

*Revisions to this document shall be communicated in accordance with program document AM-EU-P034 to ensure alignment between PCM Templates and field work procedures.*

<b>Solid Dielectric Cable Systems (XLPE)</b>			
Component Classification Categories			
Criticality	I	X	All locations
	II		
Duty Cycle	Heavy Load		
	Normal load	X	
Service Condition	In-Service	X	
	Spare	N/A	
<b>Condition Monitoring Tasks</b>			
<b>Inspect Terminations</b>	<b>Task Frequencies</b>	<b>Failure Codes</b>	<b>Comments</b>
	4Y	2a-b	
<b>Time Directed Tasks</b>			
<b>None</b>	<b>Task Frequencies</b>	<b>Failure Codes</b>	<b>Comments</b>
	N/A		
<b>Failure Finding</b>			
<b>Sheath Testing</b>	<b>Task Frequencies</b>	<b>Failure Codes</b>	<b>Comments</b>
	4Y	2c	
<b>Inspect Joints</b>	<b>Task Frequencies</b>	<b>Failure Codes</b>	<b>Comments</b>
	4Y	2b	
<b>Inspect Link Boxes and Sheath Voltage Limiters</b>	<b>Task Frequencies</b>	<b>Failure Codes</b>	<b>Comments</b>
	4Y	2c	
<b>Inspect Manholes</b>	<b>Task Frequencies</b>	<b>Failure Codes</b>	<b>Comments</b>
	4Y	1	
<b>Condition Directed Tasks</b>			
<b>None</b>	<b>Task Frequencies</b>	<b>Failure Codes</b>	<b>Comments</b>
	N/A		

**FAILURE MODE**

- 2. Fails to Maintain Boundary Integrity
- 3. Fails to Provide Adequate Electrical Insulation

**FAILURE CAUSES**

- 1. Corrosion
- 2a. Tracking / Corona Discharge
- 2b. Outer Sheath Shrinkage
- 2b. Outer Sheath Shrinkage
- 2c. Burned or Damaged Outer Sheath
- 2c. Burned or Damaged Outer Sheath

**MAINTENANCE TASKS**

- Inspect Manholes
- Inspect Terminations
- Inspect Terminations
- Inspect Joints
- Inspect Link Boxes and Voltage Limiter
- Sheath Testing

**TASK****DEFINITION**

Sheath Testing

Test outer sheath of cable at 5kv DC for 1 minute

Inspect Joints

Inspect Joints. Inspect Protective wrapping integrity. Check for shrinkage of outer cable sheath that may cause operational problems. Inspect grounding and bonding connections.

Inspect Link Boxes and Sheath Voltage Limiters

Inspect link boxes and sheath voltage limiters.

Inspect Manholes

Inspect structural integrity of manholes, shaft and tunnel walls, floors and ceilings. Inspect hardware including ladders, cable racking, saddles, verticals, brackets, hangars and duct shields. Inspect frames, covers and necks. Inspect and clean ventilating grates. Inspect sump pumps and electrical equipment.

Inspect Terminations

Inspect for oil leaks, cracks, damaged or broken Porcelain and surface tracking. Ensure insulator is clean. Inspect Grounding connections. Inspect for shrinkage of outer sheath that may cause operational problems

## **Solid Type (XLPE) Cable Template Summary**

The Preventive Maintenance program is documented via Performance Centered Maintenance (PCM) templates. Templates have been developed that address all transmission, substation, and distribution equipment that is owned, and / or, maintained by EED. 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 PCM templates are the result of good industry practices, industry experience, and manufacturer recommendations.

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### **References:**

EPRI Report TR-101670, Underground Transmission System Reference Book (1992 Edition)  
EEI Underground Systems Reference Book (1957 Edition)  
Transmission Cable Maintenance Guide, Prepared by Detroit Edison Company (9/27/00)

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### **Boundary Definition**

The boundary of Transmission XLPE Cable systems are defined from Termination to Termination, including:

- Auxiliary Equipment
- Bonding Systems
- Joints
- Manholes
- Terminations

Excluded from this treatment are: protective, timing, and control relays and Cathodic Protection Systems.

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### **Failure Experiences**

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

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### **Vendor Recommendations**

OEM manuals were referenced and interviews conducted during the development of this template.

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### **Disposition of Vendor Recommendations**

Recommendations were incorporated into the template as appropriate based on operating experience.

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### **Basis For Template Tasks**

**Sheath Testing:** Check sheath integrity.

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**Inspect Joints :** Inspection approximates real-time condition monitoring that can detect developing problems and degradation, and provides condition data used to initiate corrective actions.

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**Inspect Link Boxes and Sheath Voltage Limiters:** Inspection approximates real-time condition monitoring that can detect developing problems and degradation, and provides condition data used to initiate corrective actions.

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**Inspect Manholes:** Inspection approximates real-time condition monitoring that can detect developing problems and degradation, and provides condition data used to initiate corrective actions.

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**Inspect Terminations:** Inspection approximates real-time condition monitoring that can detect developing problems and degradation, and provides condition data used to initiate corrective actions.

<b>Revision 0</b>		<b>Date 11/06/2006</b>
Writer	George Leinhauser (Strategic Programs)	
Reviewer(s)		
Approver(s)	Kathy McHugh (FAM Maintenance Planning)	
Reason Written	To document the maintenance program tasks, frequencies, failure modes, and maintenance basis	

<b>Revision 1</b>		<b>Date 11/30/2010</b>
Writer	Chuck Priebe	
Reviewer(s)	Ken Wendt (Mgr. Material Condition)	
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.	

<b>Revision 2</b>		<b>Date 06/15/2011</b>
Writer	Chuck Priebe (Mat'l. Condition)	
Reviewer(s)	Ken Wendt (Mgr. Mat'l. Condition), Frank Frentzas (Trans. Eng.), Rob Fournie (Mgr. Trans. Eng.)	
Approver(s)	Bill Fluhler	
Reason Written	Revised Tasks and Frequencies to align with material condition improvement and operating experience.	

<b>Revision 3</b>		<b>Date 06/18/2014</b>
Writer	Angelo DeAngelis	
Reviewer(s)	Ken Wendt (Mgr. Mat'l. Condition), Frank Frentzas (Trans. Eng.)	
Approver(s)	Mike Moy (ComEd UFAM)	
Reason Written	Complete 3 Year Review. Reformat document to new EU template	

<b>Revision 4</b>		<b>Date 01/30/2015</b>
Writer	Frank Frentzas	
Reviewer(s)	Angelo DeAngelis (Mat'l. Condition), James Flisk (Trans. Eng.),	
Approver(s)	Michael Moy (UFAM ComEd)	
Reason Written	Aligned Task Frequencies to EU North Star Template as part of the PM Alignment initiative.	

<b>Revision 5</b>		<b>Date 02/02/2018</b>
Writer	Angelo DeAngelis (Mat'l. Condition)	
Reviewer(s)	Frank Frentzas (Trans. Eng.),	
Approver(s)	Michael Moy (UFAM ComEd)	
Reason Written	3 Year Review, no content change.	