11kV SWER Fatal Line Incident – Supplementary Advice

This supplementary information to the May 2012 EEA Safety Advice 09-2012 concerns Coroner's findings and also re-design of the SWER pole-top type insulator bracket. This supplementary advice is shared courtesy of MainPower New Zealand Limited for the purpose of supporting non-recurrence of similar incidents elsewhere.

The Coroner's Certificate of Findings is enclosed as part of this Advice, and the design drawings are separate downloads at the EEA web location for EEA Safety Advice 09-2012(b). Regarding the Findings, it is noteworthy that the Coroner's findings endorsed the recommendations made by MainPower and the then Department of Labour.

++++++++++++++++++++

CERTIFICATE OF FINDINGS

Section 94, Coroners Act 2006

IN THE MATTER of **Brendon Edward WALKER**

The Secretary, Ministry of Justice, Wellington

As the Coroner conducting the inquiry into the death of the deceased, I have decided pursuant to section 80(b) of the Coroners Act 2006, not to hold an inquest because I consider all the relevant facts are able to be determined without so holding one and there is no inconsistency or differences in people's written version of events and no issues of credibility. I consider an inquest is unlikely to produce information that has not already been disclosed.

I have also complied with the requirements of section 77 of the Coroners Act 2006, and have received no notification from any person of an intention to give evidence in person.

After considering all the evidence admitted to date for the purposes of my inquiry, and in the light of the purposes stated in section 57 of the Coroners Act 2006, I make the following findings:

Full Name of deceased:	Brendon Edward WALKER
Late of:	Quail Downs Farm 3429 Inland Kaikoura Road Stag and Spey Hurunui District
Occupation:	Farm Manager
Sex:	Male
Date of Birth:	17 June 1972
Place of Death:	Quail Downs Farm 3429 Inland Kaikoura Road Stag and Spey Hurunui District
Date of Death:	28 January 2012
Cause(s) of Death	
(a). Direct cause:	Electrocution
(b). Antecedent cause (if known):	Accidental contact with 11kV power lines on a farm
(c). Underlying condition (if known):	
(d). Other significant conditions contributing to death, but not related to disease or condition causing it (if known):	Left ventricular hypertrophy –hypertensive heart disease.
Manner of death	Accidental workplace mishap

In the following circumstances:

1. A year ago today, at about 10.21am on Saturday 28 January 2012, emergency services were called to Quail Downs Farm at 3429 Inland Kaikoura Road. Mr Brendon Edward Walker, the Farm Manager, had been found by his wife and 7 year old son Ethan, apparently electrocuted by a collapsed power line in a paddock on his farm. His wife, trying to help him had also received an electric shock and was injured. Their son, Ethan aged 7 had gone back on his own to the farmhouse for help and his sister aged Alana, aged 9, telephoned emergency services. Mrs Walker was transported by helicopter to hospital and treated for burn injuries and Mr Walker was pronounced deceased.

2. A post-mortem examination showed the cause of Mr Walker's death was electrocution, which would have been immediately fatal.

ISSUES

3. The questions before me are

   - How was Mr Walker electrocuted?
   - Why was he electrocuted?
     - Why did the power line collapse?
     - Why did he not see it and avoid it?
   - Can anything be done to prevent this happening to anyone else in a similar situation?
     - What has MainPower done?
     - What has DOL done?
     - Are there any recommendations the Coroner can make?

4. In looking for answers to these questions I have received evidence from Dr Martin Sage, Forensic Pathologist, who made a post mortem examination; Jacob Haronga, Senior Policy Advisor Federated Farmers of New Zealand, the New Zealand Police who carried out inquiries on my behalf, statements from Mr Walker's neighbours; a report from MainPower New Zealand Limited which owns the electricity network distribution system; a statement from Mark Hennessey, inspector and faultman at MainPower; the Health and Safety Inspector who carried out an investigation for the Department of Labour and the report of that investigation and the evidence it had available to it.

5. The Department of Labour (DOL) carried out an investigation because the farm was a place of work and Mr Walker was Farm Manager there. DOL is obliged to do this to find out if the requirements of the Health and Safety in Employment Act 1992 were met. They were. DOL did not find any breach of the requirements of this Act.

6. In carrying out its investigation DOL sought information from various people and organisations including other NZ electricity networks companies operating similar systems to MainPower and from the Electricity Engineers Association NZ. I have read the DOL report of its investigation and its recommendations and I have read the report of MainPower's Incident Investigation including a Root Cause Analysis (RCA) and the recommendations that came out of that RCA and how they are being implemented.

How was Mr Walker electrocuted?

7. The evidence shows that at about 8am that morning Mr Walker had gone on his four wheel motorcycle (quad bike) to check the cows because he had heard them mooing earlier. Sometime after 10am his wife and son went to the letterbox to check the mail and saw his quad bike in the paddock and went to see what he was doing. They found him lying off his motorcycle under a live power line which had fallen of its pole. Next to him were three dead cows.

Why was Mr Walker electrocuted?

8. The DOL report shows that the live overhead power line had collapsed and was hanging at 1.2-1.5 metres above the ground and that it is likely Mr Walker did not see it.

9. MainPower's Root Cause Analysis looked at what caused the overhead power line to collapse and made some recommendations and is in the process of implementing these.

10. DOL looked at why Mr Walker did not see the collapsed power line and made some recommendations.

11. Before setting out these findings and recommendations, I find it useful to explain the electrical distribution system that supplies electricity to the farm.

12. For electrical current to flow, a circuit must have a power source with a supply current and a return current in a circular fashion. In a conventional electrical distribution system there is more than one conductor. The supply current is via a 'live" conductor and the return current via a neutral conductor.

13. In New Zealand there is a widespread and common rural electrification system. It is different to the conventional system. The supply current is via a High Voltage SWER (-single wire, earth-return) overhead power line, which is a single "live" conductor. Return current is via a pathway in the mass of the earth. The SWER line, being only a single conductor, is less visible if it collapses, than that of a two or three line system.

14. The line that electrocuted Mr Walker was a SWER line.

What caused the power line to collapse?

15. MainPower's RCA uncovered the causes for the collapse of the power line. These are:

16. The SWER line was held aloft by a series of treated wooden pine poles. These poles are flammable. Attached on top of these poles are insulator brackets (either single or double pole top ones) to prevent the electrical current running down the pole to earth.

17. The line had become detached from one of the poles, between two adjacent 80 metre spans over an undulating hill incline, so it hung down low.

18. It became detached because the insulator bracket (together with mounting bolts, insulators and the wire) separated from the pole.

19. This was due to a pole top fire.

20. The pole top fire was caused by arcing, which ignited the pole. The arcing happened when a bird contacted between the line and the treated pine pole. (The dead bird with burn marks was found near the base of the pole.)

21. This was able to happen because the clearance between the line and the nearest uninsulated part of the pole or attachment was able to be bridged by the bird.

22. MainPower found that two months previously a pole top fire on a nearby farm on the same Inland Kaikoura Road was caused in the same way.

23. In both fires, the pine poles had been treated by the same substance[1], had the same hardware and therefore similar clearance between the live wire and the uninsulated part of the flammable pole.

24. MainPower found that since 1996 there have been eight pole top fires on its SWER lines (including this one). Of these two were attributed to a bird contacting between the line and the pole.

25. The incidence of pole fires (from all causes) on SWER lines is over 5 times the average for conventional system lines.

26. DOL contacted three other line distribution companies which use the same SWER system as MainPower. It found that all SWER line pole fires have occurred on CCA treated pine poles. (Concrete poles are not susceptible to fire and hardwood or larchwood pole fires are rare).

27. SWER lines are generally used in remote rural areas where use of pinewood poles is practical.

28. One of the other companies contacted by DOL supplied information which showed that between 1 January 2003 and 30 December 2011, fourteen pole top fires were recorded and of these, four were on a SWER distribution system and one of these was attributed to a bird.

Why did Mr Walker not see and avoid the collapsed power line?

29. Mr Walker rode into the collapsed power line and he or his motorcycle contacted the Earth and wire at the same time, thus the electrical current ran from the line, through him and down to earth. DOL's conclusion is that the cows were electrocuted before Mr Walker, as evidenced from their bloating. It is likely Mr Walker did not see the power line, being focussed on them and also because, as DOL stated in its report, *"the single conductor of a SWER is reasonably inconspicuous."*

Can anything be done to prevent this happening to anyone else in a similar situation?

What has MainPower done?

30. To prevent bird induced pole fires from occurring, MainPower commissioned a redesign of the pole top insulator bracket. This has now been completed and 300 new brackets have been made. They increase the clearance from live parts to the nearest uninsulated part of the pole or attachment that could be bridged by a bird. The clearance distance has been increased from approximately 250mm in the previous design to 505mm in the redesign.

[1] A salted chromate copper arsenate (CCA).

31. 283 of these redesigned pole top insulators have been installed on the Inland Kaikoura Road SWER line.

32. Surveys of other parts of the MainPower SWER line systems and similar upgrades are being implemented.

33. All landowners of MainPower SWER line areas have been advised in writing of general safety awareness of overhead power lines.

34. A safety bulletin has been issues summarising this incident and the outcome and a copy has been sent to the Electrical Engineers Association for distribution to it members.

35. MainPower's public safety notifications of general safety awareness of overhead power lines have been enhanced.

What has DOL done?

36. DOL made a recommendation in its report about SWER line visibility.[2] It stated that

> *The single conductor of a SWER is reasonably inconspicuous and could be mistaken for e.g. a telecommunications line. Furthermore in the event of line collapse the single conductor of a SWER system is less visible that from a two or three line system.*

37. It recommended "*Some form of visible identification to highlight the use of SWER power lines may help to raise public awareness...*"

38. DOL also recommended it will prepare an industry alert highlighting the hazards of SWER installations, and the minimum public approach distance for an 11000 Volt line being 4 metres. It will distribute this to the New Zealand Electricity Networks and recommend to them to use their internal data bases to promulgate this alert to SWER-dependent landowners.

Are there any recommendations the Coroner can make?

39. No. However, I endorse the recommendations and actions of MainPower and DOL.

40. In relation to DOL's recommendation to have some form of visible identification to highlight the use of SWER power lines, Jacob Haronga, Senior Policy Advisor Federated Farmers of New Zealand, considered the DOL recommendation would not be practical and use of flags, banner, painted poles etc would not be likely to achieve the intended outcome.

41. He considered that farmers are well aware of where the lines are on their property, and that in this case, not seeing the line was most likely due to being distracted by the dead cows rather than because the line was reasonably inconspicuous. To put flags, banners etc on the lines would make them heavy and it would have to be done by the lines companies, because they own the lines. This would involve a cost which would then have to be recovered through increased prices.

42. I have carefully considered DOL's recommendation and while I can see the merit in it, I do not make it a Coroner's recommendation in this inquiry, under section 57(3).

---

[2] DOL stated this is a recommendation only, not a requirement under the Health and Safety in Employment Act 1992

COMMENTS

In summary I find that

43. Mr Walker died of electrocution from contact with a collapsed live SWER line. He did not see the line because once collapsed, SWER lines are reasonably inconspicuous and Mr Walker was distracted by his dead cows.

44. The line collapsed because of a pole fire caused by a bird that bridged the live line and the nearest uninsulated part of the insulator bracket or the pole.

45. MainPower has since redesigned and installed new pole top insulators on the Inland Kaikoura Road SWER lines so that the clearance between the line and the nearest uninsulated part is too wide to be bridged a bird.

46. Surveys of other parts of the MainPower SWER line systems and similar upgrades are being implemented.

47. I endorse this action by MainPower and the education actions undertaken by both MainPower and DOL. I consider they will assist to reduce the chance of the occurrence of other deaths in circumstances similar to those in which Mr Walker died.

CONCLUSION

I offer my sympathy for their loss to Mr Walker's family. I take this opportunity to commend the bravery and quick thinking of Ethan Walker, aged 7, who after coming across his deceased father and seeing his mother get an electric shock, and not knowing whether she might also be dead, quickly went to get help. His prompt action and that of his sister Alana aged 9, in telephoning emergency services, meant his mother could be rescued and treated promptly. It also meant that the live line could be swiftly isolated and earthed by Mark Hennessey of MainPower, thus preventing further injuries or deaths to other people and stock.

This matter is now concluded.

Signed by the Coroner at Christchurch this 28th day of January 2013

Coroner S.P. Johnson