U.S. DEPARTMENT OF ENERGY - BONNEVILLE POWER ADMINISTRATION

BPA F
5450.05
(10-94)

ENGINEERING AND TECHNICAL SERVICES REPORT

TITLE			DATE	REPORT NO.
EVALUATION OF WOOD POLE FIRE RETARDANT TREATMENT			May 25, 2017	TEST-17-050-Revised
			AUTHOR J.G. Hildreth – TEST-MODA	
			Assisted By R.S. Dizon – TEST-MODA	
REQ ORG.	PAGES	ABM/W.O.	REVIEWED BY	
TELM	5	17-035	S. Khem – TEST-MODA	

SUMMARY:

BPA's Transmission Line Technical Services (TELM) group requested laboratory testing of a wood pole fire retardant treatment. The purpose of the testing was to determine if the treatment is effective in preventing electrically-caused wood pole fires.

Two field-aged cedar poles were erected in the Fog Chamber. One pole was treated with the fire retardant, the other was left untreated. Each pole was then directly energized between a through-bolt at the top of the pole and a metal band just above the stand. The voltage was raised until the pole began to burn.

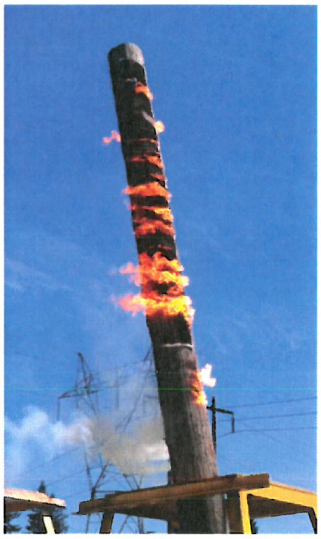

Figure 1 – Untreated Wood Pole Burning

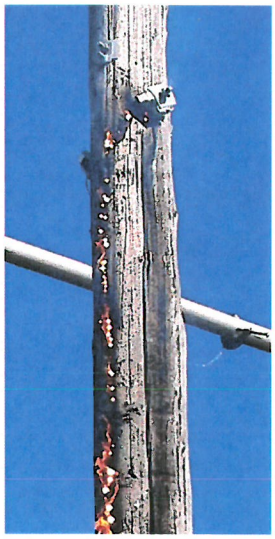

Figure 2 – Treated Wood Pole Burning

Both poles burned while the voltage was applied. The treated pole burned less vigorously and extinguished itself more quickly than the untreated pole.

While the treatment will not prevent electrically-caused pole fires, it may limit the damage to the structure in some cases.

DESCRIPTORS:

Pole Fire, Fire Retardant, Treatment, Wood Pole

DISTRIBUTION:

D.A. Timperley – TELM-TPP-3

Office of Record – TEST

Test Samples

The test samples included two field-aged cedar poles. A third, rectangular glue-lam pole section was also tested but it was too short to produce the desired result (the high voltage flashed over to the stand).

One of the cedar poles was treated with the SPF3000 fire retardant treatment manufactured by Sun Fire Defense, Marina Del Ray, California. The treatment was applied by a BPA painter who used a chemical sprayer to apply the treatment. The other cedar pole was left untreated.

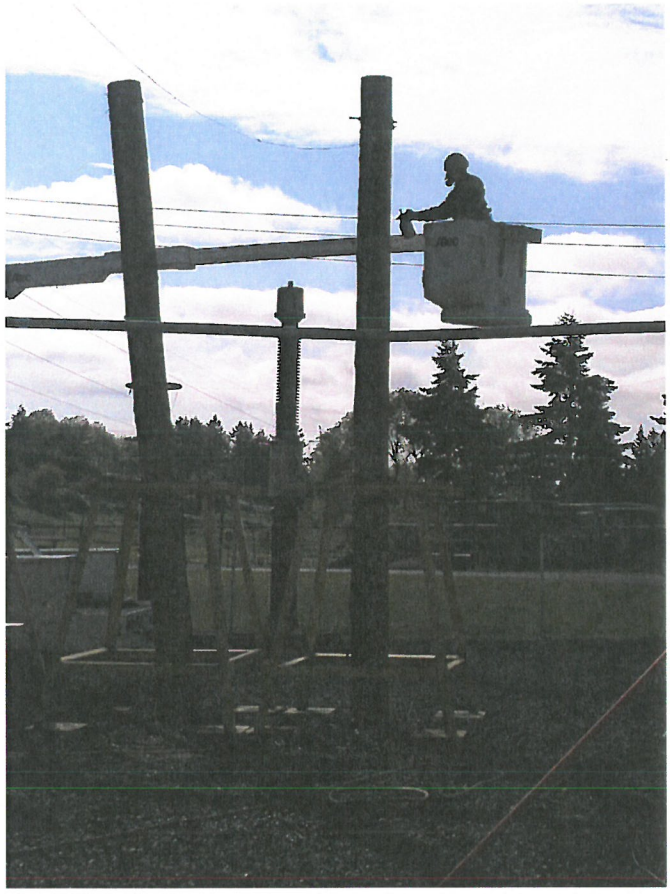

Figure 3 – Applying the Fire Retardant Treatment Using a Chemical Sprayer.

A fire blanket was installed around the through-bolt of the treated pole. It was difficult to assess the effect (if any) the blanket had on the test results.

Figure 4 – Fire Blanket Material Used to Wrap the Through-Bolt on the Treated Pole.

Test Setup

The pole sections were erected into bushing stands in the Fog Chamber yard. A through-bolt was installed in the top of the pole. A conductive band was formed around the bottom of the pole just above the stand. The conductive band consisted of 1" wide tinned copper braid fixed to the pole with screws.

Figure 5 – Test Samples Erected Into Bushing Stands at the Fog Chamber.

The through-bolt was energized from the 460-kV winding of the Fog Chamber test transformer. The conductive band was grounded through a Pearson 110a current transformer used to measure the current through the pole.

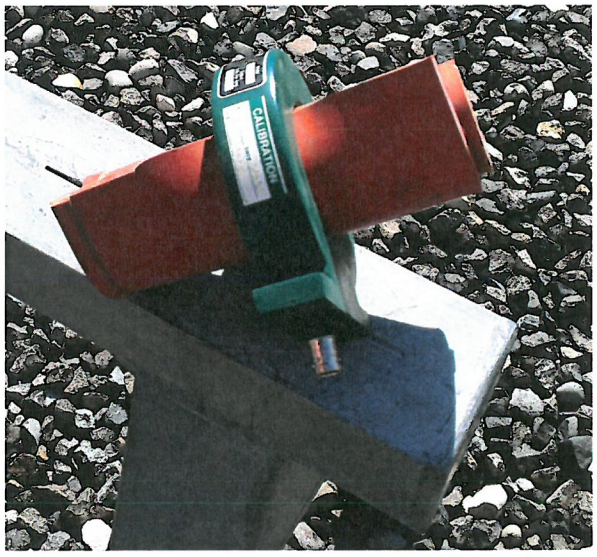

Figure 6 – Current Transformer.

A TeraHertz fiber link was used to transmit the current measurement into the control room where it was displayed on a handheld Fluke meter.

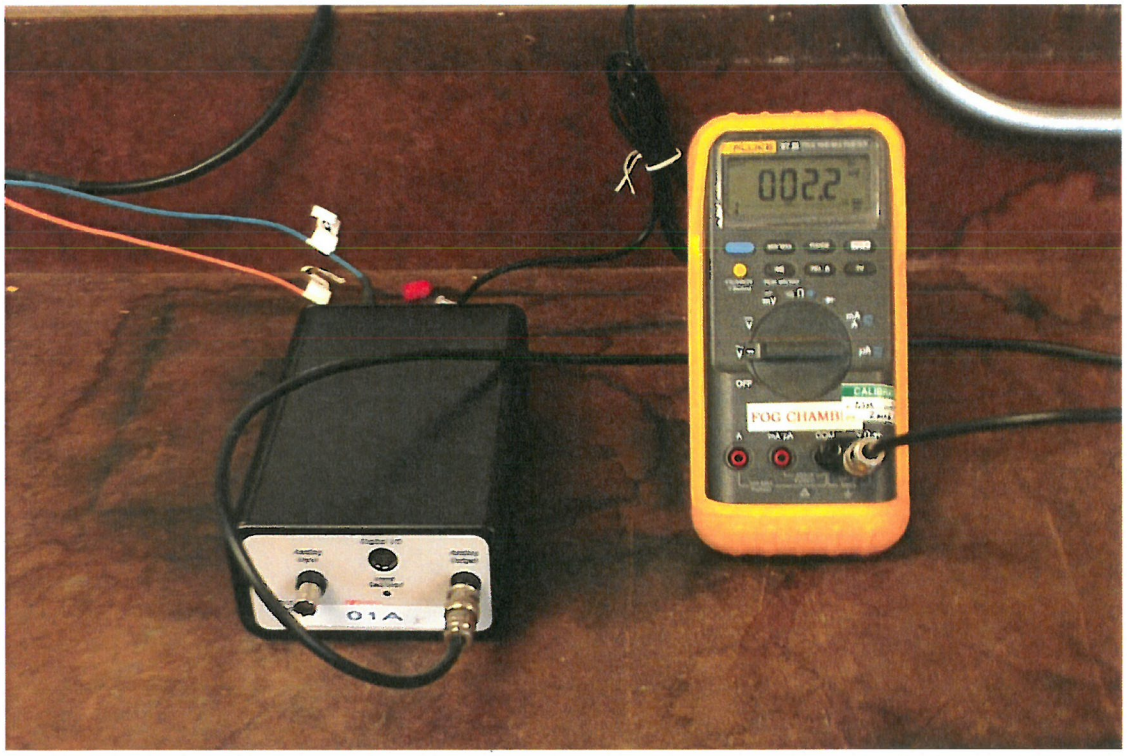

Figure 7 – Current Displayed on a Handheld Fluke Meter.

The voltage indication on the 460-kV transformer winding was not working so voltages were estimated based on the voltage regulator tap setting and the turns ratio of the transformer.

Infrared images were taken of the initial tests on the treated pole. The infrared image clearly shows the path of the current through the pole. Temperatures indicated in the image are approximate since the emissivity of the pole is not known.

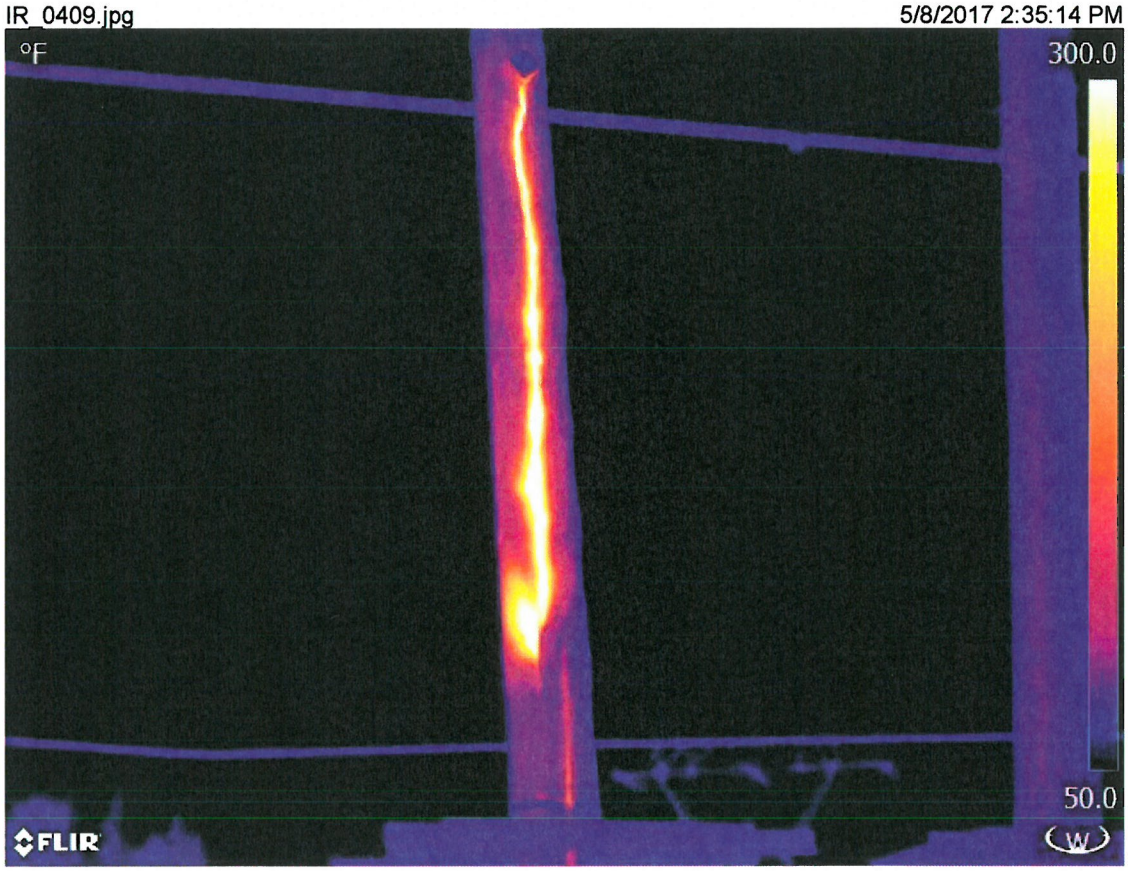

Figure 8 – Infrared Image of the Burning Pole

Results

Initially, it took nearly the full output of the transformer to get the poles to burn. Once burning, the pole would soon flash over and trip the transformer. However, once a carbon track was formed along the length of the pole the burning could be sustained at a much lower voltage. A current of around 100 mA was generally enough to cause visible burning (smoke and/or fire).

Both poles burned while the voltage was applied. The treated pole burned less vigorously and extinguished more quickly than the untreated pole.

Conclusions

While the treatment will not prevent electrically-caused pole fires, it may limit the damage to the structure in some cases.