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OBSERVATION OF WOODPECKER DAMAGE TO ELECTRICAL DISTRIBUTION LINE POLES IN MISSOURI

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ABSTRACT: Woodpecker damage to electrical distribution poles was monitored in Saline and Pettis Counties. Damage increased over the four-year monitoring period. There was an increase in both the number of poles damaged and the amount of damage to individual poles. When woodpecker-damaged poles were replaced, the replacement poles proved highly vulnerable to attack. A pole repair and replacement program in Dekalb and Gentry Counties was monitored. The objective was to determine if plastic mesh would effectively protect poles from woodpecker attack and if efficacy could be reliably determined within one year of installation. Plastic mesh failed to provide an acceptable level of protection. It was not possible to get an accurate evaluation of efficacy at the end of one year. Recommendations are made for protecting distribution line poles from damage by woodpeckers.

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INTRODUCTION

Woodpecker damage to wooden poles in Missouri creates a significant economic impact on electrical service companies and their consumers. Although the problem confronts both transmission and distribution systems, this paper deals primarily with woodpecker damage as it relates to distribution lines.

Distribution companies (i.e., Rural Electric Cooperatives) vary in size. The two cooperatives involved in this study each operate a system containing approximately 2,000 miles of line. A 2,000-mile system will contain approximately 36,000 poles. The standard distribution pole is 35' in length. Installed 6' in the ground, the top of the pole is 29' high. Figure 1 shows the standard hardware associated with distribution poles.

Dennis (1964) recognized four species of woodpeckers that are most likely to cause damage to utility poles in the midwest. They are: red-headed woodpecker (Melanerpes erythrocephalus); red-shafted flicker (Colaptes cafer); yellow-shafted flicker (Colaptes auratus); and pileated woodpecker (Hylatomus pileatus).

The red-headed woodpecker was the species most often observed on the poles and in the cavities. Although yellow-shafted flickers were observed only infrequently on poles within the study area, two were observed dead on and near distribution poles. It is assumed they were electrocuted. Red-shafted flickers are not common in the study area. Damage by pileated woodpeckers, which can be identified by its distinctive shape, was not observed in the study area.

In 1981 and 1982, The Central Missouri Electric Cooperative replaced 2,114 poles within their system at an approximate cost of $560,000. Company officials estimated that woodpecker damage was responsible for 50% of their replacement needs. A review of their inspection records for two townships involved in this replacement program revealed woodpecker damage as the reason cited for the need to replace 46% of the 259 poles recommended for replacement.

In 1983, the Northwest Missouri Electric Cooperative inspected 3,857 poles in eight townships. Recommendations were made to replace 442 poles. Woodpecker damage was cited 65% of the time as the reason for replacement.

PROCEDURES / PETTIS AND SALINE COUNTIES

The two townships selected for this study were identified by the utility as having a high level of woodpecker activity. Several line segments within these townships were arbitrarily selected for conducting pole damage observations. The sample population (230 poles) represented 11% of all poles within the townships and 31% of poles to be replaced because of woodpecker damage.

Each pole within the defined line segments was inspected in March 1983 and 1985 and again in June 1987. The number of cavity holes observed on each pole was recorded. Location was noted only as to whether the holes occurred on the upper portion of the pole (above the lower wire), or on the lower portion of the pole (below the lower wire).

The author's definition for a cavity hole is any woodpecker excavation with a horizontal penetration of more than 3". All other woodpecker activity was regarded as minor and not recorded. Normally, cavity holes have straight sides and it is not possible when standing on the ground to observe the back of the cavity. Minor excavations have tapering walls and the back of the excavation is visible from the ground.

When replaced poles were encountered on the ground they were examined for cavities and measurements taken.

RESULTS / PETTIS AND SALINE COUNTIES

Table 1 summarizes damage observations. A pole was considered damaged if one cavity hole was observed.

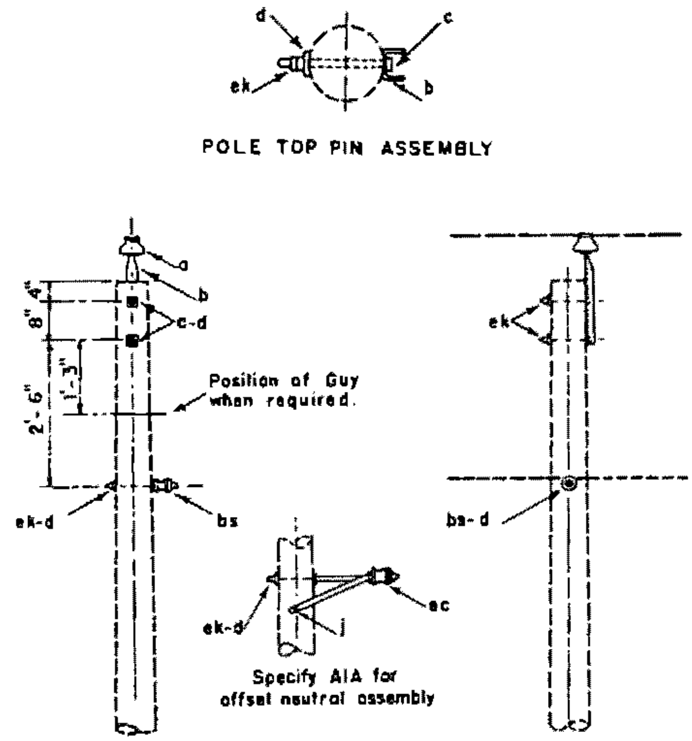

Fig. 1. Standard hardware - distribution pole.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
a	1	Insulator, pin type		d	3	Washer, square, 2 1/4"	
b	1	Pin, pole top, 20"		bs	1	Bolt, single upset, insulated, (AI only)	
c	2	Bolt, machine, 5/8" x req'd. length		ec	1	Bracket, offset, insulated, (AIA only)	
j	2	Screw, lag, 1/2" x 4" (AIA only)					
ek		Locknuts					

7.2/12.5 KV. PRIMARY, 1-PHASE,
0° TO 5° ANGLE, SINGLE PRIMARY SUPPORT

Jan 1, 1962

AI.AIA

These observations confirm that damage increases over time. The rate of increase is rather impressive. For Type I poles (installed prior to 11/82) the number of poles being damaged increased 28% in just over four years. The total number of cavity holes increased by 64%.

For type II poles (reference table 1) the record is even worse. The number of poles subject to woodpecker attack increased by 77% in just over two years, and the number of cavities increased by 126% during the same period.

The tendency for woodpeckers to rapidly and severely damage an individual pole is illustrated by observations made at the most active site inspected. The existing pole was installed in 1962. In March 1983, two holes were present. In March 1985, a total of five holes were observed and ten were present in June 1987. Although the dates are unknown when the first two cavities were excavated, this pole may have remained undisturbed for 18 to 20 years and then come under severe attack.

Rumsey (1970) recognized that, although treated poles harden with age, they remain susceptible to damage for many years. In 1985, a new cavity was observed in a pole that had been installed in 1946.

Thirty-six woodpecker cavities were examined in detail. The average horizontal penetration was 4.2". Horizontal penetrations of more than 5" were frequently encountered. The average pole diameter at the point of penetration was 6.6". The average depth was 5", although three cavities had a depth of one foot or greater. One was two feet deep.

A common conception in the industry is that cavities trap and hold rain water, thereby accelerating pole rot. Of the 36 cavities examined, none showed evidence of accelerated wood decay.

In the 1987 survey only 16% of the damaged poles inspected contained cavities in the lower portion. In most cases, cavity holes in the lower portion were associated with intense damage. On only four poles were cavities observed on the lower portion when none occurred on the upper portion. Poles containing cavities on the lower portion averaged over four cavities per pole.

PROCEDURES / GENTRY AND DEKALB COUNTIES

An inspection conducted by the utility in five townships resulted in recommendations to repair or replace 152 poles, 100 of which had been damaged by woodpeckers. Repairs and/or replacement took place in three townships

Table 1. Pole damage observed.

		Damage Surveys								
		March 1983			March 1985			June 1987		
Pole type	Total poles	Damaged poles	Cavities Total	Cavities /Pole	Damaged poles	Cavities Total	Cavities /Pole	Damaged poles	Cavities Total	Cavities /Pole
1	167	78	144	1.8	93	187	2.0	98	237	2.4
2	47				13	23	1.8	23	52	2.3
3	11				1	1	1.0	1	1	1.0
4	5							3	1	1.0
Total	230							125	293	2.3

Type 1 = Poles installed prior to November 1982. Avg. age = 37 years.
Type 2 = Poles installed between 11/82 and 9/83, replacing poles that had been subjected to woodpecker damage.
Type 3 = Poles installed between 11/82 and 9/83, replacing poles that had not been subjected to woodpecker damage.
Type 4 = Poles installed after March 1985.

during October and November 1985.

All poles recommended for replacement because of woodpecker damage were inspected during the summer of 1985. The number of cavities were recorded and their approximate position on the pole noted. The distance from the top of the pole to the center of each cavity opening was estimated in inches, using the juxtaposition of pole hardware as a guide. A determination was made as to whether excavations were recent (active site) or old (dormant site). Recent excavations were identified by the exposure of lighter colored wood at or near the cavity entrance.

The utility provided protection to 29 poles (existing and replacement) at both dormant and active sites. Only the upper portion of the pole (above the lower wire) was protected. The material used was a high density, black, polyethylene mesh, 1/4", weighing 0.12 lbs./sq.ft. ("Plastic Hardware Cloth"). Protection costs were $12/pole.

All protected poles were monitored for woodpecker damage in October 1986 and 1987.

RESULTS / DEKALB AND GENTRY COUNTIES

Table 2 shows the locations of cavities observed by the estimated distance from the top of the pole.

Table 3 shows the results of the post protection surveys. Overall, plastic hardware cloth failed to protect the pole from woodpecker attack at 62% of the sites two years after installation.

Table 3 also suggests that efficacy evaluations should be accomplished only at active sites. Two years after installation, protection had been breached at only 45% of the dormant sites examined, whereas the failure rate was 72% at active sites. It had been anticipated that the failure rate observed one year after installation would remain relatively constant over time. This assumption was not supported by observation. The failure rate at active sites increased by 64% during the second year following installation.

I had hoped to gain knowledge as to whether protection would result in damage relocation to either the lower portion of the protected pole, or to unprotected poles on

Table 2. Cavity location by distance from top of pole.

Distance below top of pole	No. of cavities	% of cavities
0" - 6"	139	39
6" - 12"	56	16
12" - 18"	53	15
18" - 24"	20	6
24" - 30"	7	2
30" - 36"	8	2
36" - 42"	6	2
Below second wire	65	18
Total	354	100

either side. Although there was no evidence of damage relocation, the high rate of failure renders this observation insignificant.

Table 3. Protection results.

	Total Poles	Poles damaged-Protection breached 10/86 Inspection No.	%	10/87 Inspection No.	%
Protected poles	29	10	34	18	62
Dormant sites	11	3	27	5	45
Active sites	18	8	44	13	72

Dormant/Active determination made--Summer 1985.
Protection installed Oct.-Nov. 1985.

OTHER INFORMATION

In 1983, a permit was obtained to allow the electric cooperative servicing Pettis and Saline Counties to kill 250 red-headed woodpeckers. It was agreed that woodpeckers would be taken only when observed frequenting distribution poles and that killing would be confined to predetermined areas in order to evaluate the effects of their efforts.

Ninety-six red-headed woodpeckers were killed between March 21 and June 16. Thirty of these birds were taken from five poles and another sixteen from only three poles. The cooperative employees concluded that this level of lethal control would be an inappropriate response to their problem and terminated the operation.

Each distribution pole comes from the manufacturer with five predrilled holes positioned near the top of the pole. In most situations, only three of these holes are utilized to mount necessary hardware. Two holes often remain unused. Although records were not maintained, it is my opinion that initial woodpecker attack is directed at these empty holes. Their role in precipitating the attack is not known.

Observations made during the surveys indicate that red-headed woodpeckers nest in distribution line poles. Assuming these efforts are successful, birds fledged from utility pole cavities may be predestined to seek out utility poles for their own reproductive efforts. If this scenario is valid, then preventing pole utilization by these birds takes on a greater importance than merely protecting the investment made in a single pole.

DISCUSSION

Many woodpecker cavities are minor, representing no significant threat to pole efficiency or life expectancy. Remedial action may not be required. If on the other hand major damage has occurred, the cooperative may wish to repair or replace the damaged pole. Protection of repaired or replaced poles is strongly recommended.

The repair of damaged poles is an alternative often overlooked by utilities in favor of pole replacement. This tendency to avoid repair may be a response to past failures. Soft material used as a hole filler was often removed by persistent woodpeckers. Woodpeckers stymied by hard substances often relocated their activity elsewhere on the pole, rendering the original repairs superfluous. When the cost of pole replacement is considered, repairing may be a valid option, particularly if accomplished in conjunction with protection.

One repair substance is OsmoWeld, an epoxy resin manufactured by the Osmose Company, Buffalo, New York. This material forms a strong bond with wood and, according to its manufacturer, restores 85% - 100% or the pole's original strength. It is hard enough to resist woodpecker attack but may be sawed or drilled. One tube fills 15 cubic inches of cavity space and, when used with treated woodblocks for filler, capacity is increased to 36 cu. in. At current prices material to fill a cavity 4" x 6" would cost $10.20.

Metal pole sprints are also available, although they are relatively expensive. Prices range from $100 to $175, depending on the size required.

Pole replacement is the alternative selected in most instances of severe woodpecker attack. The utilities wish to prevent pole failure and power outages that might result if severely damaged poles are subject to stress during inclement weather conditions.

Replacement costs vary according to pole size. Utilities operating transmission lines utilizing the larger poles may face significant costs when replacing a single pole. One such company has seriously considered substituting concrete poles at problem sites. Cost information for various sized poles is presented in Table 4.

Surveys conducted in Pettis and Saline Counties indicate that protection may not be required for poles replaced for reasons other than woodpecker damage. On the other hand, poles replacing those that had been damaged by woodpeckers were highly vulnerable to future attack. Protection would be appropriate. I would also recommend protecting any existing pole requiring repairs or sustaining active damage.

A variety of methods have been tried or proposed for protecting wooden poles from woodpecker attack. Comments herein will be confined to three products that offer mechanical exclusion capabilities: wire mesh, plastic mesh and a solid plastic shield.

There are a variety of metal wire products that could be utilized as a protective pole wrap. The Central Missouri Electric Cooperative utilizes the standard 1/4-inch mesh hardware cloth. The pole is wrapped to a point about 10 feet above the ground at a treatment cost of $30/pole.

Table 4. Cost information for various sized utility poles.

Pole size	Wooden pole cost	Concrete pole cost	Cost installed	Date	Source
35'	X		$ 300	Current	J.P. Locke
45'	X		$ 400	Current	J.P. Locke
55'	X		$ 3,000	Current	Clinton Cain
60'	$ 422	$ 960		1982	Dennis Anderson
95'	$1570	$ 1640		1982	Dennis Anderson
115'	X		$11,320	1982	Dennis Anderson

Hardware cloth is presumed to be 100 percent effective in repelling most species of woodpecker; however, pileated woodpeckers have been known to cut through this material.

The utilities would prefer to find a substitute for hardware cloth. Wire mesh, in addition to being difficult to handle, is an electrical conductor and dangerous to install when the line is hot.

Though metal wire is used by some transmission companies, it is not safe for use on poles supporting lines that transmit electrical power exceeding 69,000 volts. There is a high probability that static electricity will be conducted by the wire and set the pole on fire (D. Anderson pers. comm.).

The material used in the Dekalb/Gentry trials was "Pole Mesh" manufactured by the Osmose Company. This material is easier to work with than wire and is nonconductive. Although the material showed a high failure rate in the Dekalb/Gentry trials, it was felt it has potential to prevent woodpecker attack. When wrapped tightly around the pole, there is an anvil effect and woodpeckers can cut through the material. If the material could be mounted away from the pole, it is anticipated that woodpeckers would be unable to cut the strands. It is believed that away-from-the-pole mounting could be accomplished by minor adaptation of existing hardware.

The Vaughn woodpecker shield (Warren Heim Corporation, Ft. Pierce, Florida) is a high-density, polyethylene plastic sheeting, 40 mm thick, with a high-gloss finish, which prevents woodpecker perching. Rumsey (1973) found this material effective in preventing woodpecker damage.

The Missouri Public Service Company uses this material to protect large transmission line poles. Protection is provided from the top of the pole to a point thirty feet above the ground. They experience only minor problems with attack below the point of protection. Protection costs averaged $200/pole.

This material has some drawbacks. It obscures the condition of the pole underneath and climbers do not feel entirely safe when they have to ascend a treated pole. Holes punched while climbing may render the material subject to wind damage. For aeration purposes the material must be installed in a spiral wrap. Spiral installation requires that the diameter of the pole must exceed the width of the material strip. As the minimum strip width available is 10 1/2", this material is not appropriate for use on most distribution line poles.

RECOMMENDATIONS

Electric cooperatives should develop a comprehensive program for dealing with woodpecker damage. Each program should be specific to local conditions and provide guidelines to inspectors and maintenance personnel regarding repair, replacement, and protection decisions. In Missouri, control programs are at a stage where more information is needed. Experimentation is highly recommended, provided evaluation efforts are undertaken. The electric cooperatives are in a position to capture much of the data needed to develop comprehensive control programs.

Both the Central and Northwestern Missouri Cooperatives periodically inspect every pole within their system for damage. Currently, these inspections reference woodpecker damage only if it is the reason for needed repairs or replacement. The extent of the damage is not quantified. These inspections would be more valuable if the number of cavity holes was recorded and a determination made as to whether the damage is dormant or active. Cavity data from a series of inspection reports would provide reliable trend information and assist in evaluating the effectiveness of the damage control program.

It is my opinion that woodpecker damage to utility poles is strongly site-related. It would be beneficial if each utility would develop a program for number identification of each pole site within its system. Site identification would facilitate record-keeping, evaluation, and decision-making.

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