LOCAL COURT of NEW SOUTH WALES

Coronial Jurisdiction

Inquest/ Inquiry:	**Inquests into the deaths of Trevor DRAYTON and Edgar ORGO** **Inquiry into explosion at Draytons Winery, Pokolbin**
Hearing dates:	16-20 May; 20-23 June 2011
Date of findings:	13 July 2011
Place of findings:	East Maitland
Findings of:	Deputy State Coroner H.C.B. Dillon
Findings:	I find that Trevor Drayton died on 17 January 2008 at Pokolbin, NSW as a result of blast injuries and burns suffered in an explosion in the wine production area of Draytons' Winery. I find that Edgar Orgo died on 17 January 2008 at Pokolbin, NSW as a result of multiple injuries suffered in an explosion in the wine production area of Draytons' Winery. I find that the explosion at Draytons' Winery, Pokolbin, NSW on 17 January 2008 originated in Tank 104 situated in the wine production area of the winery and was caused by ethanol vapours igniting when heated during welding operations.
Recommendations:	1. I recommend that the WorkCover Authority of NSW consider developing a simple and practical method of bringing the Notification of Dangerous Goods

requirement to the attention of consignees of Dangerous Goods.

2. I recommend that the WorkCover Authority of NSW consider conducting a one-off publicity campaign within the wine industry reminding wineries of the risks associated with the storage and use of ethanol. Consideration of a similar campaign in the metal fabrication industry is also recommended.

File numbers: 1721/09 and 1722/09

Representation: Ms K Stern (Counsel Assisting) instructed by Ms R Graham (Crown Solicitor's Office)

Mr B. Hodgkinson SC with Mr A. Hardy instructed by Freehills Lawyers (for Drayton family)

Mr S. Lowe instructed by Moray & Agnew (for Perfab Pty Ltd)

Mr M. Cahill instructed by Mr G. Diggins, Workcover Authority (for Workcover)

Mrs Thompson instructed by Carroll & O'Dea Lawyers (for William Rikard-Bell)

REASONS FOR DECISION

Introduction

1. On the morning of 17 January 2008, a large stainless steel wine tank in a shed at the Drayton's Winery in Pokolbin blew up when ethanol fumes it contained exploded during a welding operation being conducted in the shed. Trevor Drayton, the winemaker for Drayton's, and Edgar Orgo, a very experienced welder, were both killed in the explosion. William Rikard-Bell, the assistant winemaker, was severely burned.

2. These proceedings are really three cases: an inquest into each of the deaths and an inquiry under s 30 of the Coroners Act 2009 into the cause and origin of the explosion.

3. As I emphasised when the inquest began, this is an inquiry or an investigation, not a criminal or civil trial. The purpose of an inquest is to make findings of fact about five things. I must make formal findings concerning the identities of those who died and the date and place of their deaths. A coroner must also identify the cause of death, that is, the physiological mechanism of death. Finally, a coroner must seek to determine the manner of death. In that respect, the questions are "How did this death come about?" or "What were the circumstances of the death?." We are also investigating the cause and point of origin of the explosion. There is obvious overlap of those issues and the question of manner of death.

4. Much of what follows concerns technical issues. At its heart, however, this is a case about two much-loved and respected human beings whose lives were ended suddenly and very prematurely in tragic circumstances.

Trevor Drayton

5. Mr Drayton was born on 18 February 1955 and was aged 52 when he died. Trevor Drayton was the head winemaker at the winery. He was responsible for

winemaking and wine production and for a number of the employees. He was also a director of W Drayton & Sons Pty Ltd and Goldtrac Pty Ltd, the family company that was engaged to provide services to W Drayton & Sons Pty Ltd.

6. The Drayton family has been making wines in the Hunter Valley for about 150 years. Shortly after the explosion, Mr Drayton was described by one of his friends, Mr Ken Tulloch, as "an iconic Hunter Valley winemaker. He was one of the leading figures in the winemaking community and representative of the Hunter Valley in many ways."[1] His niece, Kate Drayton, who spoke on behalf of the Drayton family, described a warm, loving man who had grown up near the family winery, a man of the Hunter Valley and a leader in the industry. She revealed a man with a sense of humour who loved the children of the family. He enchanted them with his stories and the presents he brought back for them from his many trips. As they grew up they were welcome guests in his wine-making laboratory.

Edgar Orgo

7. Mr Orgo had been employed by Perfab Engineering Pty Ltd (Perfab) since 2000. He undertook an apprenticeship in 1966 and then worked as a metal worker for various people until he commenced working at Perfab. Those who worked with him admired him as a highly skilful tradesman who had long experience and a mastery of welding techniques. His wife, Nadia, described Eddie as the "love of my life", "my soulmate". They loved dancing and rugby league and were married in 1980. She told the court that she is grateful for the many beautiful memories she has of him and said, "I know, even in my sadness, I am truly lucky to have shared my life with such a man".

8. Both men were much-loved and are greatly missed. Their deaths have saddened many people and their decency and strength of character emphasise the tragedy of this accident. Unhappily, sometimes bad things happen to good people.

[1] *The Age* 17 January 2008

The background and facts in outline

9. Draytons Winery is a long-established institution in the Hunter Valley. Draytons is a relatively small family concern, the directors of which in January 2008 were the brothers Trevor, John and Gregory Drayton and their father Max. Until that time, its industrial safety record, if measured in terms of workers' compensation claims or serious accidents, appears to have been very good. There is little doubt that the management, principally the three Drayton brothers, regarded their staff as friends and colleagues and cared about them and would not knowingly have jeopardised their safety (or that of anyone else at the winery).

10. Before the January 2008 explosion, each of the brothers took responsibility for an aspect of the operation: John Drayton was, in general terms, in charge of administration, including sales; Trevor Drayton was the principal wine-maker in charge of the production area and the small team which worked there; and Greg Drayton was the vigneron, in charge of viticulture. Greg also appears to have worked as a handyman in the winery and had some welding skills and experience. In the course of their evidence, both Greg and John Drayton insisted that each brother, including Trevor, managed his own area with very little input or interference from the other brothers.

11. Some evidence has been given that in the years before the explosion, questions had been raised with the company about hazardous materials. In 2002, an inspector from Cessnock City Council visited the winery with a view to conducting a fire safety audit. The terms of the conversation between the inspector and John Drayton are disputed, but what is clear is that no fire safety audit was done at that time or in the years before the explosion.

12. Evidence was also given by Mr Adrian Lockhart, who had worked as an assistant winemaker at Draytons, that in about 1999 or 2000 he had raised the issue of the safe storage of SVR with both Trevor and John Drayton. In his oral evidence, Mr Lockhart emphasised that his principal concern had been the security of the spirit. He said that he had known that there were excise

implications for the storage of the spirit and also that it was essential to prevent tampering with the spirit.

13. Mr John Drayton, in his evidence, disputed that Mr Lockhart had ever raised SVR storage. While Mr Lockhart was a credible witness, it is unnecessary to resolve that conflict in the evidence by choosing between the witnesses. Suffice it to say that it is clear that in the intervening period up to January 2008, Draytons routinely stored SVR in the wine production area and did not establish a segregated and clearly delineated or signposted secure area for it.

14. In the period 2003 to 2005, at their management meetings, the directors of Draytons considered, among many other things, the need for documentation of the company's occupational health and safety practices and procedures, presumably to comply with the relevant legislation. An OH&S procedures manual was drafted but never formally implemented. According to Mr John Drayton, however, the company, nevertheless, effectively complied with the relevant standards but, more particularly, sought to ensure that, in practice, the company maintained a safe working environment for all staff. Among other things, the manual provided for "general procedures for the safe use of tools" (ch 15); safe welding procedures (ch 16); safe working at heights (ch 17); the safe use of chemicals (ch 19) and the safe operation of forklift trucks (ch 20).

15. In 2008, Draytons was a manufacturer of, among other things, fortified wines and white wines. To make their fortified wines, the winery used a grape spirit known in the wine industry as "SVR" (for "spiritus vinous rectificatus") to halt the fermentation process at a certain point to maintain a high sugar content in the wine and to raise its alcohol level. SVR is a form of ethanol. White wines are manufactured in large tanks which are cooled by a system employing a coolant called "brine" which circulates through pipes into a skin on the tank known as a "dimple plate" that sits on the outside of the tank. "Brine" in this context is a mixture of denatured ethanol and water.

16. The fortified and other wines were all manufactured in the single production area, known as "the shed". The SVR was kept in the shed along with the brine and wines in their various stages of fermentation or ageing. SVR is a highly

flammable liquid and is classified under relevant legislation as a Dangerous Good.

17. In late 2007, the winery began planning an upgrade to the cooling system in preparation for the 2008 vintage. The work to be carried out involved suspension of copper piping from a range of different structures, with a brine solution to be piped through to cool individual vats via dimple plates.

18. Perfab Engineering Pty Ltd is a steel fabrication company specialising in the manufacture of tanks, especially stainless tanks, and ancillary works. The company has had a lengthy history of working in the wine industry. In October 2007, Greg Drayton, at Trevor Drayton's request, got in touch with Perfab for the purpose of obtaining costings for the installation of dimple plates to some of the tanks at the winery. This work began on 7 January 2008, following a routine safety check of the site by Mr Orgo and his offsider Mr Matthew Lahz. For about a week Mr Orgo and Mr Lahz worked together welding dimple plates and other fittings onto a number of vats as part of the new cooling system.

19. On 9 January, the winery received a consignment from South Australia of 9000 litres of SVR. The SVR was pumped into a stainless steel tank, Tank 104, in the production area. Tank 104 was indistinguishable from other nearby wine tanks. It was the tank that suffered worst damage in the explosion.

20. Nine days later Mr Orgo was working on Tank 104 when it blew up. Trevor Drayton, Edgar Orgo and William Rikard-Bell, Mr Drayton's assistant winemaker, were in the shed at the time of the explosion. Mr Rikard-Bell survived miraculously but suffered bad burns (from which he is still recovering) as a result of the explosion.

21. Eyewitnesses describe an enormous fireball erupting from the building with a very loud bang followed by a further two explosions of lesser magnitude. Flaming liquid ran into drains and across the carpark in front of the production area.

22. Emergency services were called and attended very quickly. Unfortunately, there was nothing that could be done for either Mr Drayton or Mr Orgo. They had almost certainly been killed in the explosion, virtually instantly. The Police Force on behalf of the local coroner, the NSW Fire Brigade and the Workcover Authority immediately began investigating the case. Because of the complexity of the case, it was passed on to the State Coroner's court for further investigation.

The issues

23. The principal issue this case raises is how the explosion came about and therefore how the deaths of Mr Drayton and Mr Orgo were occasioned. That question, however, raises further questions.

24. Counsel Assisting, Ms Stern, in her opening statement outlined a number of questions that go to this issue. They were as follows:

(i) Who was in the production area at the time of the explosion?

(ii) What work were those persons doing at the time of the explosion?

(iii) What if any plant or equipment was in operation at the time of the explosion?

(iv) What work was Mr Orgo doing at the time of the explosion?

a. Had the dimple plates all been finished

b. Was he in the process of welding a bracket or c-shaped hook onto tank 104 which could be used to support a flexible coolant hose?

c. What technique was he using to carry out that work?

(v) Was Mr Orgo working at a height from a box on the tines of a forklift located near tank 104? If so, who lifted Mr Orgo up using the forklift?

(vi) Was the gas bottle of the forklift faulty or leaking?

(vii) If Mr Orgo was working on tank 104 at the time of the explosion:

a. At whose direction was he doing that work?

b. Who knew or ought to have known that he would be working on tank 104?

(viii) What type of welder was Mr Orgo using at the time?

(ix) What was in tank 104?

a. What liquid was in tank 104?

b. How much liquid was in tank 104?

c. Who put the liquid in tank 104 and when?

(x) Who knew what was in tank 104?

a. Who should have known what was in tank 104?

b. Whose responsibility was it to check what was in tank 104?

c. If SVR was in tank 104, who decided SVR should go in tank 104 rather than in tank 106?

(xi)What obligations, if any, did Mr Ian Jones, who transported the SVR to the winery, have in relation to the safe storage of SVR at the winery?

(xii) What were the arrangements with respect to the approval and supervision of work at the winery by Perfab employees Mr Orgo and Mr Lahz?

(xiii) Were any assurances given to Perfab that all tanks would be empty? If so, by whom and when?

(xiv) Was the fact that tank 104 contained SVR (if that was the case) communicated to Perfab or to Mr Orgo? If so, by whom and when?

(xv) What hatches and/ or threaded caps of tank 104 were open, and how long had they been open?

(xvi) What steps should have been taken for the safe storage of SVR, and by whom?

(xvii) What steps were taken for the safe storage of SVR?

(xviii) What, if any, labelling was on tank 104?

a. If tank 104 contained SVR, what labelling should have been on the tank?

b. Was the labelling appropriate? If not, why not?

(xix) What was the precise chain of events in relation to the explosion(s) and fire?

a. How many explosions were there?

b. Did fire cause an explosion or did an explosion cause the fire?

c. What potential sources of ignition were present immediately before the explosion and fire?

d. What role, if any, did welding play in the causation of the explosion and fire?

e. What role, if any, did the forklift gas bottle play?

f. What role, if any, did any other potential ignition source play?

(xx) If the contents of tank 104 exploded before the fire, how did the content ignite?

a. Did it ignite from within tank 104 due to heat transfer from welding?

b. Did it ignite from vapour that had escaped tank 104 igniting and spreading to the contents of tank 104 and other tanks?

(xxi) If vapour ignited externally to tank 104:

a. How did the vapour escape from tank 104?

b. What was the likely ignition source?

c. How did the fire in the vapour spread into tank 104?

d. If the vapour escaped from an opening on the top of tank 104, how did the vapour and liquid within tank 104 reach sufficient pressure to explode tank 104?

I have distilled these issues into five categories:

- What led up to the explosion?

- What happened on 17 January 2008?
- What factors combined to cause the explosion?
- What can be learned from the incident?
- Should anything more be done?

What led up to the explosion?

25. In October 2007, two senior managers of Perfab visited the winery to discuss stainless steel fabrication work Trevor Drayton wanted done on tanks for the 2008 vintage (due at the end of January or early February 2008). The work involved the installation of dimple plates. According to Mr Greg Flanagan of Perfab, he asked Mr Drayton whether the tanks would be empty at the time the welding work was done.

26. It is common ground that welding should not be carried out on tanks containing wine because the wine will be damaged. Mr Flanagan's evidence was that he was given assurances on a number of occasions by both Trevor Drayton and Greg Drayton that the tanks would be empty when the welders were working on them. In his oral evidence at the inquest, Mr Flanagan explained that he had made these inquiries because on previous occasions significant amounts of time had been lost by welders who had had to wait for tanks to be emptied before they could weld.

27. Mr Greg Drayton denied having made such statements to Mr Flanagan. In my view, it is likely that Mr Flanagan was given such assurances by Trevor Drayton. As a winemaker Mr Drayton would not wish to have his wines spoiled and, as the person responsible for this side of the winery's operations, he would be unlikely to approve of time and money being wasted with welders lying idle waiting for tanks to be emptied.

28. It is possible, although less likely, that Greg Drayton offered similar assurances but simply cannot remember this now. This was not his domain but Trevor's. In October 2007, however, it is evident that no one turned his

mind to the question of SVR. It seems to have been the common assumption of all concerned at that time that the tanks were being used or would be used to contain wine or perhaps water. In any event, whatever was said in October 2007, that did not obviate the need for safety checks when the welding started.

29. Mr Flanagan also stated in evidence that he had made a general safety assessment of the site. Mr Lee Harkness, another senior Perfab manager was, however, less assured of this. He made the telling point that at that stage they were only quoting for the job. If any sort of safety assessment was conducted by Perfab at that stage, it could only have been rudimentary at best because the environment could change before welding operations commenced, as indeed it did.

30. Welding operations began on 7 January 2008. The first step to be conducted by the welders was a "Job Safety Assessment" or "JSA". Perfab, quite reasonably, required its welders to conduct a JSA before commencing any welding job. The JSA is a checklist which the welder or welder's supervisor is required to complete before commencing hot work. A JSA form was completed by Mr Orgo and signed by Mr Lahz. In some respects the form itself is ambiguous and in other respects it was inaccurately completed by Mr Orgo.

31. Among other things, the JSA form appeared to require a "hot work permit" if welding was to be undertaken. It also required that the welders check for flammable materials, fumes and gases and to ensure that appropriate control measures had been established or were available. The welders were also required to list their anticipated activities on the form together with any related potential risks and hazards and any proposed control measures they planned. Mr Orgo listed the installation of dimple plates, welding and testing of the plates and associated works. No potential hazards were identified on the sheet. I will come back to the significance of checklists in the context of a safety culture.

32. It is critical to note at this stage, however, that when the JSA was completed, there was no SVR in Tank 104. Evidence was given by Mr Flanagan and Mr

Harkness, however, that the JSA process is ongoing. Their evidence was to the effect that if circumstances change in the course of the work, the changes should be noted on the JSA form and the situation reassessed from a safety perspective.

33. For the rest of that week Mr Orgo and Mr Lahz worked on fixing the dimple plates to tanks. Mr Lahz spot-welded the plates and Mr Orgo welded seams. Towards the end of that week, Trevor Drayton approached the welders with a request that they do some further work welding brackets to tanks to support lines for the new cooling system being constructed by Mr Greg Drayton. He was referred to Perfab management.

34. The contract between the winery and Perfab was subsequently varied with Mr Orgo to return on the following Tuesday (15 January) by himself to complete the original job and to do the additional work. No fresh JSA was done but in the meantime, of course, Tank 104 had been partially filled with SVR. The additional work involved the welding of a backing plate onto a tank and a bracket then being welded to the plate. It appears that about seven brackets were to be mounted.

35. On 9 January 2008, the winery received a shipment of SVR from South Australia by tanker. At the direction of Mr William Rikard-Bell, the SVR was pumped into Tank 104 by a cellarhand, Mr Colin Locock. When a tank was filled it was standard practice in the winery to hang a large plastic placard describing the contents off a valve or handle on the tank. In this instance, however, that does not appear to have been done. Ethanol or SVR is a highly flammable substance. A safety placard in bold colours identifying the contents of Tank 104 as containing a hazardous or dangerous substance does not appear, however, to have been placed on the tank. A note of the fact that Tank 104 contained SVR was, however, made on a whiteboard in the winery laboratory which listed the various tanks and their contents at any given time. Apart from containing the SVR within Tank 104, no other special measures appear to have been taken by anyone at the winery to safely store the SVR or to warn of the presence of SVR in the winery .

36. During the few days before the explosion Mr Orgo worked his way around a number of tanks fixing brackets to the tanks. He was operating from a wooden bin sitting on the raised tines of a small forklift truck. Tank 104 had a volume of about 27,000 litres. Mr Orgo had had long experience in working on wine tanks. It would have been possible, at least from ground level, for Mr Orgo, or anyone else, to have detected the fact that Tank 104 had been partially filled by tapping on the side of the tank. A tank containing fluid will vibrate less and make a distinctly duller sound than an empty tank. The fact that the manhole of Tank 104 was closed would have been another indicator that the tank contained something.

What happened on 17 January 2008?

37. The evidence enables me to draw a number of conclusions about what happened in the wine production area on the morning of 17 January 2008.

38. First, a number of people were in the wine production area at the time of the explosion. Trevor Drayton, Edgar Orgo and William Rikard-Bell were caught in the blast. A number of others were working in or about the wine production area at the time but were not in the immediate area of the explosion. The cellar-hands Brent Thompson and Justin Booker had been with William Rikard-Bell in the shed prior to the explosion. Colin Locock was also nearby. John Drayton was in another area of the winery fixing a "Thomas the Tank Engine" vehicle. Greg Drayton was also present, and had walked away from an area near the walkway between Tanks 101 and 102 just prior to the explosion. Other office staff may also have been present in the administration area on the other side of the building. Apart from Mr Orgo, there is no evidence that anyone else present at the winery was doing anything that could have constituted a source of ignition.

39. Mr Drayton's body was found close to the forklift truck, but the available evidence suggests that he was probably not operating it at the time of the

explosion. Mr Rikard-Bell last saw Mr Drayton walking just ahead of him in the direction of Tank 104 moments before the explosion.

40. Second, there can be no doubt that the fire was primarily caused by an explosion and the ignition of a flammable liquid. This is apparent from:

- The low-level fire damage which is characteristic of a liquid fire;
- The lack of any other obvious fuel load capable of causing such an explosion;
- Greg Drayton's observation that the floor had looked like it was on fire;
- The pattern of burning across the car park;
- The pattern of burning from the drains;
- The observation of Mr Damien Griffith of liquid burning in the gutter alongside the road;
- Ms Robyn Drayton's observation that liquid in the gutter was clear but thicker than water, which is consistent with Mr Rikard-Bell's description of the consistency of SVR;
- The observation by fire-fighters that the contents of Tank 104 were on fire when they arrived; and
- The dark smoke indicative of a form of chemical fire.

41. Third, at the time of the explosion, Tank 104 contained about 9000 litres of SVR. Mr Rikard-Bell gave evidence that after the 9000 litres of SVR were delivered on 9 January 2008 and pumped into Tank 104, no SVR had been used before the explosion occurred. In my view, it is also unlikely that Tank 104 was leaking fluid shortly before the explosion.

42. A fire and explosion investigator, Mr Anthony Cafe, noted in his report of 19 March 2010 that the bottom valve on Tank 104 was open when he inspected it, suggesting to him that there may have been a leak. Mr Rikard-Bell, however,

gave persuasive evidence that if Tank 104 had had the valve open prior to the explosion it is unlikely that that would have gone unnoticed because liquid would have been spurting from the valve.

43. Detective Peter Muscio, the crime scene investigator, considered Mr Cafe's report and re-examined the valves carefully during the inquest. His conclusions were that the valves had been forced open. He gave evidence that the levers could not have been forced open as far as they had gone by ordinary human strength alone. He therefore considered that the force of the explosion was the most likely reason for the valves having been prised open. While it is possible that the valves were accidentally bumped open by, for example, a passing forklift truck colliding with them, that is an hypothesis without any evidentiary support.

44. Fourth, there can no serious doubt that Tank 104 was the point of origin of the explosion. A number of observations support that conclusion:

- The damage to Tank 104 was catastrophic and obviously more serious than the damage to other tanks;
- The roof of the shed was blown off above Tank 104;
- Tank 104 clearly pushed into T103 which was then knocked off its concrete base and pushed across the passage between T101 and T102;
- The pattern of fire and explosion damage is consistent with Tank 104 being the source of the explosion;
- It is also consistent with the observation of Mr Griffith of a cloud of grey smoke pouring out the top of the winery production area; and
- The location of the bodies was consistent with the blast and fire emanating from Tank 104.

45. Fifth, Mr Orgo had commenced working on Tank 104 at the time of the explosion. This conclusion flows from the following evidence:

- Tanks 103 and 104 were the only tanks remaining to be fitted with brackets;

- There was probably no cap on the small opening at the top of Tank 104 at the time of the explosion. This can be inferred from the fact that the screw thread on the vent was undamaged after the explosion. Had the cap been fitted and had it been blown off during the explosion, the thread would have been destroyed. Mr Rikard-Bell said that the only cap for Tank 104 was one of the U-type. His evidence was that these caps were taken off when tanks were empty or when they were being filled. Presumably, the cap had been removed when the tank was filled on 9 January but, by oversight, not replaced afterwards. If it was not in place, this may have suggested to Mr Orgo that the tank was empty;

- The observations of Mr Peter Sams of Perfab who had earlier seen Mr Orgo working in a wooden-bin box on the tines of a forklift truck at height;

- A forklift truck was found after the explosion on its side adjacent to Tank 104;

- The tines of the forklift were in a raised position;

- Shattered pieces of timber, similar to the timber used in bin-boxes, were found some distance from Tank 104;

- The location in which Mr Orgo's body was found was consistent with a fall from height;

- Welding equipment was found in the area near Tank 104, including a welder, electrical cords, plates, and an argon cylinder;

- The argon gas cylinder was found in the open position suggesting that it had been in use at the time of the explosion;

- The fact that the electricity point, from which electrical cords were connected to the welder, was in the "on" position; and

- Most conclusively, matching welding tack marks were found on a piece of stainless steel plating apparently being used as a backing plate for the bracket and on Tank 104 itself.

46. Sixth, it is inconceivable that Mr Orgo was aware at the time of the explosion that Tank 104 contained 9000 litres of SVR. There is no evidence that any label was put on Tank 104 indicating that it contained SVR, no evidence that any signage indicating the presence of dangerous goods in the tank was displayed, and no evidence that Edgar Orgo had been told by anyone at the winery that SVR was contained in that tank. Indeed, the evidence establishes also that it is unlikely that Greg and John Drayton were aware that SVR was stored in Tank 104 at the time of the explosion, although both were probably generally aware that SVR would have been stored somewhere within the winery at that time.

47. In my view, Trevor Drayton probably knew where the SVR was stored. Mr Rikard- Bell gave evidence that Trevor Drayton was generally aware of the contents of all tanks and the location of SVR was clearly indicated on the whiteboard in the laboratory. Both Trevor Drayton and Mr Rikard-Bell discussed wine production daily and made plans for storage of various juices and wines. The new vintage was about to be brought in and tanks allocated. Given the small size of the wine production staff, and his reputation as a "hands-on" winemaker, Mr Drayton would very likely have taken a close interest in the progress of the cooling system and the preparation and allocation of tanks. He would also, presumably, have had concerns about the possibility of spoilage if welding took place on tanks containing wine or other fluids.

48. Why Mr Orgo was not informed of the contents of Tank 104 either by Trevor Drayton or Mr Rikard-Bell remains something of a mystery. The answer may be simply that both men were very busy planning and organising for the new vintage. They had many things on their minds.[2] Greg Drayton was dealing

[2] According to some psychological studies, human beings can keep a maximum of four things "in mind" at any given time. See for example, Moskowitz, C "Mind's Limit Found: Four Things at Once" *Live Science* 27 April 2008 http://www.livescience.com/2493-mind-limit-4.html viewed 3 July 2011.

with the cooling system but did not have responsibility for the contents of the tanks. They probably simply forgot to speak to Mr Orgo or were so preoccupied with other issues that they did not pay much attention to what he was doing.

49. Seventh, while a number of people were aware that welders were present at the winery at the time, and some people, such as Trevor and Greg Drayton and William Rikard-Bell, were aware of the general nature of the work that was being conducted, no-one at the winery, with the possible exception of Trevor Drayton and Greg Drayton, was aware of precisely which tank Mr Orgo proposed to work on at any particular time or of the precise nature of that work.

50. Greg Drayton's evidence was that, whilst he helped Mr Orgo out if requested to do so, he was not supervising Mr Orgo's work. Mr Orgo did not need instruction in how to weld or how to fix a bracket to a tank. It is likely that Trevor Drayton, Greg Drayton and William Rikard-Bell simply let him get on with what he was doing. Someone in the shed moved the forklift for him. That may have been Trevor Drayton. But, even if Trevor Drayton was generally aware of the fact that SVR had been placed into Tank 104, he may have temporarily forgotten this due to the lack of cautionary signage on the tank. This could explain the lack of a warning being given to Mr Orgo.

51. Eighth, people working at the winery were well aware that it is a bad idea to weld on a tank containing liquid. Insofar as they appear to have thought about this issue, however, the evidence suggests that they were more concerned with preventing spoilage of wine or possibly with the fact that welding may be ineffective on a tank full of fluid (which cools the metal being welded to below the optimal temperature) than with a specific risk of fire or explosion. The reality is that Mr Rikard-Bell simply did not turn his mind to the risk the SVR posed although he was aware at the time the SVR was delivered that spillage of SVR could be ignited by reason of the welding operations.

52. Ninth, no specific procedures designed to prevent ignition of SVR were adopted at the winery. It seems that some discussions had probably taken

place some years earlier about the risk of SVR being stolen and the need to ensure its security, but the focus of those discussions was more probably on excise compliance issues than on fire or explosion. In any event, there were no special tanks for SVR nor a designated secure area. There was also no OH&S manual in use at the winery at the time of the explosion.

53. Tenth, Perfab had implemented procedures that should, in theory, have required Mr Orgo and Mr Lahz to make themselves familiar with the content of all tanks on which they were working, but which in practice were not implemented in that manner. In particular, evidence was given that hot work permits were not completed unless required by the specific occupant of the premises at which work was being conducted. Procedures to assess the risks associated with welding in the vicinity of flammable liquids were not implemented in such a manner as to ensure that a detailed assessment of the contents of tanks was made.

54. This appears to have been a reversal of best practice. The point of a hot work permit is to ensure that hot work, such as welding, can be conducted safely. It will usually be the welders who are in the best position to assess risk, not the occupants of the site at which the work is to be done who may have no expertise in welding work or the associated risks. Perfab's reliance on its clients to raise the issue of hot work permits appears to me to be contrary to common sense.

55. Regardless of whether a hot work permit should have been issued, the site risk assessment conducted by Mr Orgo and Mr Lahz seems to have been conducted in a manner which spoke of self-confidence developed through many years of incident-free work. Unfortunately, it appears that the assessment carried out was based upon visible signage and exterior visual inspection of whatever could be seen in the shed by the two welders. They do not appear to have interrogated winery staff or to have made other independent inquiries concerning the state of the tanks or their contents. The winery also does not appear to have volunteered critical information concerning the tanks. The approach taken seems to have been that the checklist was, in effect, routine

paperwork to be completed before getting down to what they were interested in: fixing the dimple plates to the tanks.

56. There is no evidence that tanks were actually emptied or purged before being worked on by Mr Orgo and Mr Lahz. Mr Rikard-Bell gave evidence that whilst tanks were filled and emptied during this period, this was not with a view to emptying them for welding work. In any event, it is clear that at least Tanks 103 and 104 were not empty and clean as at 17 January 2008.

57. While I think it more likely than not that discussions about emptying tanks had taken place during the October negotiations, and that some general assurances were given, these preceded the work on the dimple plates and took place before work on the brackets was envisaged. The essential point, however, is that Mr Orgo was not informed that Tank 104 contained SVR, there was no obvious signage and that he did not conduct his own checks on the tank.

58. Eleventh, it is very unlikely that anyone was smoking in the vicinity of Tank 104 at the time of the explosion. Mr Rikard-Bell was clear in his evidence that he would have noticed this and been angry if this had been the case. There is no other evidence to indicate that anyone was smoking in the vicinity of Tank 104 shortly before the explosion. Mr Orgo was a smoker, but it seems unlikely that he would have been smoking while conducting welding operations and no one suggests seeing him do so. Whether or not someone was smoking could only be relevant to understanding the cause of the explosion if there was cogent evidence of a leak from the tank or that ethanol vapours emanating from the tank remained in a sufficiently concentrated form to flashback into the tank once ignited by a cigarette tip or cigarette lighter. For reasons I will come to, these possibilities are much less likely than the hypothesis that a hot mark on the tank caused the vapours in the tank to ignite.

59. Twelfth, at the time of the explosion the contents of Tank 104 were not widely known at the winery. John Drayton drove to get a fire-truck from the RFS shed but took no steps to get materials for chemical fires. Had he known that ethanol was on fire he would undoubtedly have equipped the truck with suitable fire-fighting equipment and supplies. He was not able to tell fire-

fighters what Tank 104 contained for some time. Whilst there is some conflicting evidence about how he came to be able to confirm to Inspector Brett Crotty that Tank 104 contained ethanol, it is evident that it was only after this was suggested to him that he was able to give that confirmation. He was, of course, aware that SVR was being delivered to the winery as he had had a conversation with Hardy's, the manufacturers of the SVR, about the delivery possibly being delayed. If anyone at the winery, apart from the casualties, had been aware that it was SVR that had exploded, I have no reason to doubt that the fire brigades would have been immediately informed.

60. Thirteenth, it appears to me that the evidence satisfactorily enables me to identify the cause of the explosion and fire on the balance of probabilities. A number of hypotheses have been suggested. Most are entirely speculative and based on theoretical possibility rather than on cogent evidence. As Mr Cahill, counsel for the Workcover Authority, submitted, *Occam's Razor*[3] ought be applied to the facts of the case: the simplest explanation that covers all the facts is generally to be preferred.

61. For reasons given above, it is highly unlikely that ignition was caused by smoking in the shed. There is no evidence of the necessary combination of a smoker lighting up and a leak or a pooling of an explosive concentration of vapours close enough to Tank 104 to have ignited the contents of the tank.

62. One hypothesis floated speculatively shortly after the explosion was that an LPG cylinder from a forklift truck may have been the root cause of the explosion. This possibility was raised shortly after the explosion by Greg Drayton who was trying to think of possible causes of the fire. It does not have any support from experts who investigated the fire. The theory can be discounted because, although a damaged LPG cylinder was found after the explosion, the pattern of damage to it is consistent with it exploding as a result of heat being applied to it from outside, expanding the gases contained within it. There is no evidence that the gas bottle was faulty.

[3] *Pluralitas non est ponenda sine necessitate* ("plurality should not be posited without necessity").

63. None of the other tanks suffered the catastrophic damage occasioned to Tank 104 and the pattern of damage to tanks and throughout the shed demonstrates that the blast effects spread from the direction of Tank 104. Some of the contents of Tank 103 may have exploded but, if so, this would have been as a result of the primary explosion in Tank 104.

64. It seems very unlikely that ethanol was leaking from that tank's valves prior to the fire. This suggestion can be excluded by Mr Rikard-Bell's evidence that any leak would have been highly visible as the pressure in the tank would cause a leak to spurt like a jet. Fluid would have poured across the floor towards the drains. No one saw such a thing. This hypothesis also requires the implausible coincidence of a leak occurring at about the time Mr Orgo applied a welding mark to a tank containing an explosive concentration of ethanol vapours and being ignited by an unidentified source and flashing back into the tank.

65. An even less convincing hypothesis raised during the evidence was some form of remote ignition of concentrated vapours. In summary, the suggestion postulates that vapours may have oozed from the vent in an explosive concentration, settled due to gravity without being diluted due to dispersal by air currents, sunk into the drains running out of the shed under the car-park or elsewhere into the vineyard and been ignited at a distance by, for example, a discarded cigarette butt.

66. While hypothetically possible, this theory can only remain conjecture. It requires the sudden clustering of a combination of factors. Common sense suggests that air currents in the shed would almost immediately have begun to disperse the explosive concentration of emerging vapours. The temperature in the shed was about 19 or 20^{o} C. Common sense also suggests that such a temperature, in itself, would be sufficient to cause some expansion, and therefore dispersal, of the vapours as they emerged from the vent. The diffusion of vapours would continue as they settled towards the floor from a height of over four metres. Mr David Pearson, a chemist and fire and explosion expert, gave evidence that the vapours would most likely have reduced below the explosive concentration within about a metre of leaving the

vent. Most critically of all, the theory also cannot explain the coincidence of Mr Orgo working on the tank with his welder at about the time of the explosion.

67. There is also no evidence of some sort of electrical fault sparking a flashback of vapours or spilled ethanol.

68. There are, in my view, only two realistic theories of the cause of the explosion. First, the initial arc struck by Mr Orgo on the side of the tank for a tack weld to hold a backing plate in place may have caused a spot on the inside of Tank 104 to reach a temperature of something in excess of 700^{o} C, even if care was taken to adopt a welding method which minimises the size of the tack.[4] This would have taken place within half to one second. This is well above the spontaneous ignition temperature for ethanol vapour which is about 363^{o} C.[5] It is likely also that the mark on the tank remained at about this temperature for a number of seconds, although the precise length of time cannot be stated.

69. The evidence establishes that there would have been ethanol vapour in the 18,000 litre headspace of the tank concentrated and equalised within the explosive range at the time if the ambient temperature was within 10^{o} and 33^{o} C. The temperature at Pokolbin that day was well within that range, being about 19^{o} or 20^{o} C that morning. The expert evidence establishes that the tank should, even if it had had an open cap at the top, be treated in all material respects as if it were a closed vessel, notwithstanding that some ethanol would be emitted from the top opening whilst the temperature of the day was rising.

70. Ethanol vapour within the explosive range will ignite as a matter of certainty or overwhelming likelihood if brought into contact with a welding mark of 700^{o} C or more. The evidence is that the propagation of fire within Tank 104 would have taken a matter of seconds.

71. The evidence that Mr Orgo was in the process of, or had just completed, welding one corner of a plate to Tank 104 is overwhelming. Some evidence

[4] There is some evidence suggesting that the spot could have been as hot as about 1000^{o} C.
[5] Other figures for this can be found but none exceed 400^{o} C.

was given that Mr Orgo may have been using a specific angled welding technique to minimise the heat transfer to the tank. This would have led to the welding mark on the tank being of a lower temperature than it would have been if another technique was used. Nevertheless, whatever technique he was using, the temperature of the welding mark on the tank would have been some hundreds of degrees in excess of the ignition temperature of ethanol. Thus the issue of welding technique does not lead to any different conclusion as regards causation of the explosion.

72. The one question this hypothesis does not entirely explain is that, according to expert welding evidence given, it may have taken several seconds for Mr Orgo to complete the tack weld evident on Tank 104 and the backing plate found nearby. If so, and a hot spot was created on the interior of the tank within a second, why did the vapours not explode immediately? The answer seems to be that, due to various factors, there may be movement of the vapours within a tank so that there may have been a short delay before the vapours in the headspace of Tank 104 fully ignited resulting in the explosion of the tank.

73. The only realistic alternative theory as to the cause of the explosion is that, assuming that there was no cap on Tank 104, ethanol fumes from inside Tank 104 may have escaped through the top vent and been ignited by Mr Orgo's hot welder or the welding mark underway on the exterior of tank. According to Dr Daniel Massey, although ethanol vapours are heavier than air, when the vapours in the headspace of the tank reach about saturation point, or the vapours warm up and expand as the day warms, the pressure in the tank increases, forcing some of the vapour out the vent. That vapour would then descend gradually to ground level if not dispersed by air or wind currents circulating within the shed. Mr Orgo was working near the top of the tank from a box on forklift tines. It is possible that concentrated vapours sank a short distance from the vent to the point at which he was working and flashed back into the tank.

74. This theory is less likely to explain the explosion than the first theory discussed. Mr Lahz gave evidence that TIG welders do not generally produce sparks. The vapours emerging from the vent would have needed to stay within

the explosive range of concentration to the point where the weld was occurring for flashback to occur. The vent did not direct vapours in any particular direction but allowed them to disperse in any direction according to the air currents flowing around the top of the shed as they emerged. Once again, it would be an extraordinary coincidence for the flashback to have occurred at almost the same time as the hot welding mark on the interior of the tank was developing in close proximity to an explosive mixture of ethanol and air.

75. The most likely cause of the explosion therefore is that the heat of the welding mark created by Mr Orgo on Tank 104 ignited the vapours within the tank which then exploded. That initial explosion caused secondary explosions within the shed. The LPG cylinder blew up and there may have been an explosion in Tank 103 and in other tanks.

76. Finally, the medical evidence establishes the physical causes of the deaths of Mr Drayton and Mr Orgo. Mr Drayton died as a result of blast injuries and incineration. Mr Orgo suffered multiple injuries consistent with a fall from height

What factors combined to cause the accident?

77. The “Swiss Cheese” model of accident causation is a model used in the risk analysis and risk management of human systems. It likens human systems to multiple slices of swiss cheese, stacked together, side by side. It was originally propounded by British psychologist Professor James Reason in 1990 and has since gained widespread acceptance and use in healthcare, the aviation safety industry and emergency service organizations. It is sometimes called the “cumulative act” effect.

78. The holes in the cheese slices represent individual weaknesses in individual parts of the system, and are continually varying in size and position in all slices. The system as a whole produces failures when all of the holes in each of the slices momentarily align, permitting (in Reason's words) “a trajectory of

accident opportunity" to develop so that a hazard passes through all of the holes in all of the defences, leading to a failure. (See Figs 1 and 2 below)

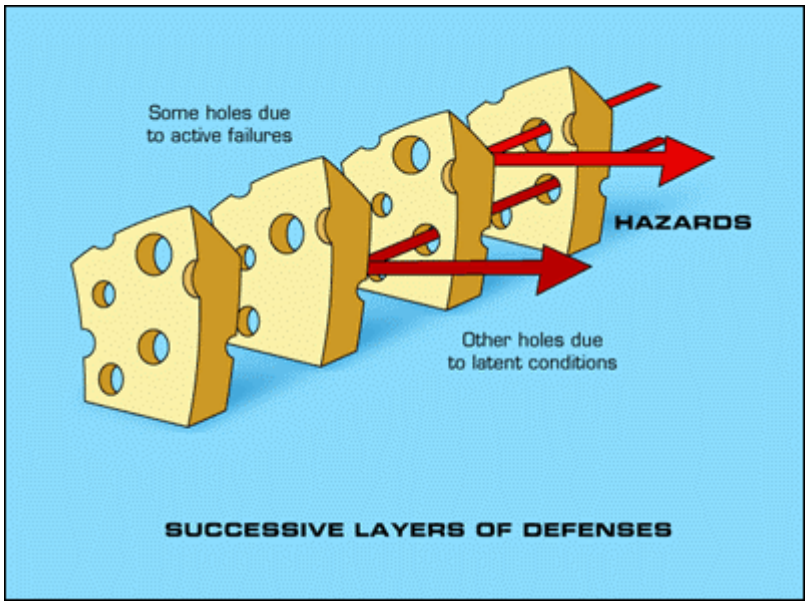

Fig 1. The defence layers work: holes do not line up

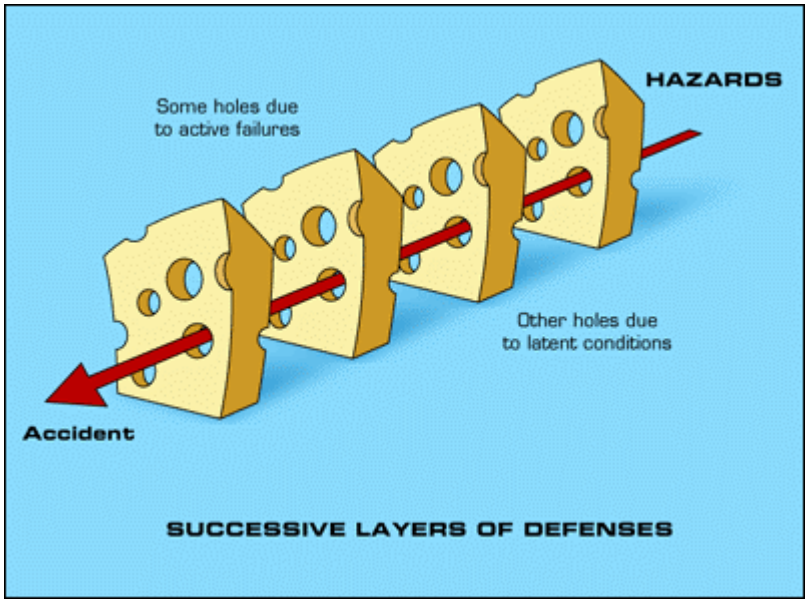

Fig 2. The holes line up: trajectory of accident opportunity[6]

79. In my view, the model is useful for an understanding of how the explosion at the Draytons Winery occurred.

[6] http://patientsafetyed.duhs.duke.edu/module_e/swiss_cheese.html

80. There were a number of layers of defence built, or meant to be built, into the winery's and Perfab's systems to prevent accidents like this one. These included the emptying, cleaning and purging of tanks on which welding was to be done; the placing of warning signs on tanks; the separating of welding operations from ethanol; the segregating of ethanol tanks from other tanks; the conducting of the JSA by welders; the testing of the tanks by welders or others to check that tanks to be worked on were empty before welding; and the use of Perfab's hot work permit system.

81. But the successive lines of defence were penetrated due to a combination of latent conditions and active failures. Latent conditions are "resident pathogens" or hidden faults in the system, which arise from factors such as organisational culture, management decisions, the design of procedures, or deficiencies in training. These resident pathogens are described by Professor Reason as having two forms of adverse effect: first, they can translate into error provoking conditions and, second, they can create weaknesses in the organisation's defences which may lie dormant within the system, until, when combined with active failures, they contribute to the occurrence of an incident or accident.[7]

82. Active failures are the mistakes or procedural errors or slip-ups that constitute unsafe acts on the parts of human operators of the system or parts of the system.

83. In this case, a number of latent conditions lending themselves to human error and creating weakness in defences can be identified. Among them are the facts that ethanol was stored in the wine production area; that it was stored in a general usage tank rather than in a special purpose tank identified as such; that cautionary signs were not displayed on the tank; that there was no special briefing by winery staff of the welders concerning the contents of the tanks and so on.

[7] Reason, J "Human error: models and management" (2000) *British Medical Journal* 320: 768-770 at p769.

84. In my view, two of the most critical latent conditions inherent in this environment were, first, a mind-set on the part of the welders and Draytons that the JSA safety checks and OH&S manuals were only a form of routine paperwork, and, second, an unwarranted confidence that because nothing had gone catastrophically wrong in the past, nothing happening at the time was likely to.

85. An emphasis on compliance and regulation of safety can, paradoxically, reduce safety. In my view, it is likely that the Draytons OHS manual was seen by the winery as a form of regulatory homework rather than as a tool for improving the actual safety of staff and others at the winery.

86. Similarly, the JSA safety check was a "tick-the-box" checklist to be completed by welders before they got on with what they regarded as the real work. Insufficient connection appears to have been made either by Draytons management or by the Perfab welders between safety compliance procedures and safety itself.

87. In short, compliance (insofar as that went) rather than mindfulness of risk itself seems to have been uppermost in the minds of those operating and working in the winery around the ethanol. In Draytons' case, not much thought appears to have been given directly even to compliance. The reason for this is probably that past experience had suggested that there was little or no actual risk.

88. It is against this background that Counsel Assisting accurately identified a number of factors contributing to the explosion:

- That Mr Orgo and Mr Lahz did not know what the contents of Tank 104 were;
- That there was nothing to suggest to Mr Orgo and Mr Lahz that Tank 104 contained a highly flammable substance, ethanol;
- That no-one at either the winery or at Perfab turned their minds to the risk of welding in the vicinity of stored ethanol; and

- That there was a communication gap within the winery as to the contents of Tank 104.

What can be learned from this incident?

89. Accidents are "normal" in complex systems. The more complex the system, and the more inter-related the components of the system and processes within the system, the greater the potential for mistakes or failures to cause problems.[8]

90. Wine production, because it combines a number of ingredients and processes, some of which are potentially dangerous, and because it requires a number of persons to be involved exercising different skills and knowledge and using a number of technologies, is a fairly complex system.

91. Complex systems require defence mechanisms, such as cross-checks and checklists, to be built into them. Insofar as their processes can be simplified and made linear (ie, one step following another rather than taking place simultaneously), safety can be increased. By reducing the number of potentially dangerous points of interaction between components or processes, the risk of failure or accident can also be reduced.

92. It is obvious in hindsight that to reduce the possibility of catastrophic interaction between components and processes in the wine-production system, bulk SVR and other very hazardous substances ought be stored separately from other components of the system.

93. It is equally obvious in hindsight that safety checklists and procedures are relatively ineffectual as defence mechanisms if they are regarded as mere paperwork rather than as tools to increase safety consciousness and mindfulness. Much reliance is placed on checklists in complex systems.[9]

[8] See generally Reason, J *Human Error* Cambridge University Press, NY, 1990 pp 176-178; Perrow, N *Normal Accidents: Living with High-risk Technologies* Basic Books, NY, 1984.
[9] See, for example, Gawande, A *The Checklist Manifesto* Profile Books, London, 2010.

Checklists work by reminding users of the steps they must take and their correct sequence in complex operations.

94. Checklists, however, are not an end in themselves and are not universal panaceas for human error. A recent trend to introduce checklists in surgery and other medical practices has caused some to sound a cautionary note. For example, a group of physicians who brought about a marked reduction in hospital infections in the United States while using a checklist emphasised that it was not the checklist itself that brought about the change but a reformation of clinical culture in the hospital:

> The mistake of the "simple checklist" story is in the assumption that a technical solution (checklists) can solve an adaptive (sociocultural) problem. To improve safety, health care needs to get the technical and adaptive work right. Without attention to adaptive work, checklists would probably suffer the same fate as guidelines—often left unused, even when very robust. Summarising evidence is a necessary but not sufficient step for translating evidence into practice. Evidence summaries need to be combined with an understanding of, and a strategy for, mitigating the technical and social/political and psychological (even emotional) barriers to using the evidence, and with feedback about performance. Emphasising checklists as the explanatory mechanism for the reduction in catheter-related infections obscures the complex labour necessary to create a collective local faith in checklists.[10]

95. If checklists are to be used effectively, they need to be well-designed. Professor Atul Gawande observes in his book, *The Checklist Manifesto*[11]:

> There are good checklists and bad… bad checklists are vague and imprecise. They are too long; they are hard to use, and they are impractical. They are made by desk jockeys with no awareness of the situations in which they are to be deployed. They treat the people using the tools as dumb and try to spell out every single step. They turn people's brains off rather than turn them on.
>
> Good checklists, on the other hand, are precise. They are efficient, to the point and easy to use even in the most difficult situations. They do not try to spell out everything – a checklist cannot fly a plane. Instead they provide reminders of only the most critical and important steps – the ones that even the highly skilled professionals could miss. Good checklists are, above all, practical.

96. The JSA checklist used by Perfab in January 2008, in my view, may well have suffered from being overly complex and trying to spell out too much. If so, its effect may have been to "turn brains off rather than turn them on". Regardless

[10] Bosk, CL; Dixon-Woods, M; Goeschel,CA; Pronovost, PJ "Reality Check for Checklists" *The Lancet* Vol 374, 8 August 2009, 444-445 at 444.
[11] Gawande (2010) at p.120.

of how good or otherwise a checklist may be, safe work places and safe industrial operations require more than a compliance mentality regarding matters of OH&S. There needs to be a mindfulness of risk and a practical approach to the assessment of risk.

97. Firms like Perfab need to ensure that its employees engage actively in a process of risk assessment prior to undertaking hot work, and actively identify those matters which may be a risk in a hot work permit prior to undertaking welding work. This case teaches us that there should be no assumptions made as to the safety of vessels.

98. This case also suggests that the wine industry, or pockets of it, may need to raise its level of awareness of the risks associated with dangerous products in use in wine production and of methods to minimise risk once identified.

99. Finally, the WorkCover Authority requires users of large quantities of dangerous goods to notify it. That system is a good one. The notification form itself sets out various procedures and requirements for the safe storage of dangerous goods. If consignees of dangerous goods do not notify WorkCover, however, due to ignorance of the need to do so, they may never take the appropriate safety measures, let alone comply with the relevant regulations. How then are the notification requirements to be brought to the notice of those who store large quantities of dangerous goods? To that question I will turn in the next section.

Should anything more be done?

100. In my view, WorkCover should consider developing a simple and practical method of bringing the notification system to the attention of consignees of dangerous goods whenever such goods are delivered in quantities triggering the requirement to notify. It is not the province of coroners, who lack the requisite expertise, to prescribe or design the method. One meritorious suggestion made by Counsel Assisting was that a Dangerous Goods stamp

referring to the requirement to notify WorkCover could be placed on consignment notes as an alert. There may be other ways.

101. Second, WorkCover has adopted a general policy of promoting safety culture within various industries by establishing and working with industry groups to plan ways of highlighting safety issues. I understand that the explosion at Draytons prompted serious thinking within the wine production industry about safety and safe storage and usage of ethanol and other dangerous goods. Following this incident, the WorkCover Authority conducted a safety education drive in the wine production industry. This inquest provides another opportunity for the industry and WorkCover to reconsider any outstanding issues and to reinforce the lessons learned. This inquest may also suggest the utility of reviewing the safety of practices in the metal fabrication industry, particularly where hot work takes place off site on tanks.

102. For reasons given below, I do not think it necessary to make any direct recommendations in respect of either Draytons or Perfab.

In conclusion

103. The purpose of this inquest has not been to identify guilty parties and to heap blame on them. Rather it has been to pinpoint the root causes of this disaster and to learn the hard lessons it has to teach us. Due to the diligence of the investigators, especially Detectives Greg Harding and Peter Muscio and Inspector Paul Wade, as well as the advice of a range of experts, I believe that the facts have been established. After this bitter experience, it is evident that Perfab and Draytons have both undertaken serious soul-searching about their safety cultures.

104. As robust as their checklists and OH&S guidelines may now be, it is their mindfulness of the potential risks that will keep their staffs safe in future.

105. Perfab has comprehensively addressed safety issues by undertaking various measures including a complete audit of its OH&S management system,

retraining of staff and management in risk assessment, upgrading of procedures and a reassessment of their clients. It only accepts work from large clients with rigorous safety standards. It has also reviewed its approach to the JSA procedure in an effort to make the checklist more suitable for its purpose. Perfab managers are now tasked to conduct careful assessments of each work project Perfab undertakes, especially those at other sites. In conjunction with an independent training consultant it has developed training for welders working *on* as well as in enclosed spaces. It has formed close ties with training organisations and worked to extend the benefits of its experience throughout the metal fabrication industry.

106. Following the accident, Draytons also engaged an OH&S consultant to complete and implement the draft OH&S manual. A safety committee for staff was established. The wine production area was largely rebuilt to include safety storage facilities and other safety infrastructure. Staff training has been improved and an emphasis has been placed on identification of safety issues. Finally, and most significantly, it is evident that both companies are very mindful of risk and are engaged in active and continuous development of a safety culture.

107. These proceedings must have been very painful for Mrs Orgo and the Drayton family who have borne their losses with great dignity and stoicism throughout. It would be a foolish coroner who presumes that an inquest can bring closure to the families of the men who have died in this debacle. I hope, however, that they may be able to find some measure of comfort in knowing that their losses are shared by the wider community and that the community has a common interest with them in seeking to prevent such tragedies recurring.

Findings under s 81 Coroners Act 2009

108. I find that Trevor Drayton died on 17 January 2008 at Pokolbin, NSW as a result of blast injuries and burns suffered in an explosion in the wine production area of Draytons' Winery.

109. I find that Edgar Orgo died on 17 January 2008 at Pokolbin, NSW as a result of multiple injuries suffered in an explosion in the wine production area of Draytons' Winery.

110. I find that the explosion at Draytons' Winery, Pokolbin, NSW on 17 January 2008 originated in Tank 104 situated in the wine production area of the winery and was caused by ethanol vapours igniting when heated during welding operations.

Recommendations under s 82 Coroners Act 2009

1. I recommend that the WorkCover Authority of NSW consider developing a simple and practical method of bringing the Notification of Dangerous Goods requirement to the attention of consignees of Dangerous Goods.

2. I recommend that the WorkCover Authority of NSW consider conducting a one-off publicity campaign within the wine industry reminding wineries of the risks associated with the storage and use of ethanol. Consideration of a similar campaign in the metal fabrication industry is also recommended.

Magistrate Hugh Dillon
Deputy State Coroner