Safety Advice 07-2006 (NZ)

June 2006 – Electric Shock While Tree Trimming

The background to this event was that a contractor work party of two arborists was sent in response to a fault to clear a twin phase pole mounted 11kV feeder line of vegetation that had fallen onto the line. This occurred on a 200 meter span between poles with wide spacing between the two circuits. The head of a dead pine tree had fallen out onto the line and some "hang" branches were still on the line. The objective was to remove these branches from the 11kV line whilst it remained in service, using insulated tool procedures. This work required an approved close work procedure in terms of the current Code of Practice for …. Tree Work Part 2.

The work party conducted a tailgate briefing at the work site and chose a work procedure for trimming of trees outside the minimum approach distance in the vicinity of distribution lines, utilising elevating work platform method.

The first branch was successfully removed utilising insulated tools from the elevating work platform. A second branch had slid down the line and was unable to be reached from the elevating work platform. A team member attempted to remove this hung branch utilising an insulated tool from a position on the ground. He had inserted about four insulated extensions on the tool to reach the hung branch. The attachment on the top of the insulated extensions was an insulated lopper (Chance tool C403-1612) actuated by polypropylene rope. The team member could not roll the branch off with this tool, so attempted to slide the branch back up the line. He could not get good purchase on the branch so attempted to close the blades of the lopper, using the actuating rope, to grip the branch. It was at this point he "felt uncomfortable" and let go of the rope. He was not sure of what he had just experienced, so gripped the actuating rope again. He again received an electric shock. The team member ceased this task and reported his experience to the team leader. Both team members then continued with the work task moving the branch back up the line whilst avoiding contact with the rope. The branch was then successfully removed from the line from the elevating work platform.

The team member was subsequently medically checked and cleared and appropriate notifications were made.

Investigation

Inquiries indicated that the required tests for the stick set were current, but that the testing organisation tests did not cover the insulated tool actuating rope component. Post-incident, the tool actuating rope was meggered as presented straight from the kit. The rope had a strong smell of pine sap. A 5kV megger gave a result of 500 Gig ohm. The rope was then saturated with water. The test was now around 4 megohm. At 6350 volts to earth, a leakage current of around 1.5 ma would have flowed when connected from line to earth -enough to cause an electric shock but of small enough current so the insulated tool actuating rope could be let go.

The Approved Code of Practice for Safety and Health in Tree Work Part 2: Maintenance of Trees Around Power Lines defines a competent worker. Section 3.1 & 3.2 define this further.

Section 3.5 sets out requirements for additional training for close working and ongoing competency. Section 8.3.2 part (i) states "where any part of a tree is making contact with or resting on live power lines, **work must immediately stop** and either:

- The network operator contacted so the work can be carried out with the line de-energised; or
- Arrangements are made to have the work carried out in accordance with the requirements of section 9 of this code.

Section 9 deals with work methods in the close working zone. Section 9.1 work manual states Appendix 2 "Close Working Standards" shall be complied with. Section 9.2.2 requires a description of each tool, its functions and uses.

Appendix 2 Section 2.1 General; requires a person suitably experienced and qualified in live line work shall be satisfied that:

- All equipment is suitable for close work and is safe to use by any worker.
- The equipment meets the appropriate standard listed in Section 2.2.2.

Observations

- The procedure identified by the tail gate for the branch removal was the incorrect procedure. (A procedure for removal of vegetation touching a live line was not submitted). The actions of the team member were also not covered by the procedure identified by the tail gate and no procedure was evident for clearing vegetation from the ground via insulated tools.
- Both team members believed that the insulated lopper rope, being part of the insulated tool subject to the equipment testing regime, had been tested and was suitable for this use.
- There appears no description of each tool and its use as required by Section 9.2.2 submitted.
- Being arborists, the team members were not competent to assess the tensions on the electric lines and their associated load bearing capabilities for the actual procedure carried out. The action of attempting to slide a branch back up the line could have cause failure of the conductor and put the team member working from the ground at further risk from failed conductors and falling debris.

Recommendations

Recipients of this advice are advised to review work and equipment controls to ensure that potential causes of similar events are identified and managed:

- Selection and observance of correct procedures for the required task and that employees understand the scope and limitations of these;
- Employees understand the correct description of each tool and limitations on use, particularly in terms of electrical insulation properties and suitability for use in dealing with trees in contact with live lines. Use of incorrect tools also involves greater risk of electrical harm especially where access is through layers of other in-service pole-mounted circuits;
- Ensure testing organisations test all tool components required by appropriate standards and manufacturer's instructions; and

- Where hung branches can not be removed safely using approved close work procedures, liaise with the asset owner regarding alternatives to carry out the work. The asset owner may require the work to be done under access permit or by using qualified persons to carry out approved live line procedures to achieve the objectives.

It is noteworthy that the new (draft) edition Approved Code of Practice for Safety and Health in Tree Work Part Two: Maintenance of Trees Around Overhead Electric Lines" includes provisions that deal with issues identified in this event.

Fig 1: Chance insulated lopper