Verify area surrounding foundation is stable / intact -- Verify condition of exposed concrete foundation -- Verify location of meandering waterways near structure foundations -- Verify condition of exposed concrete in areas of recent construction
Visual Inspection - Standard Aerial	<p>Inspection performed aerially where accessible by helicopter. The speed of inspection averages 6.0 mph. Scope of the inspection includes:</p> <ul style="list-style-type: none"> -- Verify that there are no major foundation issues, structure shall be upright and plumb -- Verify location of meandering waterways near structure foundations
Wood Pole Groundline Inspection	<p>Inspection of wood poles at the base / groundline performed to identify:</p> <ul style="list-style-type: none"> -- Identify & treat decay zones on wood poles -- Identify animal damage & nests -- Identify damaged ground conductors and protections -- Identify washouts, erosion, flooded conditions, etc.

OHT FOUNDATION MAINTENANCE BASIS

OHT FOUNDATION Template Summary

The Preventive Maintenance program is documented via maintenance templates. Templates have been developed that address transmission, substation, and distribution equipment that is owned and maintained by Exelon Utilities. Each template documents the program tasks, frequencies, failure modes, and maintenance basis for the associated equipment. Tasks and associated frequencies are designed to address known failure modes of the equipment covered by the template. In general, the tasks included in the maintenance templates are the result of good industry practices, industry experience, and manufacturer recommendations.

References:

Internal reports and operating experience

Interviews with OHT personnel

Building Code Requirements for Concrete, ACI Committee 318, Publication 318-83

Design of Steel Transmission Pole Structures, ASCE Manual and Reports on Engineering Practice No. 72, Second Edition

Guidelines for Electrical Transmission Line Structural Loading, ASCE Manual and Reports on Engineering Practice No. 74, Second Edition

Boundary Definition

The boundary of the foundation for the purpose of this document is defined to include and excluded the following: the foundation includes all concrete and/or steel at base of structure, both above and below grade designed to transfer design loads from the structure above to grade. For all types of direct embedded structures, the foundation includes the soil immediately surrounding the structure needed to provide both lateral and vertical support. Areas in which areas around foundations are supported by retaining wall, inspection of retaining wall shall be included.

Failure Experience

Failures are subject to ACE/RCI investigation. Findings/recommended corrective actions are incorporated into the template as required.

Vendor Recommendations

N/A

OHT FOUNDATION MAINTENANCE BASIS

Disposition of Vendor Recommendations

N/A

Basis For Template Tasks

Hydrographic Survey - Structures located on man made islands along the Susquehanna and Delaware Rivers require underwater inspection of sheeting and rip rap which protect the structure foundations and structural fill.

Underwater Diving Inspection - Island structures along the Susquehanna and Delaware Rivers in which Hydrographic surveys indicate evidence of riverbed scour, a diving inspection is required to gather detailed information in order to determine most cost effective repair.

Visual Inspection - Comprehensive Aerial: This inspection approximates real-time condition monitoring that can detect developing problems and degradation, and provides condition data used to initiate corrective actions. The comprehensive inspection is performed at a slower fly speed to allow for more detailed visual inspection of the structure.

Visual Inspection - Ground Patrol: This inspection approximates real-time condition monitoring that can detect developing problems and degradation, and provides condition data used to initiate corrective actions. More frequent inspections are used due to lack of visibility from aerial inspections from the obstructive terrain and urban congestion along the line.

Visual Inspection - Standard Aerial: This inspection approximates real-time condition monitoring that can detect developing problems and degradation, and provides condition data used to initiate corrective actions. When inspection is for the basis of thermography as a higher speed inspection speed is used

Wood Pole Groundline Inspection: This inspection provides condition monitoring that can detect developing problems and degradation, and provides condition data used to initiate corrective actions. Included in this inspection is the preventative treatment of the pole to mitigate wood pole decay.

OHT FOUNDATIONS TEMPLATE DEVELOPMENT HISTORY

Revision 0		Date 06/17/2005
Writer	Howard Murray (Transmission Line Engineering)	
Reviewer(s)	11/05/04 Template Challenge Session Attendees	
Approver(s)	Kathy McHugh (FAM Maintenance Planning)	
Reason Written	To document the maintenance program tasks, frequencies, failure modes, and maintenance basis	
Revision 1		Date 12/01/2006
Writer	Howard Murray (Transmission Line Engineering)	
Reviewer(s)		
Approver(s)	Kathy McHugh (FAM Maintenance Planning)	
Reason Written	General scrub, task and periodicity review/update	
Revision 2		Date 11/30/2010
Writer	Chuck Priebe	
Reviewer(s)	Ken Wendt (Mgr. Material Condition), Drew Reindel (Mgr. T&S Engineering)	
Approver(s)	Bill Fluhler , Bill Gannon, Nitin Patel, Jim Crane, Bill Sullivan	
Reason Written	Added note to ensure template changes are communicated to affected work groups.	
Revision 3		Date 02/17/2012
Writer	Antoine Morgan	
Reviewer(s)	Drew Reindel	
Approver(s)	Drew Davis	
Reason Written	Updated frequency ground patrol to once every five years for PECO system. Created ComEd and PECO sub sections for Ground Patrol task definitions and maintenance basis.	
Revision 4		Date 11/18/2014
Writer	Robert Munley, Stephen Dasovich, Howard Murray	
Reviewer(s)	George Leinhauser, Ken Wendt, Ken Braerman	
Approver(s)	J. Coffman, Cory Sommerson, Mike Moy	
Reason Written	Updated to align across BGE, ComEd, and PECO with incorporation of best practices.	
Revision 5		Date 2/2/2018
Writer	Howard Murray	
Reviewer(s)	Angelo DeAngelis (Material Condition)	
Approver(s)	Mike Moy (UFAM ComEd)	
Reason Written	3 year review, no content change.	