

DETERMINATION

Of

Sheriff W A Gilchrist

Fatal Accidents and Sudden Deaths Inquiry (Scotland) Act 1976

The Sheriffdom of Tayside Central and Fife at Stirling

Fatal Accident Inquiry

Into the death of

Basilio Antonio Brazao

Introduction

About 5 pm on 22 May 2007 Brasilio Brazao fell from the top of Turbine 9 at Earlsburn Wind Farm, Stirlingshire. As a result of his fall he sustained multiple injuries from which he died. At the time of his fall, Mr Brazao was wearing a harness which was attached to a HACA fall arrest system. The fall arrest system consisted of a galvanised steel safety rail bolted onto the rungs of a vertical ladder within turbine 9. A slider was attached to the rail and the slider was then attached to the harness worn by Mr Brazao. Much of the evidence led at the fatal accident inquiry examined the possible reasons why the fall arrest system failed to arrest Mr Brazao's fall. The HACA fall arrest system complied with the requirements of European Standard EN353-1:2002. There was no suggestion that the manufacturer, HACA, had not designed the system to meet the requirements of EN353-1:2002. There was also no suggestion of any mechanical problem with the HACA slider.

However, there was evidence to the effect that the testing required by EN353-1:2002 was deficient because it did not test for foreseeable fall scenarios, including, in particular, a fall-back test. The Inquiry was informed that the European Commission subsequently removed the presumption of conformity which allowed manufacturers to rely on compliance with EN353-1:2002 to demonstrate compliance with health and safety standards. Shortly before the Inquiry began, a revised EN353-1 was approved by member states of the European Union and the Inquiry was informed that this new standard was due to come into force in September 2014. That revised standard includes a requirement to undertake a fall-back test.

It was accepted by all parties represented at the Inquiry that had a lift been fitted in turbine 9 for use by Mr Brazao and others, then the presence of a lift would have been a reasonable precaution whereby the accident resulting in the death of Mr Brazao might have been avoided. The company responsible for the construction of the wind farm was ultimately prosecuted for breaches of Sections 2 & 3 of the Health & Safety at Work etc Act 1974. The charges related to the absence of a lift although it was accepted that the offences were not causally connected to Mr Brazao's death.

In addition to the Crown, the following parties were represented at the Fatal Accident Inquiry: The Health & Safety Executive, Falck Renewables Wind Farm Plc (the client who commissioned the building of the wind farm), Nordex UK Ltd (the main contractor responsible for construction of the wind farm), Dekra Exam GmbH (the body responsible for testing the HACA fall arrest device) and HACA Leitern GmbH (the manufacturers of the fall arrest device). The deceased's employers, Turbine Erection and Cabling Services Ltd were not represented. Mr Brazao's next-of-kin were not parties to the Inquiry although members of his family were present throughout proceedings.

The Inquiry heard evidence over 7 days from 23 June to 3 July 2014. The Inquiry visited turbine 9 on 24 June. The following witnesses gave evidence:

1. Edward Goldie, Central Scotland Police.
2. Neil Paterson (RJ McLeod, Contractors – working on site at the time of the accident).
3. Michael Bonnar (MK Leslie – working on site at time of accident).
4. Douglas Banks (Nordex).
5. Hugh McNally (Windhoist – subcontracted by Nordex to construct the wind turbines).
6. Gordon McAuley (Nordex).
7. Michael Murray (Nordex).
8. Louise Atkins (Health & Safety Laboratory).
9. Lynn Hunter (TUV NEL – carried out testing of fall arrest system).
10. Isabelle Martin (HSE).
11. Peter Dodd (HSE).
12. Peter Lennon (HSE).

None of the other parties led evidence but there were 3 joint minutes of agreed evidence.

Findings of Fact

1. The deceased was employed by TEC Services. This company was employed to carry out mechanical servicing of the wind turbines at Earlsburn Wind Farm. TEC Services started work at the wind farm about 4 weeks prior to 22 May 2007.

Most of the servicing required to be undertaken in an area at the top of the towers called a “nacelle”.

2. The wind turbines were approximately 70 metres in height. In order to get to the nacelle at the top of the tower, workers required to climb a vertical ladder inside the turbine. This extended from the floor of the tower to a top platform which was 59.74 metres from the floor.

3. The vertical ladder was fitted with a fall arrest system designed to prevent the climber from falling a distance likely to cause serious injury should he fall from the ladder.

4. A HACA fall arrest system had been fitted to the vertical ladder within turbine 9. The HACA fall arrest system consisted of a safety rail bolted onto the rungs of the ladder. A slider was attached to the rail. The slider was then attached to the harness worn by the climber. The slider travels freely up the rail when ascending the ladder, but brakes against the rail on the way down.

5. The slider comprised an alloy outer casing which housed a braking mechanism. The braking mechanism incorporated 2 profile brake cams which were connected to a brake lever by means of a sprung mechanism. When the sprung brake lever was in a down position the cams locked or “bit” onto the flanges of the vertical fall arrest rail fixed to the ladder. The brake lever was attached by means of a screw gate karabiner clip to a full body harness worn by the climber while both ascending and descending the ladder. Only when the brake lever was lifted upward by a slight backward movement of the climber would the slider release and be free to move up or down the vertical fall arrest rail.

6. The HACA slider being used by the deceased was supplied by Nordex. Nordex purchased the HACA slider in Germany.

7. On 22 May 2007 the deceased and 3 colleagues, Mr Bordacs, Mr J Brazao (deceased's uncle) and Mr Jardim began working inside the nacelle of turbine 9. Mr Bordacs left the nacelle during the afternoon. At about 5 pm Mr J Brazao descended the ladder and exited the turbine. He was followed by the deceased. Mr Jardim was last to leave and when he was closing the hatch of the nacelle he heard a scream and looked down the ladder shaft and saw the deceased falling to the floor of the turbine. Mr Bordacs was outside the turbine and heard a sliding noise that lasted about 4 seconds.

8. Mr Bordacs and Mr J Brazao entered the base of the turbine and saw the deceased at the bottom of the ladder. He was wearing his harness and was still connected to the slider. He was hanging in mid-air suspended from the slider. Mr Bordacs and Mr J Brazao removed the deceased from his HACA slider in order to place him on the floor of the turbine.

9. Mr Jardim had descended the ladder after the deceased had fallen. His HACA slider remained on the safety rail above the deceased's slider and both were subsequently recovered by the Health & Safety Executive for examination.

10. The deceased was connected to the HACA slider by way of his harness at the time of his fall.

11. The deceased fell approximately 57 metres. His head struck the left-hand stile of the ladder near to the third bottom rung of the ladder.

12. The safety rail attached to the ladder was removed for further examination. This showed bite marks which indicated that the slider had attempted to stop the deceased's fall on a number of occasions. These bite marks began at 57.72 metres above the turbine floor. This was 2.02 metres from the top platform. There were no significant bite marks below 40 metres. The brake cams on the deceased's slider were significantly worn. This was the result of the slider attempting to bite onto the safety rail. The HACA slider being used by the deceased had white powder on the

brake cams which resulted from the brake cams biting onto the galvanised rail. The wear to the brake cams was caused during the accident when the HACA slider tried to repeatedly bite onto the safety rail. Tests were carried out on the HACA fall arrest system at TUV/NEL, East Kilbride. TUV/NEL are an approved Notified Body for the testing of fall arrest equipment under Council Directive 89/686/EC. Tests were conducted on 26 July 2007 and on 28 and 29 August 2007. Three tests were instructed:

1. Test 1 – dynamic performance test in terms of BS EN353-1:2002. This test measures the braking force and arrest distance.
2. Test 2 – Anthropometric Dummy – fall back test. This test used a 71 kilogram dummy and measured the arrest distance. This was not a test required by EN353-1:2002.
3. Test 3 – Anthropometric Dummy – sit back test. This used a 71 kilogram dummy and measured the arrest distance. This was not a test that is required by EN353-1:2002.

The test results on 26 July 2007 were as follows:

1. Test 1. The device failed the test. The arrest distance was 0.25 metres and within the allowable maximum of 1 metre. The braking force was 9.23 kN, which exceeded the maximum allowable 6 kN.
2. Test 2. The 71 kilogram dummy fell a distance of 3.03 metres and the slider moved 2.43 metres on the rail.
3. Test 3. The 71 kilogram dummy fell to the floor in a head-first attitude with the dummy's spine facing the ladder.

The test results on 28/29 August 2007 were as follows:

1. Test 1. The device failed the test. The arrest distance was 0.14 metres and within the allowable maximum of 1 metre. The braking force was 6/63 kN, which exceeded the maximum allowable 6 kN.
 2. Test 2. The 71 kilogram dummy fell to the floor and landed on its knees.
 3. Test 3. The 71 kilogram dummy fell to the floor in a head-first attitude with the dummy's spine facing the ladder.
 4. Test 4. (The repeat of Test 3 with a different harness). The 71 kilogram dummy fell to the floor in a head-first attitude with the dummy's spine facing the ladder.
13. The German equivalent of the European Standard EN353-1:2002 is DIN EN353-1:2002. This imposes a requirement that the dynamic performance test apparatus must conform with Paragraph 5.6.1 of European Standard EN364:1992. Dekra tested the HACA slider and found it complied with the requirements of DIN EN353-1:202. The 6 kN maximum allowable breaking force had not been exceeded and the one metre maximum arrest distance had been achieved. When carrying out their dynamic tests, Decra utilised a 100 kilogram sandbag as opposed to a steel mass of the type used by TUV NEL.
14. EN353-1:2002 did not require the dynamic performance test to include a fall-back test.
15. The harness worn by the deceased at the time of the accident was manufactured in accordance with BS EN361:2002. This was a harness that was suitable for use with the HACA slider. The harness used in the testing at TUV/NEL complied with BS EN361:2002.
16. Following the accident a satchel worn by the deceased was found at the second platform of the turbine. The satchel had a fresh tear to the strap at the point

where it meets the bag. On examination, no fibres from the satchel were found within the HACA slider used by the deceased.

17. In 2003 the Health & Safety Executive commissioned research which identified concerns with BS EN353-1:2002 because of concerns that a climber falling backwards could interfere with a slider and lead to excessive fall distances. In June 2004 the HSE published 2 safety warnings. It was not possible to amend BS EN353-1:2002 (the UK equivalent of EN353-1:2002) but a National Annexe was added. This recommended that a fall-back test be applied to fall arrest devices.

18. Following the accident on 22 May 2007 the Health and Safety Executive issued a safety warning and lodged a Formal Product Safeguard Action to alert the European Commission to UK concerns with the HACA fall arrest system. A Formal Objection made by the UK was subsequently upheld by the European Commission which removed the presumption of conformity. The result of this action was that manufacturers of fall arrest equipment could no longer rely on compliance with EN353-1:2002 to demonstrate compliance with health & safety standards. A revised EN353-1 has been approved by member states and is due to come into force in September 2014. The revised EN353-1 includes *inter alia* testing with a rigid steel mass (rather than allowing an option to use a sandbag), a fall-back test, a sideways fall test and sideway leaning anchor test.

Determination

Section 6(1)(a) – where and when the death and the accident resulting in the death took place:

1. Basilio Antonio Brazao (born 21 December 1987) died at 17.00 hours on 22 May 2007 at Turbine 9 at the Earlsburn Wind Farm, near to the village of Fintry, Stirlingshire. The accident resulting in his death involved the deceased falling from

a ladder within turbine 9 while attached to a fall arrest device which failed to arrest his fall from the ladder.

Section 6(1)(b) – the causes of such death and the accident resulting in the death:

1. The cause of death was, 1(a) multiple injuries, (b) blunt force trauma and (c) fall from height (wind turbine, at work). The cause of the accident was Mr Brazao falling from the ladder for unknown reasons and the failure of the fall arrest slider to arrest his fall. The HACA slider failed to arrest the deceased's fall either because of the deceased's interaction with the ladder resulting in him applying a horizontal pressure away from the ladder when the HACA slider was trying to bite onto the safety rail or the brake cams may have been released from the safety rail as the deceased bounced backwards when the brake cams tried to bite onto the safety rail.

Section 6(1)(c) – the reasonable precautions, if any, whereby the death and the accident resulting in the death might have been avoided.

1. Had a lift been fitted in Turbine 9 at Earlsburn Wind Farm on 22 May 2007, had it been operational and available for use by Basilio Brazao and others, and had he used it, then the presence of a lift was a reasonable precaution whereby the death and any accident resulting in the death of Basilio Brazao might have been avoided.

2. Had the harmonised European standard which has now been adopted been in place when the HACA fall arrest device was tested it is likely that the device would not have been certified as being compliant with the requirements of the European standard. Accordingly, had the system then in place for the certification of fall arrest devices ensured that, in order to receive a certificate, the testing undertaken by a notified body demonstrated that such a device would arrest a user's fall in foreseeable scenarios, that would have been a reasonable precaution whereby the death and any accident resulting in the death of said Basilio Brazao might have been avoided.

Discussion

On 30 March 2012, Nordex UK Ltd pled guilty to a Section 76 Indictment at Stirling Sheriff Court in relation to breaches of Section 2 & 3 of the Health & Safety at Work etc Act 1974. On 15 June 2012 the company was fined £26,000. The 2 charges on the indictment referred to the failure on the part of Nordex to make a suitable and sufficient assessment of the risks to the health & safety of their employees in relation to the means of access to and egress from the wind turbines and a failure to provide and maintain systems of work that were safe in that they did not provide collective protective measures against falls from height, namely service lifts.

The pleas were tendered and accepted on the basis that the death of Basilio Brazao was not causally connected to the failures to which Nordex pled guilty. It was accepted by all parties to the Inquiry that the installation of a lift was a reasonable precaution whereby the death and accident resulting in the death might have been avoided. The Work at Height Regulations 2005 set out a hierarchy of control for managing the risks involved when working at height. This hierarchy requires consideration to be given to the avoidance of the risk and, where this is not reasonably practicable, to prevention of a fall and then to mitigation of the consequences of a fall. It was accepted that a collective protective measure to prevent a fall would include the provision of a lift. The fall arrest system is clearly not designed to prevent a fall but is there to mitigate the consequences of a fall.

Evidence led at the Inquiry indicated that when the turbines were delivered to the site at Earlsburn, 7 of the 15 turbines had been fitted with lifts. These lifts were subsequently removed prior to 22 May 2007. It would appear that the total cost of including lifts would be in the region of 1% of the contract price for the 15 turbines. Accordingly, I am satisfied that as the turbines were designed to be fitted with lifts, the installation of a lift in turbine 9 would have been a reasonable

precaution whereby the death and the accident resulting in the death might have been avoided.

I am satisfied that the other reasonable precaution whereby the accident might have been avoided would have been the use of a fall arrest system capable of arresting a fall in the event of a number of foreseeable fall scenarios including, in particular, a person falling applying a horizontal pressure by falling backwards. The tests carried out by TUV/NEL at East Kilbride clearly demonstrated that the testing required by EN353-1:2002 was deficient because it did not test for foreseeable fall scenarios, including, in particular, a fall-back. Dekra tested their HACA slider to the standards required by EN353-1:2002 but this testing was not designed to identify whether the device would arrest the fall within one metre in certain foreseeable fall scenarios.

The one area of contention at the Inquiry concerned the issue of whether the evidence was sufficient to allow the court to conclude on the balance of probabilities that the reason the device did not arrest the fall in Mr Brazao's case was that his fall involved one of these foreseeable fall scenarios and, in particular, involved either his falling backwards in the first instance or bouncing backwards when the brake cams tried to bite on the safety rail.

It is clear from the evidence that there was no damage or defect with the slider which would have prevented it from operating in the manner in which it was intended to operate. The slider was not defective in terms of its manufacture and was constructed of suitable material. Equally, it complied with the requirements of EN353-1:2002.

It is not known how Mr Brazao fell nor how he interacted with the ladder. It is possible that he initially fell feet first and then became entangled with the ladder as he fell and at some point turned upside down with his back facing the ladder. One of the tests conducted by TUV/NEL involved the dummy falling to the floor

head first with its back to the ladder. On post-mortem examination, Mr Brazao was found to have sustained significant blunt force trauma to his head. He also had abrasions to his left buttock and to the back of his left thigh. These injuries are consistent with his back coming into contact with the ladder. There is no evidence to suggest that Mr Brazao was not using the fall arrest equipment properly. At least one witness referred to a practice known as “ladder surfing” whereby climbers adopt a descent technique that allows them to descend more quickly than if simply climbing down the ladder in a normal manner. However, there was no evidence that Mr Brazao was engaging in such a practice or that he had ever done so on any other occasion. I was satisfied that Mr Brazao had received training on the safe use of the fall arrest system. Accordingly, it would be no more than speculation to suggest that he might have been using this technique to descend the ladder. In any event, even if that had been the case, there was no evidence before the Inquiry to explain why adopting such a descent technique would have prevented the slider from arresting his fall once he had lost control of his descent. It may be reasonable to assume that the fall arrest device was not designed to arrest a fall of someone descending quickly by way of ladder surfing. However, no evidence was led in support of that proposition.

The other possibility is that Mr Brazao’s bag could have snagged on or become tangled in the fall arrester causing it to fail to deploy. In her report, Mrs Atkins from the Health & Safety Laboratory said that “The failure of the strap is likely to have resulted from its snagging during the fall, but it is possible that it may have contributed to the failure of the device to arrest the fall.” In her evidence, Mrs Atkins added that while there was a bend in the strap consistent with the width of the device, she considered that had the strap in some way interacted with the lever of the device so as to prevent the brake from engaging, she would have expected to see a mark on the strap consistent with interaction with that narrower lever. No such marks were found. She also said that had the strap in some way become

entangled in the mechanism, she might have expected to have seen evidence of fabric within the device. No such fabric was found.

The Crown invited me to reject the possibility of any interaction of the satchel having interfered with the operation of the device so as to have prevented it from operating to arrest the fall. In the submissions for HACA, it was stated that there was no evidence from which the Court could hold it as having been proved, on a balance of probabilities, that the cause of the accident was the failure of the device to arrest Mr Brazao's fall. It was submitted that the Crown was inviting the Court to enter into speculation. It was submitted on behalf of HACA that it was perfectly plausible that Mr Brazao's satchel strap interfered with the operation of the equipment.

I am satisfied that the Crown's submissions are to be preferred. There was no evidence to indicate that the satchel had interfered with the operation of the equipment. More significantly, there was no evidence to explain how it might have interfered with the device. Accordingly, I am satisfied, on the balance of probabilities, that the damage to the strap of the satchel resulted from its snagging during the fall and that it did not interfere with the fall arrest system.

The speculation about "ladder surfing" and the possibility of the satchel having interfered with the device can be contrasted with the real and persuasive evidence based on the testing done by TUV/NEL that, in certain fall scenarios, the HACA device would not arrest the fall. Accordingly, I am satisfied on the balance of probabilities that Mr Brazao was using the fall arrest equipment properly and that, having fallen off the ladder, his fall was not arrested by the HACA device.

The Health & Safety Executive invited me to make findings under Section 6(1)(e) of the 1976 Act (any other facts which are relevant to the circumstances of the death). In particular, I was directed to the evidence about the poor management of the devices on site and the absence of instructions in English. However, I am

satisfied that there is no causal connection to the death flowing from these issues and I do not think it appropriate to make any finding in that regard.

Conclusion

It is not the function of this Inquiry to make a finding of fault or to apportion blame between any of the persons who might have contributed to the accident. Nordex have already been prosecuted for a failure to provide a safe system of work through the installation of lifts. To the extent that I have found that the fall arrest system in use by Mr Brazao was not capable of arresting his fall in certain fall scenarios, that does not result in my making a finding of fault on the part of the supplier of the fall arrest device. There was no defect in the manufacture of the HACA slider that would have prevented it from operating as it was intended to operate. The device had been tested by Dekra and had been certified as meeting all of the safety requirements of the relevant European Safety Standards, namely EN353-1:2002. The HACA device had been appropriately certified and HACA were entitled to rely on that certification.

It is clear that the European Standard EN353-1:2002 was deficient, but that deficiency has now been addressed by the issue of a revised standard. Neither the European Commission nor any of the technical bodies responsible for the issuing of the revised standard were represented at the Inquiry and therefore it would not be appropriate for this Inquiry to offer any comment on the length of time it took to address the concerns raised by the Health & Safety Executive before the accident and as far back as 2004.