OPERATING STANDARDS

DATE: 06/24/2008 SECTION: 6 - Operating & Maintaining STANDARD NO: E-OM1054

STANDARD: Missouri Infrastructure Utility Inspection Standard

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OPERATING STANDARDS

DATE: 06/24/2008 SECTION: 6 - Operating & Maintaining STANDARD NO: E-OM1054

STANDARD: Missouri Infrastructure Utility Inspection Standard

1.0 PURPOSE:

The purpose of this operating standard is to ensure compliance with Missouri's PSC rules and regulations by establishing infrastructure inspection and reporting procedures for Aquila Missouri's transmission and distribution systems.

2.0 REGULATORY REQUIREMENTS:

Missouri CSR 240 – 23.020 Electrical Corporation Infrastructure Standards
This standard establishes the minimum inspection requirements for transmission and distribution infrastructure as defined in Section 386.020(15), RSMo Supp.2006 regarding inspection (including maximum allowable inspection cycle lengths, conditions rating, scheduling and performance of corrective action, record keeping, and reporting).

2.1 DEFINITIONS

2.1.1 Patrols

Overhead Distribution and Transmission – A visual inspection of transmission and distribution circuits to identify potential problems and hazards on structures and equipment. The intent of these patrols is to identify hazards that may affect safety and system reliability. The inspection and documentation of conditions found shall be entered into a software application specifically designed to capture infrastructure inspections.

Padmounted Distribution – A visual inspection of equipment positioned on pads or foundations and typically located above ground level. Patrols shall include a visual examination to assess the integrity of the equipment case, foundation, and locking mechanisms. The intent is to Identify hazards that may affect safety and system reliability. The inspection and documentation of conditions found shall be entered into an software application specifically designed to capture infrastructure inspections.

Underground Distribution and Transmission - A visual Inspection of structures and equipment which supplies voltage to underground distribution and transmission cables circuits and is typically located below ground in manholes or vaults. A patrol shall include a Inspection to identify external structural conditions, conditions affecting the entry way and external ventilation portals. The intent is to identify hazards that may affect safety and system reliability. The inspection and documentation of conditions found shall be entered into a software application specifically designed to capture infrastructure inspections.

2.1.2 Detailed Inspection

Overhead Distribution and Transmission – A visual/diagnostic inspection of structures and structural supporting components to include but not limited to; insulators, attached conductors and equipment components etc. The inspection and documentation of conditions found shall be entered into a software application specifically designed to capture infrastructure inspections.

Padmounted Distribution – A visual/diagnostic inspection of equipment positioned on pads or foundations that are typically located above ground level. Detailed inspection shall include a visual inspection to assess the integrity of the equipment case, foundation, and locking mechanism. In addition, an internal visual/diagnostic inspection shall be conducted to visually assess the conditions of the structure, equipment, cables, joints and supporting hardware internal to the equipment. The inspection and documentation of conditions found shall be entered into a software application specifically designed to capture infrastructure inspections.

Underground Distribution and Transmission – A visual/diagnostic inspection of structures and equipment serving underground Distribution and Transmission cables circuits and is typically located below ground in manholes or vaults. Detailed inspection shall include a visual inspection to assess the integrity of the equipment case, foundation, and locking mechanism. In addition, an internal visual/diagnostic inspection shall be conducted to visually assess the conditions of the structure, equipment, cables, joints and supporting hardware internal to the equipment. The inspection and documentation of conditions found shall be entered into a software application specifically designed to capture infrastructure inspections.

2.1.3 Intrusive Inspection

Overhead Distribution and Transmission Poles/Structures – A ground line inspection to include visual and diagnostic techniques to examine the integrity of the structure and to ensure that it meets (**NESC**) National Electrical Safety Code structural strength requirements. Wood poles shall be sounded, excavated at the ground line, and visually inspected for decay, insect infestation, or other causes of loss or structural integrity. Life extension treatments may be applied during intrusive inspection.

2.2 STANDARDS FOR INSPECTION RECORD KEEPING AND REPORTING

2.2.1 Resource Plan

Aquila will utilize qualified personnel to perform inspections and condition assessments.

A resource plan has been developed to ensure compliance with CSR 240-23.020 Aquila will continuously re-assess its current resource plan to ensure compliance in a cost-effective and prudent manner. It is Aquila's intent to utilize both internal and external resources to physically perform patrols and visual/diagnostic inspections. Specialized resources have been used for specific patrols and intrusive inspections, and will continue to do so.

2.2.2 Demarcation Distribution

Aquila's intent is to inspect distribution system circuit components at a point beginning at the circuit's riser pole located just outside the perimeter of an existing substation. This includes all components operating at between 601V and 35kV, as well as Aquila's own street light standards (street light poles, support brackets, and luminaries' heads). Note: For the purpose of the Infrastructure Inspection cycle requirement table, distribution circuits are to be considered to be operated between 601V and 25,000V / 35,000V, phase to phase.

2.2.3 Demarcation Transmission

Aquila's intent to inspect transmission system circuit components from the circuit's termination pole located just outside the perimeter of an existing substation. This includes all components operating between 34,000V/69,000V and 345,000V. This inspection will be an aerial patrol on overhead equipment, and a structure-by-structure inspection for all ground-line inspections.

2.2.4 Record Keeping

All *source records* will be retained for inspection to ensure compliance with the rule at centralized location and copies kept at a regional operating level for the duration of the entire Inspection cycle timelines.

Corrective Actions/Repairs source records will be completed through Aquila's work management system. The software application mentioned above and Aquila's work management system will clearly identify the action necessary to correct any situation found to be either unsafe or unreliable and the date the corrective action/repair was completed.

2.3 DISTRIBUTION AND TRANSMISSION ANNUAL REPORTS-2009

Aquila will provide two separate annual reports for distribution and transmission and they will be subdivided into **patrols**, **detailed inspections**, and **intrusive inspections**. The Annual reports will come from an itemized report generated from Aquila's software application especially configured for this type of process. The software application will be formatted and documented as described in the PSC ruling found in section (3) C of CRS 240-23.020

All component information will be generated from component tables established in Aquila's FAME mapping system. Aquila plans to use a unique alpha-numeric number which has been assigned to each component and is called a Facility ID number and generated from the software system.

Components found to be in need of repair will be assigned to construction engineering to complete the initial cost estimate phase and then scheduled to be completed.

A unique number which will identify the specific work as infrastructure inspection will be assigned from the work management system and will document the component (Facility Id) and the date corrective action was completed. The engineer/estimator will update the information in the report.

Aquila will provide two separate report designs. One report will include header columns identifying ***Type of Inspection, Equipment and Equipment Type with Total Numbers****, and* ***location****.* The sub-columns will identify ***Premise Area, Substation Number, Feeder Number, Facility ID, Scheduled Inspection Date, Date Inspected, Code Errors, Corrective Action/Job ID, Date Corrective Action Completed, Date Not Inspected Per Original Schedule, Recovery Date****, and* ***Inspector's Name***.

Aquila's annual reports will specify the type of Inspection **patrol**, **detailed** i**nspection**, or **intrusive inspection**, and will include columns detailing the **T*otal number Inspected by Scheduled Date, Number of Initial Scheduled Inspections not completed according to schedule, % Scheduled/Not Completed from Schedule, %Scheduled Inspections of Equip Rate @ each Condition Level (Pass/Fail).***

Other columns in the annual report are listed as ***Number of Corrective Action Scheduled, Number of Corrective Actions Scheduled/Not Completed to Schedule, % Corrective Action Equipment at each condition Rating Level (Pass/Fail).*** Aquila's intent is to automate the reporting process using software application for the sole purpose of infrastructure inspection.

3.0 INSPECTION PROGRAM DEVELOPMENT AND DOCUMENTATION

Aquila has approved operating standards that establish standard procedures for performing Infrastructure inspection for each equipment type found on Aqula's electrical

system. These operating standards have established standard cycles for inspections, established standard conditions assessment checklists, and provide definitions of the specific conditions. Operating standards also provide; condition rating criteria and specify inspection record-keeping and retention requirements. Aquila's operating standards also identify reporting requirements to ensure compliance with the Infrastructure Inspection Requirements.

3.1 PATROL REQUIREMENTS

Aquila will document information discovered from the patrols on a distribution patrol report. Distribution inspection codes are located in operating standard E-OM 1028; appendix A which identify specific criteria for inspection. The intent of the patrol is to identify hazards that may affect safety and system reliability.

3.2 DETAIL INSPECTION REQUIREMENTS

The following equipment types have individual operating standards incorporating the methodology for the detailed inspections for each type of equipment. Each electrical standard has in-depth guidelines to follow in performing visual/diagnostic inspections.

Certain equipment types that will be bundled together during a detailed inspection are conductors, insulators, overhead switches, protective devices, overhead transformers, and other equipment found at the top of poles will be bundle together and examined at the same time structure-by-structure. The intent is to identify conditions that may affect safety and system reliability.

3.2.1 Non-wood Poles

The detailed inspection requirements are obvious structural issues such as ***weld cracks***, ***grounding/cat-welds broken***, *and* ***missing nuts or bolts***.

3.2.2 Underground Distribution Transformers

A visual/diagnostic inspection will require opening up the lids of padmount transformers and observing the ***fusing***, ***elbow bulging***, ***blown arresters*** *(if applicable),* ***defective fault indicators*** *and* ***ground methods***, ***condition of the cable that can be seen***, ***hotspots***, *and* ***oil leaks***.

3.2.3 Oil Reclosers and Sectionalizers

A visual/diagnostic inspection to identify ***leaking oil***, ***cracked bushings***, ***broken brackets***, ***blown arrestors***, ***improper grounding***, *and* ***counte**r* ***readings***. Operating standard E-OM 1052 shall be followed to insure compliance with the standard.

3.2.4 Regulators

A visual/diagnostic inspection to identify ***line or load side arrester for failure***, ***arrester failure between the S&L bushings***, ***tank vents are clear and not blocked***, ***oil level site glass for low oil (if practical) test***, ***noted oil leaks***, ***locked control box***, ***cracked or damaged bushings***, ***pole or platform leaning***, ***position indicator operates correctly***, ***gauges are in good condition cabinet gasket seals properly, and counter readings***. Operating standards E-OM 1050 and 1051 shall be followed to insure compliance with the standard.

3.2.5 Capacitors

A visual/diagnostic inspection to identify ***blown fuse***, ***bulged cans***, ***broken or cracked bushings***, *and* ***leaking fluids, faulty oil switches, faulty controls and hardware.*** Operating standards E-OM1032 shall be followed to insure compliance with the standard.

3.2.6 Overhead Switches

A visual/diagnostic inspection is to identify ***arresters missing*** – ***switch position***, ***padlock missing***, ***broken insulators/stools***, *and* ***inoperable switch***. Operating standard E-OM1024 shall be followed to insure compliance with the standard.

3.2.7 Overhead Street Light

A visual/diagnostic inspection is to identify the condition of the components of an overhead street light. Items to inspect are ***voltage***, ***photo cell***, ***fixture***, ***pole condition***, *and* ***correct fixture for that location***.

3.2.8 Manhole and Vaults

A visual/diagnostic inspection is to identify the conditions of the components in and above manholes and vaults. Inspections will include ***manhole accessibility***, ***fixed ladder for corrosion or deterioration***, *manhole cracks*, ***cables in manhole clearly marked against distribution maps***, ***fire tape***, ***ground connection***, ***damaged splices***,

cable saddle brackets, ***cable supports***, *and* ***cable ties***, *and* ***water pumping systems***. Operating standard E-OM1026 shall be followed to insure compliance with the standard.

3.3 INTRUSIVE PATROL REQUIREMENTS

Intrusive inspection are only required for *wood poles*. The timeline for intrusive inspections are every 12 years. No intrusive pole inspections are required in the first 12 years after installation; however the pole must be inspected between the 12th and 18th years. If the pole or structure is greater than 12 years of age at inception of program, an intrusive inspection must be completed within 12 years. Operating standard E-OM1009 shall be followed to insure compliance with the standard.

Post-Acquisition of Aquila's Missouri Electric Systems

This Compliance Plan has been prepared to cover Aquila's Transmission and Distribution systems in Missouri. In the event that KCP&L's proposed acquisition of Aquila's Missouri Electrical System(s) is completed, the plan will be modified and re-submitted to include the newly acquired systems. However, the provisions in this compliance plan have been designed to enable inclusion of Aquila system (s) in a fairly straight forward manner.

Distribution System Inventory Extension to Acquired Territory

KCP&L may extend KCP&L's Distribution System Inventory program to the acquired Aquila system(s). This will be factored into the plan modifications made resulting form closure of the acquisition.

APPENDIX A

DISTRIBUTION DETAILED INSPECTION REQUIREMENTS BY TYPE OF EQUIPMENT FOUND IN SECTIONS:

SECTION: E-OM 1024
Inspection/Maintenance of Distribution Switches

SECTION: E-OM 1026
Manhole Inspection

SECTION: E-OM 1028
Electric Distribution Patrol

SECTION: E-OM 1032
Capacitors, Distribution Inspection

SECTION: E-OM 1050
Inspection and Maintenance for Single Phase Reclosers

SECTION: E-OM 1051
Regulator, Field Monthly Inspection & Reports

SECTION: E-OM 1052
Inspection and Maintenance for Oil Circuit Reclosers

SECTION: E-PN 1009
Poles, Distribution, Wood-Inspection and Treatments

APPENDIX B

SYSTEM CYCLE INSPECTION REQUIREMENTS

SYSTEM CYCLE INSPECTION REQUIREMENTS:

	Patrol		Detailed		Intrusive		Notes
	Urban	Rural	Urban	Rural	Urban	Rural	
Poles/Overhead Structures							
Wood	4	6			12	12	Note 1
Non-Wood	4	6	12	12			Note 2
Conductors (Overhead))	4	6	8	12			
Conductors (real-time remote monitoring)			12	12			
Transformers (Overhead)	4	6	8	12			
Transformers (real-time remote monitoring)			12	12			
Reclosers (Overhead)	4	6	8	12			
Reclosers (real-time remote monitoring)			12	12			
Regulators (Overhead)	4	6	8	12			
Regulators (real-time remote monitoring)			12	12			
Capacitors (Overhead)	4	6	8	12			
Capacitors (real-time remote monitoring)			12	12			
Switches (Overhead)	4	6	8	12			
Switches (real-time remote monitoring)			12	12			
Protective Devices (Overhead)	4	6	8	12			
Protective Devices (real-time remote monitoring)			12	12			
Streetlighting (Overhead)	4	6	8	12			
Streetlighting (real-time remote monitoring)			12	12			
Underground-direct buried and conduit	4	6	8	12			Note 3
Underground-direct buried and conduit (with real-time remote monitoring)			12				Note 3
Underground Networks	4		8	12			
Underground Networks (with real-time remote monitoring)			12				
Manholes	4	6	8	12			
Vaults	4	6	8	12			
Tunnels	4	6	8	12			
Other underground structures	4	6	8	12			

Note 1: No intrusive inspection required for first 12 years after installation, however, intrusive inspection required between year 12 and 18
For poles/structures greater than 12 years of age at inception of program, intrusive inspections must be completed within 12 years.

Note 2: No detailed inspection required for first 12 years after installation, however, detailed inspection required between year 12 and 18.
For poles/structures greater than 12 years of age at inception of programs, detailed inspections must be completed within 12 years.

Note 3: Some components of underground-direct buried and conduit distribution systems are above ground (e.g., pad-mounted transformers, pad-mounted switches, pad-mounted reclosers, etc.) The inspection intervals also apply to these above ground devices. These inspection requirements do not apply to direct-buried cable or cable installed in underground conduit.

APPENDIX C

FORMS

BUNDLED DISTRIBUTION DETAILED INSPECTION LOG

Town / Area			
Premise			
Substation		**Feeder**	
Inspected by			

Type of Equipment	Facility ID	Inspection Date	Error Codes	Corrective Action/Activity NO.	Completion Date	Equipment Rating
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail
						☐ Pass ☐ Fail

Page # _____

BUNDLE DISTRIBUTION DETAILED INSPECTION CODES

Conductor	Error Code	
Sagging wire	CSW 1	
Broken Insulators	CBI 1	
Broken Strands	CBS 1	
Loose Ties	CLT 1	
Broken Crossarm	CBC 1	
Broken Braces	CBB 1	

Overhead Transformer	Error Code	
Cutout	OVTC 1	
Blown Arresters	OVTBA 1	
Oil Leaks	OTOL 1	
Rusting	OTR 1	
Broken Primary Bushing	OTBPB 1	
Grounding	OTG 1	

Padmount Transformer and UG Switch Detailed Inspection Form

Premise Area _____
Substation _____
Feeder _____

Facility ID	Date Inspected	Inspected By	Check & Repair Codes	**Detailed Inspection Equipment Rating**		Corrective Action/ Job Activity #
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	

Check & Repair Codes:

1. Fusing
2. Elbow Bulging
3. Blown Arresters (if applicable)
4. Defective Fault Indicators
5. Unleveled pads
6. Grounding Method
7. Condition of Cable (above ground)
8. Leaking fluids
9. Abdominal heating or burnt spots
10. Cable Markings match map labels

Page ____

Street Light Detailed Inspection Form

Premise Area _____
Substation _____
Feeder _____

Street Light No #	Date Inspected	Inspected By	Check & Repair Code #	Light works/Not		Corrective Action/ Job Activity #
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
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				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	
				☐ Pass	☐ Fail	

Check & Repair Codes:

1. Photo Cell
2. Broken Fixture
3. Test Light Works/Not
4. Right Fixture/Location
5. Pole leaning

Transmission Aerial Inspection Report

Line	Structure #	Inspection Date	Priority	Comment / Activity #	Completion Date	Inspector