



Department of **Consumer
and Employment Protection**
Government of **Western Australia**

Energy Safety

ELECTRICAL INCIDENT REPORT

**INVESTIGATION OF WILDFIRE
ON 14 DECEMBER 2004
AT LOT 2 LOCATION 1039
MOONUP ROAD
ESPERANCE WESTERN AUSTRALIA**

25 May 2005

2004-1405

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1 INTRODUCTION

A wildfire occurred at Lot 2 Location 1039, Moonup Road about 40km west of Esperance on Tuesday 14 December 2004. It was reported by Western Power Corporation (WPC) that the cause of the fire might have electrical origins.

As a result an investigation was carried out by Energy Safety, the technical and safety regulator for the electricity industry in WA. This report summarises the findings.

The cooperation and assistance of officers of WPC is acknowledged.

1.1 Location of Incident

Lot 2 Location 1039, Moonup Road about 40km west of Esperance.

1.2 Time and Date of Occurrence

Approximately 1530 hrs on Tuesday 14 December 2004.

1.3 Notification of Incident

An Officer of WPC notified the Energy Safety Division of the incident on the afternoon of Tuesday 14 December 2004.

1.4 Investigating Inspector

The investigation was carried out by Mr Gary Scott, Senior Electrical Inspector, Energy Safety Division designated Inspector (Electricity).

Mr Scott visited the site on 14 and 16 December 2004.

2 SUMMARY

Energy Safety investigated the cause of the fire at Lot 2 Location 1039, Moonup Road about 40km west of Esperance and concluded that:

- On the 14 December 2004 a sheep came in contact with a 19.1 kV phase conductor, at or near ground level, resulting in the electrocution (death) of the sheep. The heat generated from the current flow through the sheep ignited the dry harvested stubble commencing the wildfire [Photographs, Appendix A].
- It is considered that the 19.1 kV wood pole (D318/35/10/8) failed (broke and fell over) on the Thursday 2 December 2004 due to strong winds recorded in the western Esperance region on that day. Only light wind speeds have been recorded since 2 December 2004 up until the 14 December 2004.
- The pole failure did not cause the activation of WPCs high voltage powerline protection devices as the pole was lying near the ground with the 'live' insulator and conductor suspended just above the ground.
- It is considered this pole remained in this condition for twelve days until the sheep contacted the live conductor.
- Pole D318/35/10/8 failed because the structural strength of the pole had deteriorated to a level where the pole was no longer able to perform its normal duties.
- Pole D318/35/10/8 should have withstood the expected wind load.

3 ORIGIN OF THE WILDFIRE

No witnesses who claim to have seen the actual start of the ground fire have come forward. The first person to notice the fire was the property owner's neighbour who contacted the property owner.

The origin of the fire was approximately 11 metres in a northerly direction from pole D318/35/10/8 where a sheep came into contact with the high voltage 19.1 kV phase conductor. Pole D318/35/10/8 is located in secluded gully area of the property, which is not visible from the closest access road. There was also a considerable amount of back burn due to the length of the paddock stubble and moderate winds at the time of the fire [Photographs, Appendix A].

The property owner estimates that an area of approximately 5 acres was burnt. It was evident that the fire burnt in a south/westerly direction away from the fallen WPC pole and the dead sheep. This is consistent with the fire being driven away from the suspected point of ignition, by the wind coming from a northeasterly direction, as was the case at the time of the fire.

In summary, it was concluded that the fire was ignited when a sheep came into contact with a 19.1 kV phase conductor connected to a failed WPC wood pole (D315/35/10/8) that was lying in a slightly elevated position in a north westerly direction [Photographs, Appendix A].

4 INVESTIGATION

The property owner stated that the fire started at approximately 1530 hrs on Tuesday 14 December 2004 after a neighbour had contacted him, reporting the fire.

4.1 WPC's Equipment

The WPC powerline was constructed as follows:

- Single phase 19.1 kV arrangement utilising a single active phase conductor (1 x 3/2.75 scgz) with an underslung steel running earth conductor (1 x 3/2.75 scgz);
- The spans either side of pole D318/35/10/8 were, 150m to the east (pole D318/35/10/9) and 150m to the west (pole D318/35/10/7);
- The feeder supplying this system is called the Dalyup Feeder, which is electrically protected by a recloser (D318/1). The recloser incorporates an auto reclose facility and a trip counter, which does not record any other information except for the number of operations;
- The height of the pole was estimated at 9.5m from the ground level; and
- The measurement from the phase conductor to the underslung running earth conductor was 1.5m.

4.2 Examination and Findings

The following facts were determined from information provided by the property owner, WPC Esperance depot staff and on site inspection:

- At 17.00 hrs on Tuesday 14 December 2004 the WPC pole (D318/35/10/8) was found lying on the ground in north/westerly direction with the insulator end approximately one metre above the ground. The phase and earth conductors were both attached to the insulators and still fixed to pole D318/35/10/8. The pole was lying in the direction of a dead sheep and the base of the pole was on fire [Photographs, Appendix A].
- WPC Distribution Systems Officer stated at the interview that pole D318/35/10/8 was last inspected on the 24 April 2004 by a WPC wood pole inspection contractor. WPC records indicate that pole D318/35/10/8 was installed on 1 January 1970.
- The broken pole end and stump from pole D318/325/10/8 was entirely burnt out. Therefore a cross section (sample) of the pole, just under the running earth insulator was removed for scientific testing by the Forest Products Commission.
- The associated WPC wood pole contractor has since advised Energy Safety that the inspector identified on the inspection record may not have been the actual inspector who carried out the inspection. This was due to delays in WPC issuing new inspector authorisation identification (ID) numbers (2-3 months delay) following inspector training. Therefore, a new inspector would utilise another inspectors ID for this period, as WPC's records could not be updated without an inspectors ID. Therefore, there has to be some doubt about the accuracy of WPC's records.
- The next pole east of the replaced pole (D318/35/10/9) appeared to be in a unsafe condition (where it enters the ground) and showed signs of a fracture just below the top of the reinforcing columns. Energy Safety's Senior Electrical Inspector, Gary

Scott, requested that WPC replace the pole. WPC replaced this pole on Thursday 16 December 2004.

- The third pole west of the replaced pole (D318/35/10/8) appeared to be in poor condition (where it enters the ground).
- Pole D318/35/10/8 and the majority of the surrounding poles were not reinforced (i.e. no RSJ columns/steels fitted).
- The Dalyup Feeder Circuit Breaker (EHR612.0) did not record any over current operations on the 14 December 2004. Also the recloser (D318/1) with auto reclose facility incorporates a trip counter but does not record any information except for the number of operations. It is therefore not possible to determine if the recloser operated and reclosed between the 2 and 14 December 2004.

4.3 Weather Conditions

The Bureau of Meteorology provided the following weather information for 2 December 2004 regarding the Esperance region:

“The region was subject to a strong wind warning, NE/N’ly winds 40/60 kmph ahead of a 40/60 kmph southerly change. Squalls to 80kmh with change”.

The Bureau of Meteorology provided the following weather information from Cheadunup weather station (near Munglinup), for 14 December 2004 at 15.00 hours.

Northeasterly wind at 20.4 kmph
Wind gusts at 38.9 kmph
Relative Humidity 17%
Ambient air temperature 34.7°C

4.4 Other Recent Pole failures

Information received on other pole failures in the western Esperance region, that were related to the high winds on the 2 December 2004, were as follows:

- Four (4) other poles on the Dalyup Feeder, west of Esperance failed (i.e. fell over) on 2 December 2004 during or following the strong winds. A wildfire was the result of these pole failures. The pole No’s were: D577/4 east, D595/8 south, D99/12/6 & D250/16/5. The poles were not reinforced. These pole failures are subject to separate investigation and report.
- WPC’s Distribution Systems Officer stated at interview that three (3) other poles, west of Esperance failed (i.e. fell over) on 2 December 2004. These pole failures did not result in a fire. The area at the time was subject to strong wind conditions. The pole No’s were: GS499/179/97 (Lort River), D888/98/8 (Melaleuca Rd, Munglinup) & D667 (South Coast Highway, Coomalbidgup).

4.5 Independent Scientific Inspection Results

Scientific inspection of the pole butt (above and below ground samples adjacent to the break) was not obtainable due to fire damage. Therefore, a sample of the pole was taken from underneath the earthing conductor insulator for scientific inspection by the Forest Products Commission. The Forest Products Commission found:

4.5.1 Pole (D318/35/10/8) cross section, under the running earth insulator

There was white rot developing in the sapwood, but overall the heartwood was in very good condition.

Consistent with the other pole failures in this region it was considered that the cause of the pole failure was the increasing brittleness of the wood with increasing age and years in service. Jarrah is rated in Australian Standard AS5604-2003 'Timber – Natural durability ratings' as CSIRO Durability Class 2, i.e. the outer heartwood should give 15 to 25 years service in ground.

4.6 Analysis

It is prudent to assume that WPC's overhead powerlines would have been designed to ESAA C(b)1 "Guidelines for the design and maintenance of overhead distribution and transmission lines" {referred to as "ESAA C(b)1"} or equivalent or higher standard, considering that ESAA C(b)1 has been the accepted standard for overhead powerline design in the Electricity Supply Industry for many years.

The guidelines specified design factors of safety (FOS) for supports such as poles, considering wind loads and other types of loads. It can be expected that with the deterioration of a pole with age, the FOS would gradually reduce. However, it is expected that WPC's pole inspection and maintenance system would identify and initiate action when the FOS of a pole is less than 2.0. This is because poles with a FOS of less than 1.5 are considered to be unsafe and must be replaced or reinforced such that the FOS is greater than 2.0.

The reported wind speeds on the afternoon of 2 December 2004 – northerly winds at 40km/h with gusts to 72km/h – are substantially less than the design wind speeds specified in the ESAA C(b)1. The wind loads specified in the different versions of ESAA C(b)1 1964 to 1991 to be accommodated in the wood pole design have not changed substantially over the past 35 years and these have been calculated based on a maximum wind speed of 146km/hr.

5 CONCLUSIONS

There are a number of factors that occurred on the day of the wildfire that need to be considered. These are summarised below:

- No witnesses, who claim to have seen the actual start of the wildfire, have come forward. However, the property owner was contacted by a neighbour and informed that there was a fire on his property.
- WPC pole D318/35/10/8 failed and fell over on Thursday 2 December when the area experienced strong winds.
- The wildfire was caused by a sheep coming into contact with the 19/1 kV aerial phase conductor as WPC wood pole D318/35/10/8 had failed, fallen over, and the phase conductor was about one metre from the ground.
- Moderate winds from the northeast caused the wildfire to spread over an area of approximately 5 acres until local fire volunteers brought it under control.
- The majority of the poles in the immediate area of WPC pole D318/35/10/8 were reinforced at ground level (i.e. RSJ columns – steels fitted).
- WPC's pole inspection records cannot be relied upon to identify the inspector who inspected the poles and hence the data in the pole inspection report cannot be verified with that inspector.
- Scientific testing of the pole sample stump and pole end could not be carried out due to the destruction of these parts of the pole by fire.
- Four other WPC poles failed (fell over) during the same period and in the area of this fire, which has been attributed to brittleness due to age.
- Pole (D318/35/10/8) is believed to have failed because the structural strength of the pole had deteriorated to a level where the pole was no longer able to perform its normal duties.
- Pole (D318/35/10/8) should have withstood the recorded wind loads.

6 RECOMMENDATIONS

This investigation has identified that the WPC wood pole D318/35/10/8 failed along with a number of other WPC wood poles in the area around the same period. As the mode of failure is similar in all cases (although the detail of the other cases is not covered in this report), it raises real concern about the structural adequacy of wood poles erected on or before 1985 in WPC's rural power system.

Energy Safety is currently conducting a compliance audit of WPC's wood pole management system to assess compliance with the *Electricity (Supply Standards and System Safety) Regulations 2001*. A copy of this report will be provided to the compliance auditors.

It is recommended that Western Power Corporation:

1. Changes its wood pole inspection practices and procedures to ensure that the inspector who conducted the pole inspection can be clearly and positively identified;
2. Inspects all the poles in the rural area to the west of Esperance that were erected in 1985 or earlier to determine the remaining structural strength and factor of safety (FOS) of those poles;
3. Reinforces or replaces all poles that do not have a residual FOS of 2.0 in respect of the loads specified in ESAA C(b)1; and
4. Prepares a plan and program to manage this work.

Energy Safety will be reviewing Western Powers actions and will ultimately decide whether or not it is necessary to issue an Order to ensure this work is completed to appropriate Standards and timeframe.

APPENDIX A - PHOTOGRAPHS

Photograph Showing WPC Wood Pole D318/35/10/8 and the Deed Sheep



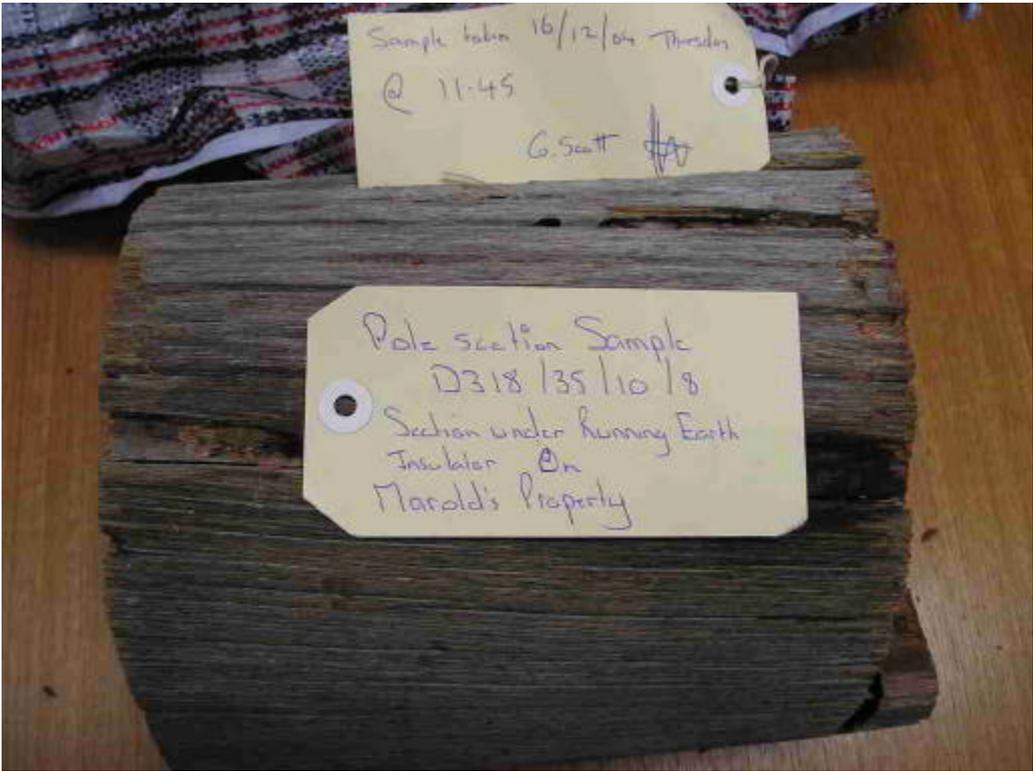
Photograph of the Deed Sheep



Photograph Showing the New Replacement Steel Pole (D318/35/10/8)



Photograph of the Sample Taken from Pole D318/35/10/8



Photograph of the Pole D318/35/10/8 Showing where the Sample was Taken

