SHERIFFDOM OF TAYSIDE CENTRAL AND FIFE AT STIRLING

[2018] FAI 1

B139/17

DETERMINATION

BY

SHERIFF W A GILCHRIST

UNDER THE INQUIRIES INTO FATAL ACCIDENTS AND SUDDEN DEATHS ETC (SCOTLAND) ACT 2016

into the death of

JOHN GRANT COUSIN

STIRLING, 5 January 2018

[1] The Sheriff, having considered the information presented at the Inquiry, Determines in terms of Section 26 of the Act that:-

> John Grant Cousin (DOB: 23 January 1954), resident in Hexham died on 28 April 2016. Life was pronounced extinct at 12.36 hours that date at Hawes Pier, Rosyth.

[2] In terms of Section 26(2)(a), death occurred on 28 April 2016 between approximately 11.30 hours and 12.36 hours that day. Death occurred on the north tower of the Queensferry Crossing or on the boat taking John Cousin from the north tower to Hawes Pier or on Hawes Pier, Rosyth.

[3] In terms of Section 26(2)(b), death resulted from an accident which occurred at about 11.30 hours on 28 April 2016 on the north tower of the Queensferry Crossing.

[4] In terms of Section 26(2)(c), the cause of death was: 1(a) Chest injury.

[5] In terms of Section 26(2)(d), the accident was caused by John Cousin removing a central pin which was holding a fly jib onto the boom arm of a MC805 Mini Crawler Crane (Giraf Track Crane) causing the fly jib to fall to the ground, striking John Cousin on the head and body.

[6] In terms of Section 26(2)(e), reasonable precautions which might reasonably have resulted in the accident resulting in the death being avoided would have been (1) not to remove the pivot pin holding the fly jib to the boom arm of the crane at a time when no other pin was securing the fly jib to the crane and (2) not to move the fly jib to gain access to a leaking hydraulic hose.

Recommendations

[7] In terms of Section 26(1)(b), it is recommended that consideration be given to imposing a requirement (or advising through guidance) that a warning label should be attached to the pivot pin on cranes such as the one involved in the present case advising operators not to remove the pin without first having confirmed that the fly jib is secured by another pin.

[8] This recommendation is addressed to the appropriate committee or sub-committee of the British Standards Institution with a view to determining whether it would be appropriate to amend the Code of Practice for the Safe Use of Cranes (BS7121-2-1: 2012).

Note

Introduction

[9] This Inquiry was held under the Inquiries into Fatal Accidents and Sudden Deaths Etc (Scotland) Act 2016 into the death of John Grant Cousin. Preliminary hearings were held on 21 September, 6, 13 and 17 November 2017. Evidence was led at the Inquiry on 7 days commencing 20 November 2017. Submissions were made by the participants at the Inquiry on 1 December 2017.

[10] The participants of the Inquiry and their representatives were as follows:-

- Mr Gavin Callaghan, Senior Procurator Fiscal Depute for the Crown;
- Mr Barney Ross, Advocate, for the family of John Cousin;
- Mr Peter Gray, QC for GGR Group Ltd (the supplier of the crane);
- Mr Murdo MacLeod, QC for Forth Crossing Bridge Constructors (FCBC) (the principal contractor for the construction of the Queensferry Crossing);
- Mr Andrew Lothian, Solicitor, for Mr Stewart Clark (the maintenance fitter employed by GGR).

[11] The following witnesses were called by the Crown and gave evidence:

(1) Lucas Hollis (FCBC):

(2) DS Robert Williamson (Police Scotland):

(3) David Brown (FCBC):

(4) Duncan MacKenzie (FCBC):

(5) Tony Smith (FCBC):

(6) Gavin Wilkie (FCBC):

(7) John Wight (FCBC):

(8) Bernard Reynolds (FCBC):

(9) Anthony Duffy (FCBC):

(10) Paul Lang (GGR):

(11) Thomas Rae (GGR):

(12) Stewart Clark (GGR):

(13) David Gostick (HSE):

(14) Isabelle Martin (HSE).

The Legal Framework

[12] The Inquiry was held under Section 1 of the 2016 Act and was governed by the Act of Sederunt (Fatal Accident Inquiry Rules) 2017. The purpose of the Inquiry under Section 1(3) of the 2016 Act is to establish the circumstances of the death and consider what steps (if any) might be taken to prevent other deaths in similar circumstances. At the conclusion of the evidence and submissions in an Inquiry, the Sheriff is required to make a determination setting out:

(1) When and where the death occurred;

(2) When and where any accident resulting in a death occurred;

(3) The cause or causes of the death;

(4) The cause or causes of any accident resulting in the death;

(5) Any precautions which -

(a) Could reasonably have been taken;

(b) Had they been taken, might realistically have resulted in the death, or any accident resulting in the death, being avoided;

(c) Any defects in any system of working which contributed to the death or any accident resulting in the death;

(d) Any other facts which are relevant to the circumstances of the death.

[13] The Sheriff may also make recommendations in respect of the taking of reasonable precautions, the making of improvements to any system of working, the introduction of a system of working, and the taking of any other steps, which might realistically prevent other deaths in similar circumstances.

[14] In this Inquiry, the Procurator Fiscal represents the public interest. The purpose of the Inquiry is not to establish civil or criminal liability.

Summary: Evidence Not In Dispute

[15] The circumstances leading up to the accident are usefully summarised in a report prepared by Police Scotland (Crown Production No. 23). This account was not in dispute. The report discloses that the contract to build the Queensferry Crossing was awarded to Forth Crossing Bridge Constructors (FCBC) in 2011. GGR, was one of a number of sub-contractors involved in the construction. They supplied 3 cranes including 2 Giraf Track Cranes. FCBC sent a number of their employees to be trained by GGR on the operation of these cranes prior to their delivery. GGR also took responsibility for the maintenance of the cranes whilst they were on hire. As part of the

terms of the hire, FCBC were required to provide a weekly report of the hours of operation for each crane to assist in the scheduling of services. The last planned service of the 2 cranes was carried out on 20 March 2016.

[16] The Giraf Track Crane is an 18 ton tracked crane with a hydraulic telescopic boom. The crane has attached to the side of the boom a separate fly jib, which weighs 550 kilogrammes. The fly jib is an "extension piece" for the boom and when it is deployed, it extends the boom's reach by an additional 5 metres. The fly jib is attached to the side of the boom by means of 2 large metal pins which pass through holes welded onto the boom and corresponding holes welded onto the jib. One pin is situated at the base of the boom nearest to the cab whilst the second pin is approximately half-way along the boom towards the end. To deploy the jib the pin closest to the cab is removed, allowing the second pin to act as a central pivot which allows the front end of the jib to be manoeuvred into position whereby a third pin at the front of the boom can be slid through further corresponding holes linking the end of the jib to the end of the boom. This allows the central pin to be removed as the jib is now secured to the front of the boom. The jib is then pivoted round on this front pin to align with the end of the boom where a final pin is placed through further corresponding holes on both the boom and the jib, thereby securing it to the front end of the boom and fixing the jib in place as an in-line extension. All pins have corresponding keepers that can be pushed over retaining lugs welded to the boom to prevent them from falling out.

[17] The deceased, John Cousin, was employed as a leading hand/foreman working on the Queensferry Crossing under the umbrella of FCBC. The deceased's daily duties

were to oversee the work carried out by 2 fitters who were responsible for inspecting, maintaining, servicing and repairing all equipment owned by FCBC placed on any of the 3 towers/road decks. Predominantly this equipment involved the generators on each tower but staff on any tower could contact them and ask them to look at any equipment requiring attention. The deceased would assist in carrying out this work while also overseeing the work of the fitters. As such, he was free to plan his day and would regularly move between all 3 towers and the workshops. The deceased and fitters were not responsible for the repair of any hired equipment. If such items required attention then the company which had hired the equipment to FCBC would be contacted to attend and carry out the repair.

[18] Witness Lucas Hollis was employed by FCBC as a ganger on the north tower of the Queensferry Crossing. Part of his job involved being a machine operator for the Giraf Crawler Crane. On 27 April 2016, Hollis was operating the crane on the north tower when he noted there was a leak from a hydraulic hose. He alerted his supervisor and then contacted GGR, from whom the crane was hired, and arranged for a mechanic to attend the following day. This was arranged through Paul Lang of GGR. Hollis advised that he could not lower the boom from its current raised position. He was advised by Lang to leave the crane at that position for an engineer to attend the following day. Hollis then placed an exclusion zone around the crane by means of a red and white plastic chain. The crane was then left in the position it was in when the leak occurred, namely with the boom in a raised position and the cab facing to one side.

[19] Around 16:00 hours on 27 April 2016, the witness Stewart Clark, who is employed by GGR as a mechanical fitter, was told by witness Paul Lang of the above fault and asked to attend the Queensferry Crossing the following day to carry out the repair.

[20] About 06:30 hours on 28 April 2016, the witness Clark attended the crossing in order to be escorted to the north tower to complete the repair. On arrival, Clark had to wait for someone to attend and escort him across by boat to the tower. Due to a mix-up, this did not happen until about 11:00 hours when the witness Hollis attended and escorted Clark by boat to the north tower. They arrived at the crane on the road deck of the north tower about 11:20 hours.

[21] Witness Duncan MacKenzie was employed as a workshop manager with FCBC. He was the immediate supervisor of the deceased and he confirmed that the deceased would be deployed to any of the three towers in order to oversee routine maintenance work on FCBC equipment. The deceased was also supervisor to 2 other fitters, namely Anthony Duffy and Bernard Reynolds.

[22] The deceased and the other fitters were not expected to maintain or repair any of the plant hired from external companies. However, occasionally they would deal with minor problems such as flat batteries or might assist a fitter from the hire company. MacKenzie confirmed that the deceased was predominantly responsible for his own workload and responded to faults as and when required. On 28 April 2016 about 08:00 hours, whilst within the workshop with the deceased, witness MacKenzie answered a telephone call from his son who was employed on the construction side of the crossing.

MacKenzie's son asked him if he was aware that one of the cranes on the north tower had broken down and asked if one of MacKenzie's fitters was coming out to deal with it. MacKenzie was not aware of this breakdown but he and the deceased identified that this crane was not one of FCBC's cranes and that, as a result, FCBC had no responsibility for carrying out the repair. Before MacKenzie could advise his son of this, he heard another male in the background of the call (not identified) telling his son that everything was in hand and someone was coming out to deal with the repair. The deceased was present in the office at this time and overheard this conversation.

[23] Shortly after this, the deceased left the workshop to catch a boat to the towers and carry out his rounds to check on equipment on the towers, a task that the deceased would carry out every few days and which would normally take him 4 or 5 hours to complete. MacKenzie had no further contact with the deceased. The deceased made his way by boat to the north tower and headed up to the road deck. About 11:15 hours, witnesses Gavin Wilkie and his brother Alan Wilkie, who were employed as steel fixers, and were working together on the north tower, spoke to the deceased. The deceased informed Gavin Wilkie that he was there to "assist the guy fixing the crane". Alan Wilkie saw the deceased walk off in the direction of the crane.

[24] Witness Romain Simon was also working on the north tower in his capacity as a site supervisor. He was directly involved in the installation of a stay pipe, which was the major operation on the tower at that time. He was standing at the northwest corner of the road deck waiting for the stay pipe to be lifted into place by the main tower crane. This was due to commence at 11:00 hours. Witness Simon was approached by the

deceased who began talking to him about the stay pipe. He recalls that they were talking about how the boom on the Giraf crane would have to be moved from its current position of facing west as it may affect the lifting of the stay pipe. Witness Simon was aware that the crane had broken down the previous day due to leaking hydraulic fluid leaving the boom sticking in a raised position. He noted that the boom was still sitting at the 45° angle with an exclusion zone around it. About 11:00 hours the lifting of the stay pipe commenced and witness Simon left the area to supervise this, leaving the deceased still talking to Gavin and Alan Wilkie.

[25] Witness Steven Morrison, who was engaged in lifting the stay pipe, was within a work basket about 150-170 metres above the road deck of the north tower. On looking down to the road deck he saw the Giraf crane parked-up on the northwest side of the deck with the boom at about a 45° angle. He used a small pocket camera to take a picture of the road deck area to the north of the tower. At this stage, no persons were working on the Giraf crane. The time stamp on this image is 11:18 hours although it was not subsequently possible to establish the accuracy of this time stamp in relation to GMT.

[26] When witness Stewart Clark arrived at the Giraf crane, the deceased was standing beside the crane and introduced himself as John. Witness Clark then entered the cab of the crane. At about 11:22 hours, witness Paul Lang telephoned Clark to find out how he was getting on with the repair. Clark lowered the boom, at which point the leaking hose began to spill more fluid. Witness Hollis also noticed that as Clark lowered the boom, the hose began to leak fluid again. Due to this, Hollis headed to a store next

to the tower where the chemical spill kit is held, in order to collect 2 bags of spill granules to soak up the fluid. Witness Clark exited the cab and opened the hydraulic engine bay. The deceased opened the door at the opposite side. Clark then isolated the valve for the hydraulics and stepped onto the track to access the hydraulic hose but found he did not have enough space to use his spanners as the fly jib was in the way.

[27] When Hollis began making his way back to the crane, the deceased was standing on the road deck next to the boom and Clark was standing on the crane tracks next to the cab of the crane. Hollis noticed that the leaking hydraulic fluid had started spreading under the crane and was appearing behind the crane. Accordingly, he passed from the front of the boom around the near-side of the crane to the back where he commenced pouring the granules from the spill kit bag onto the hydraulic fluid.

[28] Hollis was walking backwards as he poured granules from the spill kit bag making his way from the rear of the crane towards the front and on the near-side of the cabin. As such, his back was towards the deceased and Clark. Hollis then heard a noise like 2 pieces of steel grinding against each other. He spun round to see what was happening, at which point he saw the deceased holding the fly jib with his arm stretched over his head. The fly jib then fell on top of the deceased, hitting him on the head above the eyebrow and striking Clark as well. At this point Clark was either on or next to the tracks of the crane. After the fly jib fell, the deceased was lying on the ground with the fly jib lying next to him.

[29] There were no other persons in the vicinity at this time. Witness Hollis immediately called for help and went to help the deceased who he saw was bleeding

heavily from the mouth, ears and nose. Hollis then placed the deceased in the recovery position and continued to shout for help. Witness Simon, who was still engaged in duties with the lifting of the stay pipe was standing with his back to the crane and about 15-12 metres away when he heard something heavy falling. When turning round he saw the deceased lying on his back on the ground. Simon began walking towards the deceased and, on getting closer, he saw Clark near the tracks of the crane. Clark looked shocked and was shaking. Simon saw Hollis kneeling beside the deceased and talking to him. He also saw the fly jib lying about 1-2 metres away from the deceased.

[30] Witness Mark Nimmo, who was also working on the road deck and involved in the lifting of the stay pipe became aware of Hollis shouting for help. Nimmo ran to where Hollis was and saw the deceased lying on the ground in the recovery position. Realising he was seriously hurt, Nimmo immediately ran to collect a stretcher from the first aid room. Witnesses Gavin and Alan Wilkie did not see the fly jib fall. They heard a noise like metal hitting concrete. They saw the deceased on the ground being assisted by Hollis. They also noticed Clark who was in a state of shock. At this point, witness Nimmo arrived with a stretcher. A number of other persons also arrived to assist and the deceased was placed into the stretcher. Normal procedures for removing a casualty from the road deck under such circumstances involve utilising the main tower crane to lift the stretcher from the deck, all the way down to the barge at sea level. However, as this crane was in the process of lifting the stay pipe, it was deemed too dangerous and time-consuming to lower the stay pipe again and utilise this crane. The decision was therefore made to evacuate the deceased by carrying him down several flights of stairs

to a lift. A number of persons assisted in this process due to the difficulty and weight involved. Witness David Paterson, who had attended at the crane in response to the incident noted a male, at this point unknown to him (Clark), who appeared to be sat on the road deck on his own. This male appeared to be in shock and kept saying "My neighbour, my neighbour, I was working with him".

[31] Paterson describes the male as trying to stand up a couple of times and being so shaken-up that Paterson thought he was going to collapse. Clark was then helped off the deck and down to the barge by other persons.

[32] As this was being carried out John Muirhead, a barge master, was made aware by radio that there had been an accident on the road deck and a boat would be required urgently. Muirhead arranged for this by radio and, when the boat arrived, prepared it to receive the stretcher. The boat then transported the deceased to Hawes Pier, as per emergency procedures. Witnesses Mark Nimmo, John Wight and John Muirhead accompanied the deceased to Hawes Pier. An ambulance was also requested to attend. Police Scotland and HM Coastguard were also notified. A second boat was summoned for Stewart Clark, who was assisted down the lift by Anthony McCluskey, who states Clark did not talk about what had happened during this journey other than saying he had seen a flash. Witness Ross Gallacher, who had assisted in carrying the stretcher down to the barge, saw witness McCluskey accompanying Clark onto the barge. Gallacher describes this male as limping and "talking gibberish", not making any sense other than saying he thought he had hurt his head and that the boom of the Giraf had hit him.

[33] On arrival at Hawes Pier, Nimmo, Wight and Muirhead carried the stretcher off the boat and up Hawes Pier to await the arrival of the ambulance, which they could see working its way towards them.

[34] About this time, witness Steven Morrison was still within the work basket on the north tower. He had witnessed the aftermath of the incident but not the incident itself. Morrison took another picture with his camera which shows the scene of the incident soon after the accident. This image is timed on Morrison's camera as having been taken at 11:48 hours.

[35] About 11:46 hours witness Ian Angus, who was employed as a paramedic by the Scottish Ambulance Service, was dispatched to the incident. He attended immediately arriving at 12:00 hours. On alighting his vehicle he saw workers carrying a stretcher up the pier. He immediately provided assistance. About this time Joseph Mitchell, who is employed as a Senior Manager with HM Coastguard, and Callum McNicol, who is employed as a Senior Coastal Operations Officer with HM Coastguard, attended at Hawes Garage in relation to another matter. At this time they observed 2 FCBC safety boats alongside Hawes Pier. Knowing this was unusual, unless in an emergency situation, they made their way towards Hawes Pier. They saw persons helping a worker off the vessel and supporting him as he walked up the pier. Arriving at the pier minutes later, both witnesses saw a second casualty on a stretcher being worked on by a paramedic.

[36] On noting there was no pulse or breathing present, Angus instructed Mitchell and McNicol to assist with CPR as he prepared his equipment. Angus also notified

ambulance control that the incident was a traumatic cardiac arrest and asked how far away assistance was. He was advised the nearest ambulance was 13 minutes away and that a doctor was at that point 20 minutes away. On arrival of the ambulance further efforts were made to resuscitate the deceased. This continued for approximately 25 minutes until the doctor arrived.

[37] When Dr Campbell-Hewson, who is a consultant in emergency medicine at the Royal Infirmary of Edinburgh, arrived he attended to the deceased and after being provided with a full history of the casualty, carried out an assessment, after which he decided not to escalate resuscitation, the predominant reason for this being the presence of cardiac arrest resulting from a blunt injury to the head, coupled with time delay before resuscitation and basic life support was provided. At 12:36 hours, he pronounced life extinct. The deceased was conveyed to the City of Edinburgh Mortuary.

[38] During this process Stewart Clark arrived on the pier accompanied by witness Blackwood. The witness John Wight approached to see if he could assist. He noted Clark did not appear injured but appeared to be in shock. He asked Clark what had happened and Clark responded that "They had been taking the fly wheel off a Giraf crane, he had knocked his pin out first then John knocked his pin out and the wheel came out and hit the 2 of them." Clark was conveyed to the Royal Infirmary of Edinburgh for examination, following which he was discharged.

[39] All work was halted on the crossing and staff returned to shore. All operations on the bridge, except for maintenance of generators, were then stopped. On Thursday 5 May 2016, Dr Ralph Bouhaidar and Dr Ian Wilkinson carried out a post mortem

examination of the deceased. They certified that the cause of the deceased's death was 1(a) chest injury. It was the opinion of Dr Bouhaidar that the injuries which had been sustained by the deceased were not survivable.

[40] On 29 April 2016 a joint Health & Safety Executive and Police Scotland Inquiry was launched into the circumstances surrounding the death of John Cousin. On 28 April 2016 Isabelle Martin, HM Inspector of Health & Safety attended at the Queensferry Crossing. She prepared a summary report which is Crown Production No. 24.

[41] Witness Martin attended the incident scene which was on the northern side of the north tower. She noted that the position of a small mobile crane. The crane had a fly jib which was now lying on the ground under a tarpaulin. There was blood on the ground around the area where the jib was lying. A small bag, spanner and red metal pin were also on the ground. A metal pin was also hanging on a chain from the middle of the main jib of the crane. Police Scotland took the various items from the ground into their possession and they also took the pin that was suspended from the chain in the middle of the main jib. Witness Martin's investigation established that the hydraulic hose had failed on the crane and fluid had leaked from it. Accordingly, the hose needed to be removed and replaced so that the crane could continue to be used in the construction project. Witness Martin's conclusion was that replacing the hydraulic hose was a relatively straightforward task and that the only risk was ensuring that hydraulic fluid was not ejected from it at high pressure. Removing the hose would simply involve taking the retaining clips from either end of it and lifting it off, fitting a new one and then refitting the retaining clamps. Deployment of the fly jib on the crane was

demonstrated to witness Martin on an identical crane located on the central tower. The process involved the removal and insertion of 4 pins in a specific order. Removing pins in the wrong order would result in the fly jib falling from its housing on the main jib of the crane. As it weighed half a ton, this could cause significant injury.

[42] Witness Martin established that the process for deploying the fly jib was as follows:

(1) Ensure the jib of the crane is in a horizontal position.

(2) Remove the pin located towards the cab of the crane.

(3) Manually move the fly jib to enable the locating journals at the end of the main jib of the crane to line-up with those on the fly jib.

(4) Insert the retaining pin through the journals at the end of the main jib and secure in place. This forms the hinged joint.

(5) Remove the central pin that is holding the fly jib to the main jib of the crane.

(6) Swing the fly jib around 180° until it is located onto the end of the main jib of the crane.

(7) Fix the final pin in place through the locating journals at the end of the main jib of the crane.

[43] It was established that the central pin on the fly jib is the pin that holds it in place and prevents it falling from the crane to the ground and potentially causing injury. If this pin is removed before the pin is fixed in place at the hinged joint then the fly jib will

fall to the ground. The fly jib sits on rollers and when the central pin is removed it rolls freely outwards.

Summary: Contested Evidence

[44] The foregoing description of events before and after the accident is uncontroversial. The evidence presented to the Inquiry focused mainly on 2 issues where there was either a dispute about what had happened on uncertainty over the sequence of events: (1) who removed the central pin and, (2) why was that done? Investigations by the Police Scotland and Health & Safety Executive and the evidence led at the Inquiry established that no-one saw the central pin being removed. From the evidence it is clear that there were only 2 persons who could have removed the pin, namely the deceased or witness Clark. That assumes that the pin had not already been removed by someone else or had not fallen out prior to the attendance at the crane by the deceased and witness Clark. For reasons discussed below, I discount the possibility of the pin having been removed by someone at an earlier stage or to it having fallen out. Accordingly, the central pin could only have been removed by either the deceased or witness Clark.

Stewart Clark's Evidence

[45] Witness Clark gave evidence confirming that he was escorted to the north tower by witness Hollis at 11:20 hours on 28 April 2016. He had been asked to attend at the north tower by his colleague, witness Lang, who had shown him a photograph of a

leaking hydraulic pipe. When he arrived at the north tower he saw that the boom arm of the crane was raised. He brought the arm down and then noted that there was a problem with access to the hydraulic hose. He confirmed that he would have required to use 2 spanners to remove the hose and said that this was not possible given the position of the fly jib. He therefore decided to move the fly jib. According to his evidence it was at this point that he had a conversation with the deceased in the course of which the deceased said that he would have to move the fly jib to gain access to the hose. Witness Clark indicated that he had already formed that view. He maintained that he did not ask the deceased to do anything and the deceased did not suggest that he would do anything.

[46] Clark explained that he intended to take out one pin at the cab end of the fly jib. It was then his intention to move the fly jib out of the way to give him a "couple of feet" of access. He maintained that he did not require assistance and did not ask for assistance. He removed the pin at the cab end using a large spanner which he had recovered from the hydraulic bay of the crane. He said that he had to strike the pin 2 or 3 times to get it to release. His position was that he then went to his bag to get a cloth to wipe hydraulic fluid from the track of the crane. Having done this he went to his bag to get his spanners. In his evidence he indicated that his bag would be close to where he had removed the cab end pin. He indicated that he had already given the fly jib a pull to ensure that it would move. Having confirmed that it would move, he said that he went to his bag to get the spanners he would require to remove the hose. While at his bag he heard a noise behind him to which he did not pay any attention. As he stood up

he was struck on the back of the head. There was a white flash and he heard metal hit the ground.

[47] Prior to describing the steps he had taken with a view to partially deploying the fly jib, Clark had been asked to explain how the jib would be deployed. He confirmed that there were 2 pins and that you would remove the pin at the cab end first so that the fly jib could then pivot on the second pin. However, when shown a photograph of the crane and asked to indicate the location of the second pin he pointed to the very end of the boom. It was only on further questioning that he confirmed that the second pin was located more towards the middle of the boom. It was also clear from his evidence that he seemed to be under the impression that having removed the cab end pin that would enable the fly jib to be fully deployed.

[48] The evidence witness Clark gave at the inquiry has to be assessed in the context of statements he made to other persons including the police and Health & Safety Executive after the accident. On the day of the accident he was reported by witness Paterson as saying "My neighbour, my neighbour. I was working with him". The account he gave in his police statement which he gave on 28 April 2016 at 18:20 hours was in the following terms:

> "As soon as I arrived someone who introduced himself as John was standing next to the crane. He seemed quite knowledgeable talking about things to do with the crane that I wasn't even aware of. He was talking about how the spool valve would burst in the hydraulic system. I have heard of this but I don't know what this is and I took it to be a term that someone of John's generation used as he was older. John became involved without being asked and whilst I have opened the hydraulic engine bay, he's opened the other door at the opposite side. ….. I have then isolated the valve for the hydraulics and I'd stepped on the tracks slightly to access the hydraulic hose but I didn't have enough space to get

my shifting spanner in because the jib arm was in the way. John had then said something like "You are not going to get into that with the extension being there" meaning the jib arm. I had then hit the pin with a larger spanner after removing a small locking pin at the bottom. It took 3 decent hits from below before I was able to pull the pin out from the top. The pin is about 1-1½ft long and 1½" in diameter at the top, tapering into about half that diameter. After removing the pin I jumped down off the tracks and gone into my bag to collect the spanners I needed to remove the hydraulic hose. Whilst I was in my bag I heard hammering but this is a usual noise in this environment. When I stood back up I felt a blow to the back of my head and a white flash. I don't remember much after that."

[49] Witness Clark also gave a statement to the Health & Safety Executive on 26 August 2016. His account of what happened was in the following terms:

"I hadn't met John before. I hadn't met any other mechanics or maintenance staff before. I only knew the crane operators or the tower supervisors and foremen who escorted me. John didn't mention that he was there to assist me. He was already working in the vicinity. I was looking at the angle of the boom, working out how to get the boom down and was phoning Paul when John approached me. I don't recall any barriers around the crane and don't recall anyone telling me that the crane was in an exclusion zone. John noticed that I couldn't get into the hydraulic hose and he suggested that I would have to get the fly jib out of the way and I couldn't see any other way of doing the job. John wasn't with me all the time. He came and went, he was doing other things. ….. I threw the boom round so that it was parallel with the tracks, fully retracted, and the angle of the boom was parallel with the ground. I switched the engine off, came out of the cab and switched the hydraulic system off. I was looking at the coupling and the fly jib when John suggested that the fly jib would need to be moved. It's quite common for someone from the site to come and assist. This has happened on different sites I'd been on – Scottish Power, another job at Stirling where 2 guys assisted with an Oscar 600 Vacuum Robot, for example. Nobody from GGR has ever told me not to let anyone assist me. When I'd mentioned in the past that I'd needed assistance from the site I was told that that was ok. I had also been told prior to going out that the operator will help me – not at the Forth Crossing but on other occasions. ….. After I came out of the cab, I had a go at getting in behind the fly jib to remove the hose. The only way I could see to do that would be to remove the pin at the cab end of the jib. This would allow the jib to swivel out far enough to allow me to access the hose. I proceeded to get something to get the pin out. There was an "R" flip at the bottom of the pin which I removed. Before this, John had mentioned doing this but after this I don't remember his whereabouts and there wasn't any discussion about I'll do

> this and he'll do that. There was a lot of oil which had leaked out during my operating it and I put a few rags down on the track. I was facing the machine and have no idea what anyone else was doing. Where moving the pin couldn't be done myself, I had to give the pin I think 3 hits with my spanner to loosen it before I could pull it out the top. I put the pin down on the tracks. After that I made my way down to my bag to get more rags and another spanner. My tool bag was, I think, on the track, at the very cab end. I remember taking rags out of the bag to soak up the oil, and remove the saturated rags. I remember trying to clean the oil that was on the wee step up between the tracks and the cab. I remember getting 2 spanners, a retaining spanner and one to shift the nut from the hydraulic coupling site. I never got to that stage though. I heard some banging going on. It was close to me. It sounded like metal onto metal. I had taken some spanners out of my bag, looking for the smallest tool so that the jib needed to be moved to a minimum. I heard a noise, a guy shouting "aaarghh". I knew something was wrong and stood up and looked round. I can't remember exactly where I was, somewhere next to the tracks. It must have taken me about 45 seconds to get my pin out. I was on the way to stand up when I was hit from behind. I felt a weight hit me. It was similar to standing up and hitting your head off something. Something hit my helmet and knocked it off and struck my right shoulder as well. I remember seeing a white flash and feeling my teeth crashing together. Next thing I can remember is my teeth being really sore and becoming aware that I was next to the tracks. I think it might have been between the tracks. The next thing I knew was that John was badly injured. John was lying on the ground, blood coming out of his mouth and ears."

[50] Witness John Wight was one of the workers who helped remove the deceased from the north tower. After the deceased was removed to Hawes Pier, this witness became aware of witness Clark who he described as being shaken and leaning against a wall as if his legs had gone to jelly. In evidence, this witness confirmed speaking to witness Clark. He asked him what had happened. He recalled witness Clark telling him that something hit him. He also indicated in his evidence that witness Clark had told him that he didn't know what had happened. In his statement to the police this witness gave the following account of his conversation with witness Clark:

> "I asked him what happened and he said that they were taking the fly wheel off a Giraf crane. He knocked his pin out first and then John knocked his pin out and the wheel came off and hit the 2 of them".

Evidence of Lucas Hollis

[51] Witness Hollis was the crane operator who took witness Clark to the north tower. He spoke to having met the deceased when leaving the tower to collect witness Clark. He told the deceased that the crane was going to be repaired. In his evidence he said that when Clark arrived at the crane he telephoned someone and then started lowering the boom. This caused oil to leak. Witness Hollis said that he went to get granules to soak up the oil. He said that the deceased had been close by repairing generators and that he could not remember if they had been talking. He confirmed that the deceased was near witness Clark but that he did not hear the discussion. As he was spreading the granules round the crane he heard a noise like "steel off steel". He spun round and saw the deceased holding the fly jib which fell over onto him.

[52] In his statement to the police on 28 April 2016, witness Hollis gave the following account (in which he referred to witness Clark as "Paul"):

> "John also works for the same company as I do, not for the cranes. As far as I'm concerned, he works in general maintenance. I don't know how he came to be there and this is the first time that I know of any machinery breaking on the north tower. Paul started up the engine on the crane, with me standing next to the cab, on the ground, and John at the opposite side. He turned the cab towards John's direction, he tried to put the boom down but it started leaking oil. I ran to the middle of the bridge to the cosh store in order to collect 2 more 20 kilogramme bags of stones used to soak up the spillage. Before I got back Paul had lowered the main boom and he began working on the hydraulic hoses with John. John was standing on the ground by the main boom, which was at his eye level. Paul was standing outside the cab, working on the boom arm. I don't know what they were doing, as I had proceeded to clean the oil spillage. There

> was oil underneath the crane and on the side where John was standing. I could hear Paul and John talking to one another and I think I heard John asking to remove a pin. I can't remember what he had said exactly but it was maybe a minute later, when my back was to John, that I heard a creaking noise. I turned to see John holding the fly jib above his head. I think he had it in 2 hands, or maybe one."

Evidence of Gavin Wilkie

[53] This witness gave evidence about his conversation with the deceased at about 11:15 am on 28 April 2016 on the north tower. In his evidence he could not remember the deceased explaining why he was on the north tower but in his statement he had recalled the deceased saying that he was there "to assist the guy fixing the crane".

Submissions Relating to Removal of the Central Pin

[54] In his submissions on behalf of the family of the deceased, Mr Ross invited me to reject witness Clark's evidence in relation to his interaction with the deceased in the period that they were seen together prior to the accident. It was submitted that, on the evidence, it would be open to the Court to find that the central pin on the fly jib attachment was removed either with the knowledge and acquiescence of, or at the instigation of, witness Clark. It was submitted that if Clark's account was to be taken at face value, the possibility that in the brief window of time between removing the cab end pin and the accident, the deceased had, of his own volition, without any forewarning and entirely unnoticed by Clark, proceeded to remove the central pin was extremely unlikely for the following reasons:

(1) The central pin is located less than 1.5 metres from the cab end pin. Clark was therefore in extremely close proximity to the central pin throughout the

period immediately prior to the accident. Anyone engaged in removing the central pin during this period would, effectively, have been right beside him. If someone had been engaged in working on the boom at that distance, it would have been reasonable to expect that he would have been aware of their presence.

(2) The evidence of Clark about the level of interaction with the deceased is irreconcilable with the evidence of witness Hollis. His evidence was that Clark and the deceased were working on the task together. He gave evidence that he saw the deceased and Clark speaking near to each other and in his statement to the police he referred to Clark working on the hydraulic hoses with the deceased.

(3) The hypothesis that the deceased removed the pin of his own volition was inconsistent with the evidence in relation to the deceased's skill, competence, experience and temperament. Evidence had been led from witness Duncan MacKenzie who was the FCBC Maintenance Manager. He would have expected the deceased to understand the principle of the fly jib attachments. He had given evidence that he could not envisage any circumstances in which the deceased would remove the pin on his own initiative.

[55] It was also submitted on behalf of the deceased's family that it was clear from the evidence that witness Clark had a fundamentally erroneous understanding of the operation of the fly jib attachment on the crane. In his evidence witness Clark made clear that his understanding of how to deploy the fly jib was as follows: (a) the pin at the cab end would be taken out; and (b) the jib would be pivoted on the remaining pin and swung right round and a further pin inserted opposite the pivot pin to lock it in

position. It was submitted that this description given by witness Clark in his evidence reflected the position set out in his statement to the HSE and the police on 26 August 2016 in which he stated: "I've had to extend the fly jib on the G150 which I did with Paul Lang. To deploy the fly jib, it is held parallel with the boom by 2 cylindrical locking pins. The procedure would be to remove the pin nearest the cab end of the boom, retaining the pivot pin which is at the end of the boom. The jib is then rotated round on the pivot pin until it is acting as a full extension of the boom. Then the first pin which had been removed from the cab end is slotted into the holes to connect the end of the boom at the other side." It was submitted that it was clear from the evidence that this description was inaccurate in at least 2 respects:

(i) It has retaining pins at the cab end and the boom end (rather than the centre) and;

(ii) It mis-describes the role of the central pin which is to support the weight of the fly jib and allow a small pivot at the front of the boom.

[56] It was submitted that the significance of this was that witness Clark was ignorant as to the existence and significance of the central retaining pin. It was submitted that it would follow from that that witness Clark would have no reason to think that it was necessary for the central retaining pin to remain in place. It was submitted that this made it more likely that Clark would either have instigated or acquiesced in the removal of the central pin by the deceased and the deceased, with his experience of working in large construction projects, would have been entitled to proceed on the basis that Clark,

as the representative of the hire company, was trained and competent in the operation of the crane, including the mechanics of the fly jib attachment.

[57] Mr Gray, in his submissions on behalf of GGR, submitted that it must remain a matter of speculation as to what motivated the deceased to remove the central pin. It was submitted that the deceased had made a tragic error in relation to the type of equipment with which he may have felt he was very familiar. I was invited to accept that there was no reasonable basis upon which to conclude that witness Clark was aware or ought to have been aware of the actions of the deceased. In his evidence, witness Clark was clear that in no circumstances should a second pin be removed when the fly jib was in the stored position; and it was equally clear that he understood that to be the position on the day of the accident as he had informed a police officer in a witness statement at 18:20 on the day of the incident that "I can only assume that John had removed the second pin after me, causing the jib arm to fall. This pin would never be removed as it is the pivoting pin and it was *in situ* when I removed the pin I removed." In his evidence, witness Clark had indicated that had he been aware that the deceased was doing anything to remove the second pin, he would have told him that he must not. It was also submitted on behalf of GGR that the evidence of witness Hollis in relation to this matter provided little assistance. In his statement given on 28 April 2016, witness Hollis stated that he could hear Clark and the deceased talking to one another and stated "I think I heard John asking to remove a pin". It was pointed out that that statement was immediately qualified in the very next sentence when he stated "I can't remember what he had said exactly", and on 10 June 2016 when interviewed at length by the HSE

he stated that he "… didn't hear anything that they were saying." Mr Gray submitted that this evidence required to be treated with a degree of caution as witness Hollis was not party to any discussions, and was engaged in other work himself.

[58] Mr Lothian, on behalf of Stewart Clark, invited the Court to accept that Clark was an entirely credible witness, and, insofar as possible given the passage of time, a reliable witness, in particular in relation to the issues which were critical to the inquiry. It was pointed out that he had made concessions where it was appropriate and reasonable to do so. For example: he conceded he might have made a comment to Mr Wight (in relation to what he described at the time as the removal of a "fly wheel"); he conceded that his recollection while giving evidence at the inquiry about how far along the boom central repairing pin was situated might initially have been incorrect; he conceded that he had not seen a barrier to denote the presence of an exclusion zone; he conceded that from the photographs in Crown Production 22, that there did not appear to be sufficient room to complete the removal of the hydraulic hose; and he conceded that he did not remember having to detach a clip from the pin and accepted he would have had to do so. It was submitted that in each of those matters witness Clark might have dissembled or attempted to give evidence designed to be more favourable to him, but he did not do so. It was also submitted that his evidence was, in all material aspects, entirely consistent with his prior statements including the statement he gave to the police on the day of the accident as well as his more lengthy HSE statement given in August 2016. It was pointed out that notwithstanding the fact that he had himself been struck by the fly jib, he determined that it was appropriate to return to the FCBC offices

to provide a police statement on the day of the accident. His reasons for doing so, according to his evidence, were that he "Felt it would be better to give a statement there and then so it was the freshest account in my head." It was submitted on his behalf that this was commendable. Finally, the Court was also invited to have regard to his general demeanour when giving evidence which was described as being constructive and respectful, without seeking to be evasive or to blame others.

[59] It was submitted on behalf of witness Clark that the only direct witness to the conversation between himself and the deceased was Stewart Clark and his evidence had been consistent since the time he gave his police statement on the day of the accident. It was pointed out that throughout the investigation and when giving evidence at the inquiry, witness Clark had been consistent and there was no discussion about taking out the second pin, that the deceased did not offer to help nor did Clark ask the deceased to help, and that there was no discussion at all about who was going to do what. In his evidence, Clark stated that the conversation with the deceased lasted a minute to a minute-and-a-half. Witness Hollis had indicated that the conversation had lasted for 5-10 minutes. However, it was pointed out that there was evidence that the telephone conversation between Clark and Lang had occurred at 11.22 am and that this was prior to the boom being lowered. It was a matter of agreement (paragraph 12 of the joint minute) that the fly jib became detached at about 11.30 am. There was therefore a period of approximately 8 minutes between the telephone call being made and the accident happening. If witness Hollis' evidence as to the duration of the telephone conversation was to be taken literally then it was submitted that that answer had to be reconciled with

his own evidence that after the crane boom had been lowered he went to retrieve a bag of granules from the store which was about 5 minutes away, therefore entailing a 10 minutes round trip. Witness Hollis also said that Clark was on the deck for about 10-15 minutes before the deceased arrived. It was submitted that all of these statements cannot be correct given that only 8 minutes passed between the commencement of the telephone call prior to the boom being dropped and the moment when the fly jib fell from the crane. It was submitted that the only logical conclusion from this evidence was that witness Hollis was either mistaken about the length of the conversation or did not mean his answer about the duration of the conversation to be taken literally.

[60] In the submissions on behalf of the Crown, Mr Callaghan invited the Court to conclude that there was no clear evidential basis to conclude that Clark and the deceased were working together. It was submitted that the evidence indicated that such discussions as took place between the deceased and Clark were of a general nature, touching on the need to move the fly jib, but that there was no offer of help from the deceased or acceptance of same (or request for same) from Clark. According to the Crown's submissions, the deceased's actions were unanticipated, hence, would have been difficult to prevent.

HSE Investigations & Conclusions

[61] Evidence was given at the inquiry by David Gostick, HM Specialist Inspector (Mechanical engineering) and Isabelle Martin, HM Inspector of Health & Safety. Mr Gostick referred to his report dated 7 September 2016 (production No. 21) and his supplementary report dated 17 March 2017 (production No. 22). Mr Gostick's conclusions following his investigations were as follows:

(1) Maintenance of plant and equipment is a hazardous process due to the size and weight of parts involved, the hydraulic pressures used to operate the equipment and the chemicals which may be used. When maintenance is undertaken without adequate training and safe systems of work in place then it is foreseeable that an incident leading to serious or fatal injuries may occur.

(2) He was unable to identify any specific faults with the crane which would have directly led to the incident.

(3) No operator's manual or safe system of work was available at the crane to detail safe removal of the failed hose or deploy the fly jib.

(4) In his opinion, by removing and installing the securing pins in the correct order, the fly jib could be safely deployed.

(5) The locking arrangements for both of the pins used to secure the fly jib in restored position were suitable.

(6) There were significant differences between the pins on the 2 cranes examined, indicating that the pins on the incident crane may have been modified or repaired at some point prior to the incident.

(7) The central securing pin of the incident crane was bent and was significantly smaller than the locating bores of the crane on the central tower. Depending on the sizes of the locating bores on the fly jib and boom on the incident crane, the pin may have been a very loose fit. It was not clear whether this had a significant effect on the incident. However, the following comments could be made:

- The central pin would still have to have been unlocked and rotated clear of the drop pin spigot for it to be removed.
- If unlocked and rotated clear, it may have been possible for the pin to have fallen out if left unattended.

[62] In his second report, the witness Gostick had been asked to comment further on the size of the central pin compared to the size of the hole that it fitted into. This was in the context of assessing whether there was any possibility that the central pin might have fallen out. Witness Gostick explained that when he observed the removal of the pin at a later stage when the fly jib was not attached, it was necessary to use a large hammer and freeing oil before the pin could be withdrawn. If the fly jib was attached to the boom that would likely increase the difficulty in removing the pin. In addition, the pin had a tight bend in it approximately half-way along its length. Mr Gostick's conclusion was that the bend in the pin would make it very difficult to install and remove the pin. Accordingly, his conclusion was that it was very unlikely, but not impossible, that the pin had dropped out. He was also satisfied that the bend in the pin was very unlikely to have happened during the accident.

[63] Mr Gostick gave evidence that the removal of the leaking hydraulic hose would require the use of 2 spanners; one to hold the central nut stationary and a second to rotate the left-hand nut. He found that there was a gap of approximately 90mm between the central line of the pipes and the face of the fly jib. The flexible hose which was leaking was attached to a hard pipe and the spacing of the hard pipes and their proximity to the fly jib meant that this space was too small to allow the use of suitable

spanners to be able to disconnect the flexible hoses from the hard piping to allow replacement of the flexible hoses.

[64] With the cab end securing pin removed and the jib swung out but not aligned with the journals on the boom, the gap increased to 127mm. In witness Gostick's opinion, this was still too small to allow the use of tools.

[65] With the boom levelled such that the journal on the fly jib would fit within the plates on the boom end and the pin on the boom end removed, the gap increased to approximately 300mm. It was his opinion that this was sufficiently large to allow the use of spanners.

[66] Witness Paul Lang, the service engineer with GGR who had asked witness Clark to attend to the repair of the hydraulic hose, indicated that his method of gaining access to the leaking hydraulic hose would have been to detach the metal pipes to which the hoses were attached thus enabling the hoses to fall below the level of the fly jib. He indicated that he would not have moved the fly jib to gain access.

[67] Witness Gostick was asked for his opinion on this approach to gaining access to the hydraulic hoses. In this connection he was referred to the risk assessment (production No. 8 for the family) which GGR had undertaken in respect of the process of setting up a fly jib attachment. The initial risk rating was one of high risk which was only reduced to a residual risk rating of medium in the event of safety measures and controls being implemented. The risk assessment identified that there was a risk of injury from falling components and that the most likely outcome was a fatality. Mr Gostick accepted that those risks applied even if the fly jib was only to be partially

deployed to access the hydraulic hoses. The risks were the same whether the fly jib was being deployed fully or partially and the consequences could be fatal. Accordingly, he was of the opinion that it was essential that the operator be trained in the operation of the fly jib. In his evidence he accepted that the alternative method of accessing the hydraulic pipes by lowering them was the preferred option because it removed all of the risks associated with partially deploying the fly jib. He was of the view that an experienced engineer would always look for the safest way to gain access. However, he also indicated that moving the fly jib was a reasonable way of gaining access and that removal of the cab end pin did not make the fly jib unsafe. Access to the hydraulic hoses could be obtained by partially deploying the fly jib but this would have to be done in the correct sequence to ensure that there was no risk of the fly jib falling off the platforms on which it rested. Mr Gostick was referred to The Provision and Use of Work Equipment Regulations 1998. Regulation 8 requires an employer to ensure that all persons who use work equipment have available to them adequate health and safety information and, where appropriate, written instructions pertaining to the use of the work equipment. Regulation 9 requires every employer to ensure that all persons who use work equipment and receive adequate training for purposes of health and safety, including training and the methods which may be adopted when using the work equipment, any risks which such use may entail and precautions to be taken. He was also referred to the BSI Standards Publication BS71 21-2-1:2012, Code of Practice for the Safe Use of Cranes. Mr Gostick's position in relation to Stewart Clark's training in connection with the deployment of the fly jib was that this was insufficient whether fully deploying or

partially deploying the fly jib. In Stewart Clark's statement to the Health & Safety Executive he displayed a misunderstanding of the method of deploying the fly jib. In particular he had mistakenly described the pivot pin as being at the boom end.

[68] Reference was made to productions 1-5 for the family namely the training and personnel records for Stewart Clark and Paul Lang. Mr Gostick deals with this matter at paras 2.42 – 2.48 of his supplementary report. He noted that Stewart Clark had 2 SVQs prior to joining GGR however these were related to the operation of metal working machinery and civil engineering/building operations, not the maintenance of plant and equipment. Mr Gostick noted that the training given to Mr Lang and Mr Clark appears to be very generic in nature and related more to processes than specific familiarisation with particular pieces of equipment. He noted that Mr Clark had only received familiarisation training with one particular piece of equipment, the Unic URW376 spider crane. Neither Mr Clark nor Mr Lang had received familiarisation training with the MC805 and, accordingly, in Mr Gostick's opinion, should therefore not have been working on these cranes unsupervised.

[69] At my request, Mr Gostick had been asked to provide a further report detailing the method of deploying the fly jib on the type of crane which Stewart Clark in his evidence had confirmed was the only crane on which he had been shown the deployment of a fly jib. The fly jib on this crane was much smaller but the arrangement for deploying it was essentially the same as the MC805. One possibly significant difference was that the pivot pin was nearer the end of the boom than on the crane involved in the incident.

[70] Mr Gostick's conclusion was that, whilst the fitting of the jibs on the 2 machines was almost identical, Mr Clark was only shown this process during an examination which, in his opinion, did not constitute adequate training because it was provided to him by a trainee, there was unlikely to have been sufficient time available for Mr Clark to both repeat the task shown to him and/or ask questions in order for him to fully understand the process and he was not subsequently given the opportunity to repeat the process under supervision to gain confidence and correct any errors.

[71] Isabelle Martin, HM Inspector of Health & Safety spoke to her report (production No. 24). In her report she made reference to the requirements of Regulations 8 & 9 of the 1998 Regulations. She noted that information on the deployment of the fly jib would have been required under Regulation 8(1). This should have been supplied with the crane when hired by GGR with the fly jib in place. In her report witness Martin also made reference to Regulation 9. She noted that Stewart Clark had only received familiarisation training and that this was on a similar crane but not the particular crane involved in the accident. Her conclusion was that he was not trained to deploy the fly jib. He was however adequately trained to disconnect and remove the damaged hydraulic hose and replace it. Witness Martin confirmed that it was not unsafe to remove only the cab end pin. She was not critical of Stewart Clark's decision to remove the fly jib to gain access to the hydraulic hoses. She was also not critical of the fact that fitters employed by FCBC might do some minor work on hired equipment or assist fitters from the hire company. She accepted that Stewart Clark could have gained access

to the hydraulic hoses by unclicking the hose pipes and lowering them below the level of the boom and fly jib.

[72] Witness Martin was referred to production No. 16, in which the result of enquiries made with previous employers of the deceased is detailed. She agreed that there were numerous references in these written responses to the deceased having worked with mobile crawler cranes, mobile telescopic cranes and mobile hydraulic telescopic boom cranes. She accepted that the deceased was a vastly experienced mechanical fitter and that the responses from his previous employers showed that they had high regard for his skill, competence and attitude to health and safety.

[73] In conclusion, witness Martin stated that it was her opinion that Stewart Clark had not intended to deploy the fly jib and that his intention had been simply to remove the cab end pin in an effort to obtain better access to the hydraulic hoses. She was of the opinion that there was no need for a risk assessment for changing a hydraulic hose.

Submissions on Reasonable Precautions and Defects in System of Work

[74] On behalf of the family, it was submitted that there were 3 reasonable precautions which, had they been taken, might have avoided the accident resulting in a death. The first was that it would have been a reasonable precaution for Clark to have replaced the hose by removing the pipe clamp on the side of the boom to lower the hydraulic hoses and thus gain access to the leaking hose without having to move the fly jib out of the way. Had that been done, the accident would have been avoided. Witness Lang had explained that that was the method he would have used. Clark was not aware

of this option which it was submitted would have been the safer option. Witness Gostick in his evidence explained that the advantage of using this method to gain access to the hose was that it removed all the risks associated with moving the fly jib.

[75] The second reasonable precaution suggested by Mr Ross on behalf of the family was that it would have been a reasonable precaution for Clark to ensure that the central retaining pin was not removed once the cab end pin had been removed. It was accepted that this would only apply if the Court was satisfied that Clark was aware that the central pin was being removed.

[76] The third reasonable precaution would have been for GGR to have ensured that the service engineer sent to carry out the work was trained and competent in relation to the MC805.

[77] With regard to the system of working, it was submitted on behalf of the family that there were defects in the system of working employed by GGR which contributed to the accident resulting in the death. There was a requirement in terms of The Provision and Safety of Work Equipment Regulations 1998 and the BSI Standards (Code of Practice for the Safe Use of Cranes) for maintenance personnel to be fully conversant with the machinery they were required to maintain. The Court was invited to find that the training provided to Clark was insufficient in that he had not been provided with sufficient training by a suitably qualified trainer in relation to the safe deployment of the fly jib. It was accepted that it required to be demonstrated that the defects in the system of work contributed to the accident resulting in the death in order for it to be open to the Court to make such a finding. It was submitted that Clark was not aware prior to

attending the site that the hydraulic hose was obstructed by the fly jib even although this was apparent from the photographs that were sent to witness Lang by witness Hollis. Clark was given no guidance as to how to go about the task. The Court was invited to accept that the existence of the defect in the system of work had therefore contributed to the accident. The result of the defect was that Clark was not trained and competent to work on the MC805 crane because he had not been adequately trained to identify the availability of the alternative procedure using the removal of the clamps holding the pipes to the boom.

[78] It was submitted that the fact that Clark had not intended to fully deploy the fly jib did not mean that he did not require to be trained to do so. It was submitted that the task of changing the hydraulic hose did not exist in isolation in at least 2 respects: the hose was not isolated but was a component part of a much more complex piece of machinery; and it did not exist in isolation in the sense that it took place in the context of a large infrastructure project in which there was clear potential to come into contact with other employees from other companies, who might foreseeably try to assist. The risk assessment carried out by GGR identified the process of setting up a fly jib of attachment as being high risk. In terms of severity of the hazard, the most likely outcome was identified as a fatality. The risk assessment identified that machine operators and maintenance staff were at risk of falling objects and the measures identified as necessary to control the risk included that operators must receive sufficient information, instruction, training and experience before attempting the operation. In failing to ensure that Clark was properly trained in the operation of the fly jib

attachment it was submitted that GGR had failed to follow their own risk assessment and it was submitted on behalf of the family that, on the balance of probabilities, this failure contributed to the accident.

[79] The Crown invited the Court to make a finding to the effect that a reasonable precaution which might reasonably have resulted in the death or any accident resulting in the death being avoided was not to remove the middle or pivot pin at a time when no other pin would be securing the fly jib to the boom of the crane. The Crown's position was that the evidence pointed to the deceased having removed the central pin and to his having done so without appreciating the inherent danger. With regard to Mr Clark's training, the Crown's position was that what he did was not of itself unsafe. Accordingly, the Crown's submission was that it would not be appropriate to make a finding relating to Mr Clark's training in terms of Section 26(2)(e).

[80] With regard to the issue of whether there were any defects in any system of working, the Crown did not invite the Court to make any such finding. Reference was made to Sheriff Kearney's Determination dated 18 January 1986 into the death of James McAlpine, which is referred to at paragraph 8-99 of the Third Edition of Sudden Death and Fatal Accident Inquiries by Ian Carmichael. Sheriff Kearney commented that "The Court must, as a pre-condition to making any such recommendation, be satisfied that the defect in question did in fact cause or contribute to the death." The Crown's position was that if the Court was satisfied that the deceased was not instructed to remove the central pin, and had not agreed such a course of action with Mr Clark, then there was no

evidential basis to conclude that the deceased's actions formed any part of a system of working and that rather they might be characterised as an unexpected intervention.

[81] In the submissions on behalf of GGR, reference was again made to Sheriff Kearney's analysis of what was required before a Court could identify a reasonable precaution whereby the death or any accident resulting in the death might have been avoided. The Court was invited to conclude that the pin must have been removed by the deceased in circumstances where there was no reasonable basis upon which to conclude that Clark was aware, or ought to have been aware, of the actions of the deceased. It was submitted that Clark was competent to replace a hydraulic hose in that he had received appropriate training to undertake that task. The steps which he took on site to gain access to the hydraulic hose were appropriate and within his competence. Accordingly, the Court was invited to accept that there were no reasonable precautions which might have been taken by GGR which, had they been taken, might realistically have prevented the accident. Equally, it was submitted that there were no defects in any system of work of GGR relevant to the circumstances of this case.

[82] The submissions on behalf of FCBC were to the effect that the cause of death was the deceased's removal of the central pin, thereby causing the fly jib to fall on him. It was submitted that there was no evidence that would justify any finding critical of FCBC and there were no recommendations that fell to be made in terms of Section 26(1)(b) insofar as they might relate to FCBC.

[83] Finally, on behalf of Stewart Clark, it was submitted that the method chosen by Clark to gain access to the hydraulic hose was not the cause of the accident but simply

formed part of a chain of events leading up to it. It was submitted that gaining access by moving the fly jib was not an unreasonable method of approaching the task. It was simply an alternative method of accessing the hoses.

[84] With regard to Clark's training and competence, it was submitted that there was no evidence from any source that the provision of further information or training to Clark would have caused him to do anything differently on 28 April 2016. It was accepted that Mr Gostick had given evidence that he would have expected a maintenance engineer moving the fly jib to have been fully conversant with the procedure for setting up the fly jib. His evidence was that Clark was not trained or competent to set up the fly jib. However, in having regard to the requirements of Section 26(2)(e) and (f), there was no evidence before the inquiry that additional training or competency on the part of Clark would have caused him to do anything differently. Witness Martin's evidence was that Clark was competent to remove the cab end pin, and that removing the cab end pin was a reasonable and safe step to take.

Discussion and Conclusions

[85] Before addressing the issue of whether there were any reasonable precautions that might have prevented the accident, or any defect in any systems of work, it is necessary to attempt to establish what caused the fly jib to fall from the crane. There are 2 questions that require to be considered: (1) how did the central pin come to be released; and (2) did Stewart Clark play any part in that?

[86] In relation to the first question, I am satisfied that the pin was removed by someone immediately before the fly jib fell to the ground. I discount the possibility that the pin had already been removed prior to the boom being lowered by Stewart Clark. I also discount the possibility that the pin fell out as the boom was being lowered. With regard to the former, I am satisfied that if the pin had already been removed or had fallen out prior to the boom arm being lowered, this would have been noticed by witnesses Clark and Hollis or by the deceased himself. The pin would have been hanging on a chain below the boom arm and this would have been visible to all concerned. In addition, I am satisfied that if the pin had been detached before the boom arm was lowered, the fly jib would have fallen off during the process of lowering the boom arm. The other possibility is that the pin had not fallen out prior to the boom arm being lowered but was not fully secured and then fell out as the boom arm was lowered. However, I am satisfied that if that had happened then again the fly jib would have fallen off during this operation. Equally, I do not think there is any question of the boom having been successfully lowered with the fly jib in place and for the pin then to have fallen out while the boom arm was in a horizontal position parallel to the crane's tracks. The bend in the pin would have made it difficult to remove and would have made it unlikely that the pin would have fallen out. In any event, for any of those scenarios to be the possible explanation for what happened, someone at an earlier stage would have had to deliberately turn the central pivot pin through 180° before it could have been removed or fallen out. Having done so, that person would then, for some unknown reason, have left the pin in position.

[87] For all of the above reasons, I am satisfied that the central pivot pin was removed by someone immediately before the fly jib fell from the crane. By a process of elimination, I am also satisfied that the pin was removed by the deceased. There were only 3 persons who could have removed the pin: Stewart Clark, Lucas Hollis or the deceased himself. I accept the evidence of Lucas Hollis and Stewart Clark that they did not remove this pin. Accordingly, the only other person who could have been responsible for removing the pin was the deceased. This is also consistent with the evidence about Stewart Clark's position near the tracks of the crane immediately after the fly jib had fallen to the ground, the position of the deceased on the ground and the position of the large spanner which is likely to have been used by the deceased to assist him in removing the central pin. Regrettably, the only conclusion that I can reach is that the reason the fly jib struck the deceased was because he was positioned underneath the fly jib at a point near the centre of the fly jib where he was engaged in removing the central pivot pin.

[88] The question which then requires to be addressed is whether Stewart Clark played any part in the deceased's decision to remove this pin. Stewart Clark's own evidence was that he did not ask the deceased to remove the pin and did not know that the deceased intended to do so. On behalf of the family, it was submitted that there were 3 reasons why Stewart Clark's account should be rejected: Stewart Clark's proximity to the deceased when the pin was removed; the evidence as regards to the level of interaction between the deceased and Stewart Clark; and the inconsistency between the deceased removing the pin on his own initiative and the evidence about the

deceased's skill, competence, experience and temperament. I accept that it is appropriate to attach significant weight to these factors. However, on balance, I am not persuaded that I can make a finding that the deceased's removal of the pin was done at the instigation of, or with the acquiescence and knowledge of, Stewart Clark. I reach that conclusion principally because I am satisfied that these factors are not sufficient to enable me to reject Stewart Clark's description of events. Although it is clear that he did not fully understand the system for partially or fully deploying the fly jib, he has been consistent throughout in displaying an understanding that there were only 2 pins securing the fly jib to the boom arm and that the process of deployment involved the removal of only one pin. In those circumstances, he would not have asked the deceased to remove a second pin, or acquiesce in its removal by the deceased.

[89] Of the 3 reasons advanced for rejecting Stewart Clark's evidence, the third is arguably the least convincing. I accept that the deceased was a very skilled and experienced mechanical engineer. However, given that he removed the central pivot pin, that must mean that he did not appreciate the significance of this pin whether or not he did so on his own initiative or because he was asked to remove the pin by Stewart Clark. It is certainly true that he was entitled to rely on the fitter from the hire company being competent to work on the crane but that does not mean that he would have agreed to remove the central pin knowing that it should not be removed. The fact that he removed the pin means that the evidence about his experience and attitude to health and safety issues is essentially neutral when it comes to assessing whether he removed the pin on his own initiative or at the behest of Stewart Clark.

[90] The evidence of witnesses about the deceased and Stewart Clark working together is relevant but not determinative. It is clear from the evidence that the deceased was present, did have conversations with Stewart Clark and was involving himself. That would clearly give witnesses the impression that they were working together but is not inconsistent with Stewart Clark's evidence that the deceased chose to involve himself without being invited to do so or without being told what to do.

[91] Arguably the one piece of evidence that is difficult to reconcile with Stewart Clark's account concerns the position Stewart Clark must have been in when the deceased was removing the pin. He would only have been about 1.5 metres from the deceased and it is difficult to understand how he could have been unaware of what the deceased was doing especially if the deceased was using a spanner and banging on the pin to effect its removal. On the other hand, Stewart Clark's evidence is that he had his back to the deceased and was otherwise engaged when the pin must have been removed; and there is no doubt that he and the deceased were operating in what would be a very noisy environment.

[92] I am satisfied on a balance of probabilities that the deceased removed the central pivot pin. I accept that there is a possibility that Stewart Clark may have played a part in the deceased deciding to remove that pin but I cannot make a finding of fact to that effect.

[93] The above conclusion necessarily has an impact on my findings in relation to reasonable precautions and my conclusions as regards the system of work. If the deceased removed the central pivot pin on his own initiative, the reasonable precaution

that would have prevented the accident and therefore his death would have been not to remove that pin. If Stewart Clark played any part in the decision to remove the central pin, then it would have been a reasonable precaution for Stewart Clark to have ensured that the central pin was not removed and it would have been a reasonable precaution for GGR to have ensured that the service engineer sent to carry out the work was trained and competent in relation to the operation of this particular crane. However, as I am not satisfied that Stewart Clark did play any part in the decision to remove the central pin I have not identified these as reasonable precautions which might have prevented the accident because his lack of training did not contribute to the accident happening.

[94] That still leaves the issue of whether it would have been a reasonable precaution for Stewart Clark to have replaced the hydraulic hose by removing the pipe clamps on the side of the boom rather than moving the fly jib attachment. On this matter, I agree with Mr Gostick that lowering the hydraulic pipes and hoses to gain access to them was an inherently safer method of gaining access as opposed to moving the fly jib. Having said that, I can understand why Stewart Clark tried in the first instance to gain access by moving the fly jib. The fly jib was in the way and, given there was a method of safely moving the fly jib, I do not think it unreasonable for him to have chosen that method of gaining access to the hoses. He was not aware of the alternative method of gaining access by removing the clamps fixing the metal pipes to the boom arm. I do not criticise him for not identifying this as being the more appropriate method of gaining access to the hydraulic hoses. This was clearly down to his lack of experience. Nevertheless, with the benefit of hindsight, it is clear that this was the preferred method of gaining access to

the hoses and was the one that should have been utilised in preference to partially deploying the fly jib. Accordingly, it would have been a reasonable precaution which, in the circumstances of this case, would have avoided the accident and therefore the death.

[95] This conclusion on my part has not led me to identifying any defects in the system of work which contributed to Stewart Clark deciding to move the fly jib to gain access to the hydraulic hoses. GGR have been criticised for not ensuring that Stewart Clark received sufficient training in the operation of the crane. However, those criticisms essentially relate to the lack of training and experience in relation to the deployment of the fly jib. There was no evidence before me to suggest that if Stewart Clark had received technical training from the crane manufacturer or from a competent trainer who had received model-specific training from the manufacturer, that this would have had any impact on his approach to identifying the best method of gaining access to the hydraulic hoses. Stewart Clark was clearly qualified to remove a hydraulic hose, and if he had received model-specific training in relation to the operation of this crane, he would have been competent to fully deploy the fly jib. Failing to identify that there was an alternative method of gaining access to the hydraulic hoses was, in my opinion, simply down to his lack of experience and did not result from a defect in a system of working.

[96] This was a tragic accident. I can understand why Mr Cousin's family might believe that he would not have removed the central pin on his own initiative. I can therefore understand why they might be critical of Stewart Clark's competence and the training provided to him by his employers. However, on balance, I am not persuaded

that he instigated or acquiesced in the removal of the pin. Accordingly, the criticisms of his training, while justified, cannot give rise to a finding of a defect in a system of work because any such defect would not have contributed to the cause of the accident.

Recommendations

[97] Given the critical importance of not removing the central pin until the front of the fly jib is secured to the front of the boom arm, and the likely fatal consequences if this is not done, it is arguable that there ought to be some form of warning attached to the pin alerting anyone contemplating its removal not to do so without first checking that it is safe to do so. No evidence was led at the inquiry about the use of warning labels or notices on hazardous equipment. Accordingly, I am not in a position to fully assess the implications or practicalities of recommending that there should be some form of warning attached to the pivot pins on cranes of the type that featured in this case. However, I am satisfied that there is at least a case for recommending that consideration should be given to at least examining the case for such warnings to alert operators of the dangers associated with certain operations.

[97] When making a recommendation, I am required by the Fatal Accident Inquiry Rules to set out clearly the person to whom the recommendation is addressed. Although I raised the possibility of making such a recommendation with participants, I was not addressed on to whom any such recommendation should be addressed. I am aware that Regulation 24 of the Provision and Use of Work Equipment Regulations 1998 requires that every employer should ensure that work equipment incorporates any warnings or

warning devices which are appropriate for reasons of health and safety. However, I cannot address my recommendation to every employer, or to every manufacturer of cranes. I have therefore identified those responsible for producing the BSI Code of Practice for the Safe Use of Cranes as the persons to whom my recommendation should be addressed in the first instance.