

**INQUIRY UNDER THE FATAL ACCIDENTS AND SUDDEN DEATH INQUIRY ACT HELD
ON 11 MARCH 2004 INTO THE DEATH OF JOHN KELLY**

SHERIFFDOM OF GLASGOW AND STRATHKELVIN AT GLASGOW

**INQUIRY HELD UNDER FATAL ACCIDENTS AND SUDDEN DEATHS INQUIRY
(SCOTLAND) ACT 1976**

SECTION 1(1)(a)

SECTION 1(1)(b)

**DETERMINATION by WILLIAM HOLLIGAN Esquire, Sheriff of the Sheriffdom of
Glasgow and Strathkelvin following an Inquiry held into the death of JOHN KELLY,
date of birth 27 August 1965 who resided at 129 Crofton Avenue, Croftfoot, Glasgow.**

GLASGOW, 11th March 2004.

The Sheriff, makes the following Determination:

[1]That pursuant to section 6(1)(a) John Kelly, date of birth, 27 August 1965, residing at 129 Crofton Avenue, Croftfoot, Glasgow died on 30 August 2001 at 8.50 am within the Victoria Infirmary Hospital, Glasgow as a result of an accident that occurred at his workplace on the same date shortly after 8.00 am at Glasgow City Council, Land Services Dept, Kingspark Depot, 325 Carmunnock Road, Glasgow.

[2]That pursuant to section 6(1)(b) the cause of death was multiple chest injuries caused by having been struck by a mower on a T44 Hayter, Beaver Grass Mower driven by Alan Smillie, an employee of Glasgow City Council.

[3]That, pursuant to section 6(1)(c) the following are reasonable precautions whereby the accident might have been avoided:-

(a)Regular inspections of the cable for any defects;

(b)Replacement of the cable (and not repair) should any defects have been found;

[4]That pursuant to section 6(1)(d) the following are defects in the system of working which contributed to the accident resulting in the death:-

1.Reliance upon drivers reporting a "sticky" pedal;

2. Absence of a system of work in which drivers would regularly inspect cables for any defects and for cables to be the subject of routine maintenance checks.

[5] That pursuant to section 6(1)(e) the following facts are relevant to the circumstances of the death:-

(a) There was a design defect in the T44 which led to over-articulation of the cable outwith the manufacturers' specification.

(b) There was poor control of the manufacture of the articulated joint between the swivel sleeve and bulkhead hub.

(c) There was no recent training of employees of the Council in the carrying out of emergency stops on the T44.

(d) No information was given to the Council that the cable be subject to regular inspection for damage and that it should be replaced and not repaired if found to be at all defective.

NOTE:

Introduction:

[1] In this Fatal Accident Inquiry the following parties appeared and were represented:-

Procurator Fiscal Depute: Mrs Holligan;

Mr Kelly's family ("the family"): Mr Eodanable;

Hindle Controls Ltd ("Hindle"): Mr Constable;

Glasgow City Council ("the Council"): Miss Kerr;

Hayter Ltd ("Hayter"): Mr Grant.

I heard evidence over the following days: 15 - 17 December 2003 and 19 - 23 January 2004.
I heard evidence from the following witnesses:-

Alan Smillie, Kenneth Coyle; Mark Burns, James Stewart, Samuel Callaghan, David Nelson, Alan Gray, John Tuttle, James Robertson, Gordon Graham, Scott Dark, Simon Pearce, Fraser McNeill, Thomas Cowan, Jack Aikman, William Paton, PC Leckie, William Reilly, Dr Stewart Arnold, Dr Stephen Joel, Peter Swift and John Alexander.

[2]The parties entered into two Joint Minutes which agreed the use and contents of certain documents and photographs. The time and place of death and the terms of the post mortem were all agreed.

The Machinery and the Parties:

[3]The accident to which this Inquiry relates involves a T44 Beaver mower which I will refer to as the "T44" manufactured by Hayter. It is a grass cutting machine. Crown Production No. 1 contains a number of photographs of the T44 involved in the accident. In summary, the T44 can be driven on the road. It has a cab in which the driver sits. It has cutters both to the front and side which can be raised and lowered from the cab. The control panel is situated to the right of the driver's seat. Amongst other features it has a throttle which regulates the engine speed. The throttle is also to the right of the driver's seat and is operated by a handle. The control panel has a picture of a hare and a tortoise respectively, signifying full and low power. The ignition key is also to the right of the driver. There is a conventional steering wheel and to the right of the steering wheel, and alongside it, is a parking brake which is also referred to as an emergency brake. Unlike a motor car there is no foot-brake. There are two pedals on the floor: one is for forward motion; the other for reverse. The T44 has integrated hydraulics which both steer and drive the vehicle. (The system used in the T44 is similar to that involved in forklift trucks). Both the forward and reverse pedals are connected to the same drive pedal linkage housed under the cab floor. The traction control cable controls this linkage to a lever on the hydraulic transmission pump in the engine compartment behind the driver. It is the flow of hydraulic oil which determines the direction of travel. Pressing either footpedal causes the pedal linkage to move which produces either a pull or push action on the traction cable. The cable itself comprises a flexible inner cable which travels within a flexible outer cable. At each end is a swivel tube which is secured to the bulkhead by a retaining groove. When neither pedal is depressed the vehicle is in neutral. When the pedal is depressed hydraulic oil is directed in the appropriate direction causing the vehicle either to move forward or in reverse, depending upon which pedal is pressed. It is clearly essential to the proper functioning of this system that the cable is free to move. It is accepted that the cable in question was manufactured by Hindle, under licence from Morse Controls Ltd.

The Accident:

[4]Crown Production No. 13 is a diagram of the courtyard where the accident occurred. It also shows the position of a number of Council employees present when the accident occurred. Although there were minor discrepancies as to where certain of the witnesses were standing at the relevant time (in particular David Nelson and Samuel Callaghan) I do not think that they are material. All of the witnesses were in general agreement as to the sequence of events. The Kingspark Depot has a courtyard with a gate at one end and an archway entrance at the other. At that time, mowers, including "sit-on" or "drive-on" mowers, were kept within the courtyard. Employees were given their instructions for the day. They selected their machines and carried out such maintenance on the machines as they had been instructed to do. The general time for starting work in the morning was 8.00 am. On the morning of 30 August 2001 at approximately 8.00 am, Alan Smillie was to drive the T44. It was parked facing the wall towards the top right hand corner of the courtyard as shown in Crown Production No. 13. Mr Smillie's intention was to reverse the T44 between the flam vaults (shown on the right hand side of the drawing) and then proceed forwards through the archway in order to re-fuel the vehicle. Mr Smillie was familiar with the T44 and used it during the summer months. He had parked it in the courtyard the day before and it remained in that position. Mr Smillie had had no problems with the vehicle. Mr Smillie checked the cylinder mowers and oil levels and greased certain of the nipples. He also inflated one of the back tyres which seemed flat to him. He did not check the cable. There is a store room located in the middle of what I will describe as the bottom wall of the courtyard shown in photograph No. C (Crown Production No. 1). The store room is kept secure by two metal gates which open out into the courtyard itself. The gates are attached to metal gate posts. On the morning of 30 August 2001 there were a number of employees moving around the courtyard. I will refer to this feature later on in this Note. The store room was the responsibility of Mr Coyle who was on duty that morning. Mr Kelly reported a fault in his machine which it was Mr Coyle's duty to note and report to the depot at Polmadie. Mr Kelly had reported the fault to Mr Coyle and was in the process of walking away from Mr Coyle. Mr Coyle was near the entrance to the store room. Mark Burns and James Stewart, two apprentice gardeners, were also at the store room awaiting distribution to them by Mr Coyle of waterproof equipment.

[5]Mr Smillie got into the T44 and turned on the ignition. He set the throttle at full power. Mr Smillie depressed the reverse pedal and the vehicle began to move backwards. Mr Smillie was looking over his right shoulder which would be consistent with his intention to reverse between the flam vaults on the right hand wall. He took his foot off the reverse pedal. The vehicle did not stop or slow down as he expected it to do. He put his foot on the forward pedal but the vehicle continued to go backwards. Initially, Mr Smillie was heading in the direction where Mr Monaghan and Mr Callaghan were standing. Both Mr Smillie and Mr Callaghan described how the vehicle turned to the left. Mr Smillie described the feeling of fear and Mr Callaghan described Mr Smillie as looking "flustered and panicked". The evidence of Mr Tuttle was to the same effect. Mr Smillie was trying to avoid colliding with the men standing in the courtyard. Mr Smillie did not attempt to bring the vehicle to a halt by switching off the ignition or by using the parking brake. The vehicle continued to move backwards and headed towards the store room. Mr Burns was struck either by the cage or the vehicle (he was not sure which). Mr Coyle was also struck. The evidence is that Mr Kelly was struck by one of the mowers of the machine and was crushed between the mower and the metal gatepost. The machine continued into the store room coming to rest amongst a number of machines stored inside. The distance which Mr Smillie travelled between commencement of the manoeuvre and the collision with Mr Kelly was approximately 10 metres. Mr Coyle and Mr Callaghan described the engine noise of the T44 as being different

from what it usually sounded, running at a higher pitch. Most, if not all, of the eye-witnesses to the accident were unanimous that the whole incident happened very quickly.

Understandably no one could give a precise calculation but the duration of the journey and the event itself was measured by the eye-witnesses in seconds. With some difficulty Mr Kelly's colleagues were able to retrieve him from between the mowers and the gatepost. He was put in the recovery position and an ambulance called. The ambulance arrived and Mr Kelly was taken to the Victoria Infirmary where he was pronounced dead at 8.50 am. Police also arrived at the scene. The relevant area was cordoned off. Mr Reilly, an inspector with the Health & Safety Executive (which I will refer to as the "HSE") arrived. Having been informed as to what had happened he decided that he required specialist assistance from colleagues in order to determine why the T44 had failed to stop.

[6]I will say more about the work done by the HSE later in this Note but, at this point, it is sufficient for me to say that the HSE came to the view that the accident occurred following the failure of the cable. Investigations were carried out as to its manufacture and use in the T44 machine. Sometime after the accident a meeting was convened in Buxton including representatives from the HSE, Hayter and Hindle. Following that meeting, and at the request of the HSE, Hayter issued a safety bulletin dated October 2001 (Crown Production No. 6) which informed owners and users of the need to inspect and, if appropriate, replace defective cables. No evidence was led from either Hindle or Hayter and therefore the Inquiry must rely upon the evidence, mainly of the HSE witnesses, as to the state of mind of Hindle and Hayter. Crown Production No. 5 is a document produced by Morse Controls Ltd which shows that Morse Controls Ltd were aware of the need for regular checks of cables and that, when in doubt, the cable should be replaced, not repaired. Mr Constable referred to the cable as a "catalogue" item. The document from Morse Controls Ltd clearly assumes a marine application. It was not suggested that the use by Hayter of such an item was itself incorrect. However, according to Dr Arnold, Hayter were unaware of the need to keep the cable within a certain alignment (see later) and there is nothing in the lengthy Service and Operators' Manuals supplied by Hayter to the Council which suggests any particular requirement that the cables be inspected on a regular basis. The plant controller at the Council's Polmadie workshop (Mr Robertson) said he had no knowledge of any need to ensure a regular check of the cables and had he so known he would have included this in the regular 200 hour service of the T44. At that stage cables were inspected by the Council if a driver reported the pedal becoming "sticky".

Training:

[7]Two issues concerning training arose. The first concerns the training given to Mr Smillie; the second concerns the training given to the mechanics employed by the Council.

Crown Production No. 11 is the training record of Mr Smillie. The record was spoken to by Mr William Paton, employed by the Council at its Daldowie complex as a training instructor. It was Mr Paton's task to train operators and mechanics. Mr Smillie was an experienced driver. He had been employed by the Council since 1992. He had attended a number of training courses since 1992, a number of which involved driving "ride-on" mowers. In particular, Mr Smillie, along with Mr John Cairney and David Nelson, were trained in the use

of the T44 at a course on 9 March 2000 run by Mr Paton. Mr Paton said he did remember the course. It was his evidence that he did tell the employees that the emergency brake was a lever and that the vehicle could also be stopped by turning off the ignition. He accepted that he had not asked the employees to perform an emergency stop on the T44. That was because all drivers were trained to do an emergency stop on the first machine. They were not trained to carry out an emergency stop on subsequent vehicles. The training course lasted approximately 3 hours. Mr Paton concentrated upon familiarisation with the machine. Although the drivers did drive around Kingspark, because of poor ground conditions, no grass cutting was possible. Mr Paton was not concerned about this because the drivers were all experienced and needed no training in the operation of grass cutting itself. The Council did not offer any refresher courses at the start of the season. Mr Paton was adamant that he had pointed out the emergency braking features of the vehicle as the T44 did not, like some other machines, have a foot-brake or hand-brake mechanism.

[8]Mr Smillie's evidence was to the effect that he had not seen, or had no recollection of seeing, the operator's manual which ought to have been on a tube in the T44. The manual contains information as to the emergency braking of the T44 (Crown Production No. 4). He was vague about the training he had been given by Mr Paton. I was left with the impression that if he had been told about emergency stopping procedures by Mr Paton it was not something which he had remembered by the time of the accident. Mr Nelson had also been trained on the T44 although, like Mr Smillie, his memory of the training was vague. He did not think he had ever been trained in how to carry out an emergency stop in a grass-cutting machine. Alan Gray's evidence was to similar effect. I do not think the evidence of Messrs Smillie, Nelson and Gray was to the effect that they had never been trained on how to carry out an emergency stop it was more that they had no recollection of being trained on how to do so. On any view of the evidence none of them had been trained on how to carry out an emergency stop on the T44 itself.

[9]In relation to the training of the mechanics it was Mr Robertson's evidence that they received no training on the T44 from Hayter or anyone else. From a mechanical point of view the T44 was, in Mr Robertson's opinion, similar to other machines. The Council did have Service Manuals given to them with the machines (see Crown Production No. 3). There was evidence from Mr Reilly, Dr Arnold and Mr Graham which suggested that there had been some "oral training" from Hayter. There was no direct evidence of this nor is it clear when such training took place, where it took place or who was involved. As I have said, Mr Robertson's evidence was to the effect that the mechanics were not trained by Hayter. I am not prepared to hold that there was any training given by Hayter to Council staff. Even if I had been so minded, I do not think that the evidence permits me to determine what the content of that training was.

The Repair and Maintenance of the T44:

[10]The Inquiry heard evidence as to the repair and maintenance of the T44 whilst it was in the ownership of the Council. Mr Robertson, as plant controller, had been in his position for approximately 4 years. From his enquiries, the T44 involved in the accident had been purchased by the Council in or about 1997. The Council were supplied by the Service

Manual and an Operator's Manual. Although there are differences between certain machines there are certain common features to most machines. The Council employs trained mechanics to carry out repairs and to service the vehicle. As I have said, there was no specific mechanical training given to the Council staff on this machine.

[11]The T44 was fitted with an hour meter. It was serviced every 200 hours. Cables were not part of the routine service. There is no mention in any of the literature given to the Council that the cables should be the subject of routine maintenance, or inspection by the operator. It is the policy of the Council to purchase spare parts from the manufacturer or the manufacturer's recommended supplier. For the T44, at the relevant time, the recommended supplier was A M Russell Ltd ("Russells") now no longer trading. The Council carried out repair and maintenance of the T44 (and other equipment) at the Polmadie work shop and did not, as a matter of routine, send machines back to the manufacturer for that purpose. There was evidence from Mr Gordon Graham, a former employee of Russells, that the Council would only refer to the manufacturer if they could not resolve the difficulty themselves. There is no evidence that this actually happened in the case of the T44.

[12]The Inquiry also heard evidence from the following mechanics based at Polmadie:

Scott Dark, Simon Pearce, Thomas Cowan and Jack Aikman. It also heard from Fraser McNeill, storeman.

The evidence was to the effect that if there was work needed to be done on the T44 this would be recorded by way of a plant job card. The card contains a diagnosis of the fault or faults together with a description of the work done and a note of materials requisition from the Council's stores. The card records the date on which the machine was brought in. There does not appear to be a record kept of when the job was completed or the vehicle sent out.

[13]Scott Dark carried out work on the T44 in or about July 2000. This work is of particular importance as it is clear that it involved removal and replacement of the cable. Mr Dark had not received any specific training on the T44 but he has general experience of such machines and the availability of the manuals and knowledge of more experienced mechanics was sufficient for him, as indeed it was for other mechanics. The relevant job card narrates, under diagnosis, amongst other things, "traction, cable u/s" which Mr Dark explained meant unserviceable. Mr Dark's evidence was that, at first, he tried to clean up the cable by applying WD40 but he was not satisfied with this so he replaced the cable altogether. He requisitioned a cable from stores. There is a purchase order, p 135 of (Crown Production No. 2) and a delivery note, p 141 of (Crown Production No. 2) together with the evidence of Fraser McNeill that the cable was ordered and delivered from Russells. Mr Dark could not say exactly when it was fitted but it must have been some time after delivery on 20 July 2000. Mr Dark was clear that he fitted the cable as supplied. He did not fit a brass coloured sleeve onto the cable and would have noticed had such an item been on the cable.

[14]Further work was carried out on the T44 on 27 July 2000; 26 June 2001; 11 July 2001 and 13 July 2001. Simon Pearce was involved in the work done on all four dates. In the case of the work carried out on 13 July 2001 there were other mechanics also involved on the T44. The first three jobs did not involve working on the cable, the fourth job did. It required disconnecting the cable from the hydrostatic pump (ie not the pedal end). Mr Pearce did not recall anything unusual about the cable. In particular, he did not recall any missing sleeve at the engine end. He had no occasion to look at the other end of the cable. He did not replace the cable and did not alter or tamper with it in any way. Both Thomas Cowan and Jack Aikman also worked on the T44 following the card of 13 July 2001. Mr Cowan had no recollection of working on the cable. He had never seen a cable with a copper coloured end to it. Jack Aikman's work involved changing wheel motors which would not have required him to work on the cable. He had no recollection of working on the cable. Had he seen a bent cable he would have changed it.

Technical Evidence:

[15]The Inquiry heard evidence from a number of experts:

Dr Stewart Arnold, a specialist inspector employed by HSE, specialising in mechanical engineering;

Dr Stephen Joel, also employed by HSE, an expert in metallurgy;

Mr Peter Swift, a senior scientist, also employed by the HSE specialising in mechanical engineering;

Mr John Alexander, a retired police inspector with extensive experience of road traffic matters.

I should also mention the evidence of Mr William Reilly, an inspector of work places and accidents, employed by the HSE. Mr Reilly was called to the scene of the accident. As I have said, it became clear to Mr Reilly at an early stage in his investigation that he required more specialist help. He called for Dr Arnold who arrived the same day. In his evidence Mr Reilly, quite properly, deferred on technical matters to the views of his specialist colleague. With no disrespect to Mr Reilly I shall concentrate on the views of Messrs Arnold, Joel and Swift. Before doing so there is one aspect of Mr Reilly's evidence to which I will refer. The evidence from the Council employees was to the effect that the method of work in the courtyard at the time was for employees to collect their machines from within the courtyard area before starting work. These machines included both ride-on and push varieties. The impression I gained from this evidence was that the courtyard was a busy area first thing in the morning. It occurred to me that this system of work might have been relevant to the Inquiry. Driving a number of vehicles in a congested areas might have produced hazards. Mr

Reilly said, at the time, the HSE had no one skilled on workplace transport. I assumed from that Mr Reilly did not feel that he had sufficient expertise in this particular area. However, in any event, he concluded that, as Mr Kelly had not been in the courtyard area at the time, the state of the courtyard was causally unconnected with the accident. Given that Mr Smillie's evidence was that he was, at one point, trying to avoid colliding with employees in the courtyard, I am not sure that I agree. However, the Inquiry was told that the practice as to where the ride-on mowers are parked has now changed and as the evidence in this issue is relatively sparse I will say nothing further about it.

[16]As I have said, at an early stage, attention was directed to the cable which was critical to the functioning of the forward and reverse movement of the vehicle. Under the supervision of Dr Arnold, Mr Graham of Russells removed the cable. It was the evidence of both Dr Arnold and Mr Graham that when they did so the lever went back to its normal neutral position. The cable (Crown Label No. 1) was sent for testing at the HSE's laboratory in Sheffield. It was there that Dr Joel carried out a number of metallurgical tests, not only on the failed cable but also on a number of other similar cables supplied to him. Dr Arnold produced a report (Crown Production No. 7) as did Dr Joel (Crown Production No. 8) and Mr Swift (Crown Productions Nos. 9 and 19). As I understand the evidence, Dr Arnold was regarded as the senior specialist HSE inspector who was assisted in his task by Dr Joel and Mr Swift.

[17]At the end of the day I do not think there is any major disagreement as to the mechanism of the accident. Mr Smillie drove the T44 in reverse intending to turn the vehicle so as to exit the courtyard. He took his foot off the reverse pedal which ought to have brought the vehicle to a halt, the lever returning to neutral. It did not stop, the cable became stuck and by pushing the forward pedal this caused the cable to buckle, jamming it in reverse. In his report, and relying partly upon work as done by his colleagues, Dr Arnold put forward two possible scenarios as to why the cable jammed. The first scenario was to the effect that a nut fell into a gap between the lever and the pump casing causing the lever to jam in reverse. The inner wire then buckled when the pedal was depressed. Dr Arnold and Mr Swift both discounted this theory. There was no evidence of any nut or other object being present; the lever returned to neutral when the cable was removed which suggested that there was no obstruction; there was, relatively speaking, a long distance for a nut to travel to become jammed. I should add there was an error in Dr Arnold's report at paragraph 5.1 in which the distance was described as 125 cm when it should have been 125 mm. The second scenario was to the effect that the cable became stuck in reverse because of internal friction and wear between the inner cable and outer cable. There was evidence that there were no seals on the cable which would have allowed dirt and other material to build up. Pressure on the forward peddle caused the wire to buckle, jamming the cable in the reverse position. It seems to me that, this is how the vehicle became stuck in reverse. I did not understand any of the parties to offer any alternative explanation as to the underlying mechanism of the accident.

[18]A greater difficulty is the issue as to the factors which contributed to these events. It is clear that the cable removed from the vehicle did not have swivels fitted to the bulkhead at either end. At the engine end there was no swivel at all and at the pedal end there was a brass coloured swivel which was not attached to the bulkhead but was seized onto the cable some distance from where it should have been had it been attached to the bulkhead. Dr

Arnold and Dr Joel were both clear that, in their opinion, the swivel was not part of the manufacture. There was no direct evidence from either Hayter or Hindle. There was hearsay evidence from Dr Arnold as to the meeting which he attended in Buxton during which representatives from Hindle and Hayter said that the brass swivel was not part of their manufacture. Mr Graham said that, to the best of his recollection, he had not seen a swivel that colour. The swivel was unlike any of the others that Dr Joel had tested. Dr Joel was of the view that it was a piece of stock brass tube. It was not the same dimensions as other swivels; there was no proper flare to enable it to be attached to the bulkhead. All of the foregoing leads me to the conclusion that the swivel was not part of the original manufacture. The presence of the swivel was crucial. I quote from paragraph 6.2 of Dr Arnold's report:-

"6.2 If the cable failure was caused by internal resistance on the cable and the swivel tube had been in place, it is likely that the force applied on the forward footpedal by the driver would have been sufficient to overcome any internal resistance. Hence the cable will have functioned satisfactorily since buckling of the inner wire would have been prevented by the swivel tube. The Morse cable catalogue indicates that the given cable should be able to function with a maximum push force of 18.1 kg (177 Newtons) with the swivel tube in place. The HSL results shows that it only requires a force as low as 23 Newtons to cause the inner wire to buckle with no swivel tube present."

"HSL" is a reference to Health & Safety Laboratories. In other words, had the swivel been in place then in all probability the cable would not have jammed in reverse. Mr Dark gave evidence that he fitted a new cable sometime in July 2000, presumably after the cable had been delivered on 20 July 2000. I have no reason to believe that the cable would have been other than as manufactured. Otherwise, it must follow that Mr Dark fitted a cable which was not as manufactured, something he said he would not have done. The evidence of Mr McNeill is consistent with the part having been ordered from Russells and delivered to Mr Dark when it became available. The T44 remained in the control of the Council between July 2000 and the date of the accident. Repair and maintenance work was carried out by the Council staff from the Polmadie workshop. On a balance of probabilities it seems to me that between the cable being fitted in or about July 2000 and August 2001 someone fitted the brass swivel. I am not in a position to find who it was or when it was done but the only reasonable explanation is that it was done by someone employed by the Council. No one else would have had reason to have charge of the T44 nor do any work on it. There was no evidence before me to suggest that anybody else had access to the machine or that work had been carried out on it by anybody other than the Council.

[19] There are other features relating to the cable. There was evidence from the relevant experts that Morse Controls Ltd recommended the cable should be used within an articulation of 8 degrees. As I understand it, from its position as secured to the bulkhead, the cable should not have moved more than 8 degrees in any one direction. The evidence was that the cable was moving within anything up to 13 degrees. Again, although there was no direct evidence for this from either Hayter or Hindle, the evidence from the experts was to the effect that Hayter were unaware of this requirement. There is nothing in any of Hayter's literature concerning the T44 to this effect. Crown Production No. 5 is a document from Morse Controls Ltd which refers to the importance of checking the serviceability of the cable and it specifically refers to the level of articulation. As I have said, Morse Controls Ltd

anticipated use of the cable in a marine environment. Dr Arnold did not think that the cable was, of itself, unsuited for use in the T44. However, such limited evidence as does exist, suggests to me that Hayter were unaware that the manufacturer's specification required a degree of articulation less than 8 degrees. Dr Arnold did not seem to think that excessive articulation was other than a secondary cause of the accident. However, he did say that over-articulation would increase the rate of wear and tear on the cable and therefore increase the risk of removal from the bulkhead. As I understand his evidence, Dr Arnold, quite properly, felt unable to say that over-articulation and the potential manufacturing issues identified by Dr Joel were causally relevant in the accident because by then the original swivel had been replaced. However, I did not understand him to demur from Dr Joel's conclusions on this issue nor the consequences thereof. Mr Swift was also of the view that over-articulation would lead to a greater resistance to movement. Dr Arnold also said that over-articulation would increase the likelihood of the cable buckling. An additional factor was Dr Joel's evidence as to the flanges which he tested on the cables other than Crown Label No. 1. Dr Joel found that in a number of these cables the swivels came away from the bulkhead hub. At paragraph 7.5 of his report he concluded:-

"In the case of the articulated joint between the swivel sleeve and the bulkhead hub on the Hindle cables, the dimensions of the swaged retaining groove have been poorly controlled and this had led to instances, even in one case when the nominally new cable, where the pull-out force did not meet the specified minimum."

As I understand Dr Joel's evidence the swivel was attached to the bulkhead hub by way of a groove. He found that, in a number of cases, the swivel did not remain in the groove and came out with application of a force well below the specified minimum. The implications are obvious. Swivels might well be detached from the bulkhead, but secondly, Dr Joel found that on examination of a number of swivels the nickel plating had cracked allowing the brass substrate to fail through a progressive corrosive mechanism. The purpose of the nickel plating was to provide protection from corrosion. As I understand it, over-articulation of the joint could have caused the protective nickel coating to crack allowing corrosion to set in and that corrosion would permit the joint of the flange to fail. Dr Joel could not of course say this had occurred in relation to Crown Label No. 1 because there was no swivel at the engine end and, as I have already found, the swivel at the pedal end was not part of the original manufacture. However, Dr Joel's findings seem to me to be relevant. I go no further than to say it is a possible explanation as to why the swivels on Crown Label No. 1 did come off in the first place. Furthermore, as Dr Arnold commented, the cable is a safety critical feature of the T44. Evidence which relates to the safety of the cable involved in this accident is relevant to the Inquiry. I should add that it was Dr Joel's evidence that the only way in which the original swivel could have come off the cable was if it had split down its length or if someone had removed it. He regarded the former as most unlikely and I agree.

[20]The second aspect of the technical evidence concerns the question whether Mr Smillie might have been able to avoid the accident by stopping the vehicle before the collision. The Inquiry heard evidence from Mr Swift and Mr Alexander. Mr Swift carried out a number of tests using the T44 which had been involved in the accident, fitted with a new cable. I should add that the tests were carried out in January 2004, after the evidence in the Inquiry had commenced. The results of Mr Swift's tests caused Dr Arnold to modify the views he

expressed in paragraph 5.3 of his report in line with Mr Swift's findings. Mr Alexander carried out tests using a different vehicle. He had made several efforts to try and find an identical vehicle but without success. In fairness to Mr Alexander, I have him noted as deferring to Mr Swift's results which, as I have said, involved the use of the T44 itself. The tests involved measuring time and distance at different engine speeds so as to replicate, as far as possible, the situation confronted by Mr Smillie when he undertook his reversing manoeuvre. An allowance also had to be made as to reaction time given the unusual events which confronted Mr Smillie. As Miss Kerr pointed out, Mr Smillie was faced with two such events: firstly, when the vehicle failed to stop after he took his foot off the reverse pedal; secondly, when the vehicle did not go forwards but continued to go backwards. I do not think I need go over all the evidence. There is one aspect which I will mention. The Hayter Manual recommends that the T44 be started with the throttle at 70 per cent of power. On the morning of the accident Mr Smillie started it at full power. As I understand the evidence, the speed of the vehicle is dictated by the interaction between the throttle and the pedal. Given Mr Swift's evidence I do not think I am in a position to say that the selection by Mr Smillie of full throttle, as opposed to 70 per cent of throttle, is such as to have made a critical difference between stopping in time and not stopping in time. The evidence was to the effect that the distance between the commencement of the manoeuvre and the collision was approximately 10 metres, a total of 14.2 metres when one adds in the point at which the vehicle came to rest. During tests the average time taken to travel 10 metres was 4.68 seconds. If one allows something in the region of 3.1 seconds' reaction time to cover both unexpected events it only left Mr Smillie 1.58 seconds to rectify the position. The figures for the reaction time come from Mr Alexander 's opinion and on this point he and Mr Swift were in agreement. Not surprisingly, Mr Swift's conclusion was that Mr Smillie could not have stopped the vehicle in time to avoid the collision.

The Parties' Submissions:

[21] Parties made their submissions to me as to what, if any, determination I should make having regard to the terms of section 6(1) of the Fatal Accidents and Sudden Deaths Inquiry (Scotland) Act 1976 ("the 1976 Act"). Mrs Holligan, Mr Constable and Mr Grant handed up written submissions. Miss Kerr and Mr Eodanable made oral submissions. I will not go into all of the detail of the parties' submissions but summarise them as follows.

In terms of section 6(1)(a), Mrs Holligan proposed that I find that Mr Kelly died on 30 August 2001 at 8.50 am within the Victoria Infirmary Hospital in Glasgow as a result of an accident that occurred at his workplace on the same date shortly after 8.00 am at Glasgow City Council, Land Services Dept, Kingspark Depot, 325 Carmunnock Road in Glasgow. Other parties agreed and I have so determined. The Crown's position was that, in terms of section 6(1)(b) the death was caused by multiple chest injury sustained during an accident caused by the direction control mechanism in the Hayter T44 machine being driven by Mr Smillie jamming in reverse mode whereby the machine struck Mr Kelly fatally injuring him. In terms of section 6(1)(c) a reasonable precaution whereby the accident could have been avoided was if the traction control cable which was fitted to the Hayter T44 machine involved in the accident had conformed with the manufacturers' guidelines.

In terms of section 6(1)(d) I was invited to make three findings of a defective system of work, namely:-

(1) That the training given by the Land Services Department to its operators on the use of ride-on mowers was inadequate and required to be reviewed, and that consideration should be given to:-

(a) Operators being required to perform emergency stop procedures and being trained on the use of a new machine and

(b) The mandatory use of refresher training and the use of machines given the seasonal nature of the work.

(2) That the Service Manual supplied by Hayter relating to the T44 machine was inadequate in that it did not include specific guidance on the maintenance of the traction control cable (a safety critical component).

(3) That the Council was responsible for the maintenance of its machines including in the T44 involved in the accident. That the system of maintenance in place at the time of the accident relating to the maintenance of the cable was inadequate in that it relied on the operator of the machine to report a "sticky" pedal. That Glasgow City Council, Land Services Department should have had a more robust system in place whereby the traction control cable should have been visually inspected and the pedals tested on a daily basis and the cable replaced annually.

In terms of section 6(1)(e) I should find the following two facts relevant to the circumstances of the death of Mr Kelly namely:-

(1) That tests showed the installation design of the traction control cable in the T44 meant that it operated out with the manufacturers' recommended articulation guidelines and

(2) That tests showed that Hindle's swaging process was poorly controlled in that the force required to remove the swivel sleeves on some traction controlled cables was far less than the manufacturers' specification.

For Hindle, it was submitted that no act or omission on the part of Hindle was relevant to the cause of death or the cause of the accident resulting in death. There were no precautions taken by Hindle which would have resulted in the death or accident resulting in death being avoided and there were no defects in any system of working which contributed to the death or accident resulting in the death.

In particular, it was said that the evidence established that the cable involved in the accident was different from that of the original manufacturers.

Secondly, there were material differences apparent in the cable which rendered it unserviceable and dangerous and unfit for use.

Thirdly, it was established in evidence that the traction control cable was being used out with the manufacturer's specification and that this could cause failure of the swivel sleeve during use.

Fourthly, it was not established that there was:-

(1) Any failure on the mechanism used by Hindle Controls to swage joints and cables manufactured by them and

(2) That even if there was such failure, this was not relevant to the cause of death and any accident resulting in the death.

Fifthly, it was established that there was no duty on the part of Hindle to inform customers of the precise nature of the cables manufactured by them and the inspection and maintenance criteria which were applicable.

Sixthly, it was established in evidence that Hayter and the Council were aware of the safety critical nature of the traction control cable and the requirement to regularly conduct visual inspections and to replace the traction control cable where the swivel sleeve was missing or detached.

For Hayter, it was submitted that the absence of specific guidance on inspection and maintenance of the traction control cables in the Hayter Manuals was not relevant to the accident. The Council had an experienced team of mechanics familiar with such traction cables in charge of the Polmadie Depot.

There was evidence to show that the inner cable wire failed to return to neutral when the reverse pedal was released and that the swivel sleeve at the pedal end was detached. There was no evidence to show that either of these things was linked to any over-articulation. The evidence which did exist showed that no other similar incidents had been recorded. Dr Arnold had said at one point in his evidence that it was "marginal" how much more stress over-articulation would place between the flare on the sleeve and the groove in the bulkhead. Hayter had not been informed by the cable designers or manufacturers regarding

maintenance inspection criteria for the cable although Hayter had now produced, in co-operation with the HSE, detailed written guidance.

On behalf of the family it was submitted that I ought to make a finding pursuant to section 6(1)(b) that the cause of the accident was that the T44 had become stuck in reverse mode and that the driver had failed to carry out a recognised emergency stop. In relation to section 6(1)(c) firstly, had Mr Smillie carried out a visual inspection of the cable, death could have been avoided. Secondly, had Mr Smillie been trained concerning an emergency stop the accident might have been avoided.

In terms of section 6(1)(d) it would be open to me to make a finding concerning the activity in the courtyard on the morning of the accident involving both machines and personnel.

In terms of section 6(1)(e) I should make a number of findings:-

(1)The cable was fitted by Scott Dark.

(2)Once fitted, the cable remained under the control of the Council.

(3)Manuals should be available for drivers.

(4)Refresher courses should be carried out to include emergency stop procedures and

(5)Mr Smillie should have reversed the T44 at no more than 70 per cent of throttle speed.

For the Council it was submitted that I should make no findings concerning the movement of vehicles and personnel in the courtyard on the morning of the accident. There was no causal link between the two having regard to the place at which the impact actually occurred. It was also submitted that there was no direct evidence of any training having been conducted by Hayter.

So far as the training of Mr Smillie in emergency stops was concerned, at the end of the day, the use of an emergency stop was irrelevant because, standing Mr Swift's evidence there was not sufficient time within which Mr Smillie could have avoided the accident in the first place.

It was submitted that I ought to make a determination that if Hayter had given guidance to check the cable, then the Council would have carried out that guidance and that check might have prevented the accident.

I should also make a finding in terms of section 6(1)(e) that there was a design problem concerning over-articulation and that might have played a part in the chain of causation.

Although Miss Kerr invited me to reach the view that I could not be satisfied as to the state of the cable at the point of delivery if I were minded to reach such a conclusion then it would be open to me to infer that it was the Council that replaced the swivel tube. I was invited to hold that the accident might not have happened if the swivel tube had not been loose from the bulkhead. The evidence supported that and that was all that I needed to do.

Conclusions and Determination:

[22]My responsibility is to make a determination on this matter pursuant to section 6 of the 1976 Act. It is not the function of an Inquiry to make any findings of fault or to apportion blame (*Black v Scott Lithgow Ltd* 1990 SLT 612 per L P Hope at p 615 H - J). One of the purposes of an Inquiry is to investigate matters so as to avoid a repetition of the accident. Causation does have a role. In particular, the provisions of section 6(1)(c) and (d) seem to me to proceed upon the basis that there will be, in most cases, a process or event which falls to be examined in order to see what led to the accident. Having established such a process or event it is then possible to see what steps might have been taken to avoid the outcome or what defects there were. In my opinion, the provisions of section 6(1)(c) and (d) fall to be applied objectively and with the benefit of hindsight. Section 6(1)(e) gives some support to this interpretation. There may be circumstances which are relevant to the death but which might not have been established to have had a causal link. It is with that in mind that I summarise the critical factors in this matter. Before doing so I should add that I have, on the whole, found the witnesses to be credible and reliable. The only comment I make is I have found that, on a balance of probabilities, an employee of the Council fitted the brass swivel. I do not know who nor when. I go no further than saying that someone employed by the Council fitted the brass swivel.

The cable was not specifically manufactured by Hindle for Hayter for use in the T44. The cable is safety critical (see the evidence of Dr Arnold). The design by Hayter of the assembly incorporating the cable was outwith the manufacturers' specification because it led to over-articulation, movement outwith 8 degrees. That particular issue has now been addressed by a modification to the design - (see Crown Production No. 18). Hayter was not aware of the particular specification for articulation of the cable. Hayter's literature supplied to the Council contained no relevant warnings as to the need to inspect the cable regularly for any defects and to replace it if any defects were found. The Council had no adequate procedures for checking the cable. It was not part of their service process nor were operators advised to check the cable as part of their daily maintenance check. Reliance upon drivers informing the Council that if the pedal was "sticky" was not adequate (see the mechanical evidence from the Council). There was evidence before the Inquiry of a degree of awareness of risks

associated with the use of cables. Morse Controls Ltd certainly knew and there was evidence from Mr Graham that he carried out monthly checks. Dr Arnold recommended that regular visual inspections be carried out. Not only would this show frayed or worn cables but also whether the swivel was in place. It seems to me that there ought to have been a system in place for the regular checking of the cables. There is a degree of overlap between sections 6(1)(c) and (d) in that checking the cable for defects would have been a reasonable precaution and that there should have been a system of working to the effect also. As I have concluded that someone employed by the Council fitted the brass swivel it seems to me a logical step to determine that a reasonable precaution would have been to replace the cable when found to be defective and not to attempt to repair it.

The cable (Crown Label No. 1) was faulty. It did not have a swivel at the engine end (although this did not contribute to the accident) and it did not have a swivel at the pedal end, as installed by the manufacturer. The absence of a swivel at the pedal end was critical - (see the evidence of Dr Arnold). The brass swivel which was attached to the pedal end of the cable was not as manufactured and supplied by Hindle and was, as I have said, on a balance of probabilities, fitted by a Council employee sometime between July 2000 and the date of the accident. As the original swivel was no longer in place I do not say that the particular swivels on the cable became disconnected because of over-articulation and the manufacturing issues identified by Dr Joel. However, it seems to me that the evidence is relevant to the functioning of cables. The issue of over-articulation has already been addressed by Hayter. I recommend that Hindle consider Dr Joel's findings and consider whether any revision to the manufacturing process is necessary.

Alan Smillie was undertaking his manoeuvre before he realised there was a problem. The total distance travelled by the T44 before it came to rest was 14.2 metres but only 10 metres between the point of commencement and the impact with Mr Kelly. Whereas the tests carried out by the experts as to stopping times are very helpful, inevitably they involve averages and estimates. No one can say with confidence exactly what happened, in what sequence and what time each step took. However, on the information before me I am not prepared to hold that Mr Smillie could have avoided the accident by attempting an emergency stop. The distances were too short, the events so unusual and the reaction time so short, I cannot conclude he could have avoided the accident once the problem first arose. However, it is clear that, as a group, the drivers of the mowers were, at best, hazy as to the performance of an emergency stop. I recommend that steps be taken to address this issue.

I have placed the question of over-articulation, manufacturing and emergency stops under the heading of section 6(1)(e). I have done so mainly for reasons of causation. I do not think I am in a position to say that, on the evidence, these factors fall within either section 6(1)(c) or (d) but they are nonetheless facts which I consider relevant to the circumstances of the death. I have included a finding that the Council were not given specific information relating to regular inspection of the cable.

I am grateful to the representatives of the parties for their assistance in dealing with the matters raised by the Inquiry. It remains for me to express sympathy to the family of Mr Kelly on their loss.

SHWH.AH.Kelly.FAI.08.03