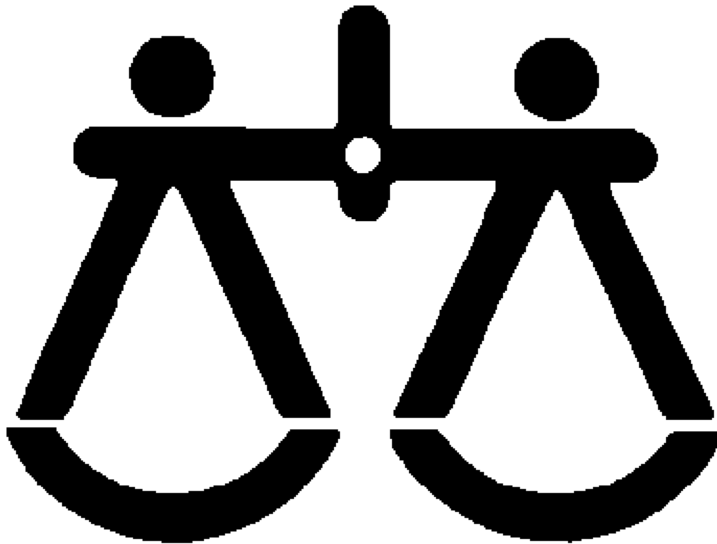

2nd September, 1996
Case No: 1207/93

Inquest into the death of KEVIN GALLAGHER-GREEN at BHP Western Port Works on 17th April 1993

[Held at the Coronial Services Centre, Southbank on 13th and 18th April, 23rd June 1995, 2nd May and 28th August 1996]

The death of Kevin Gallagher-Green occurred on the 17th April 1993, at BHP Western Port Steel Works, Bayview Road, Hastings from neck injuries.

Incident summary

Mr. Gallagher-Green, aged 39, an `Adult Apprentice Maintenance Fitter', was working on a pickle line at BHP Western Port Steel Works [John Lysaght], Hastings when, in the process of adjusting the height of the Transfer Tilt Table, he was crushed between an hydraulic ram and a hydraulically operated beam moving under the table. The incident occurred when the machine was running.

The Pickle Line is approximately 300 metres long, and provides a continuous process for sheet steel. The point where the incident occurred is the welder transfer clamp which is a hydraulically operated ram, operating on a cyclic system.

Mr. Gallagher-Green was inducted into BHP's safety procedures on 24th January 1993 by a Leading Maintenance Fitter, Mr. Glen Hawkett. Although Gallagher-Green worked there for 14 years he was only in his 2nd/3rd training year as a maintenance fitter. From Hawkett's evidence at inquest it appeared Gallagher-Green was aware of the Company's isolation and tagging procedures. Gallagher-Green had worked at BHP Western Port from about 1978.

At about 1.30am on 17th April 1993, shortly prior to the incident, Steelworker Mr. Geoffrey Edwards drew Leading Maintenance Fitter Hawkett's attention to a problem on the line relating to the height of the Tilt Table. Hawkett and Gallagher-Green then went under the machine to inspect the problem. Hawkett told Gallagher-Green he was going to isolate the welding section of the line.

Mr. Hawkett left, Gallagher-Green apparently stayed where he was. Edwards then restarted the welding operation. Edwards was unable to see the area where Gallagher-Green was moving when he restarted the machine, as the control panel and angle of his position blocked full vision of the tilt table. The last time he saw Gallagher-Green he was standing on the north side near the transformer [about 2 feet from the cylinder].

Initially, in his statement to the HSO inspector Hawkett was unable to explain why he did not completely exclude Gallagher-Green from the line before isolation procedures were put into place. However a later statement taken 30th June 1993 and his evidence at inquest sheds a different light on the subject. Without Hawkett's further explanation on 30th June it would not have been possible to discover all of the causative factors involved in the incident.

The lead up and incident

Mr. Edwards explained in his statement [taken 4th June 1993]:

> *`The welding machine that I was working on wasn't operating properly prior to the accident so another worker, Glen Hawkett, had been working underneath it. I had seen Kevin standing near the machine opposite Glen on the south side and that was the last I recall seeing him. Once Glen, who was working on the machine had left the area I reset the machine and started it again. I wasn't aware anyone else was under the machine at the time'*

When the machine restarted Gallagher-Green was struck by an eye beam moving under the table. The eye beam was not clearly visible when standing beside machine.

Mr. Edwards further explained the events as:

`...I said to Glen `Can you have a look at the exit Tilt Table, it's up to high' . The three of us [including Gallagher-Green] went to the table area and I explained to Glen it was up to high. Glen Hawkett got down on his knees and hands and crawled into the space between the Tilt Table and No. 1 Bridle. The line was ruining at normal speed at this time. Glen, when he reached the table cylinder he had a pair of multi-grips with him in his right hand.

He placed the multi-grips onto the top of the shaft of the cylinder and tried to turn it. At this time Kevin Gallagher-Green was still standing beside me watching Glen. Glen, after attempting to make the adjustments, came out from below the table and told Kevin to go off to the store and get a pair of Stillsons. Kevin...[on his return]...gave the Stillsons to Glen. I was still standing alongside Glen when Kevin done this. Glen took the Stillsons from Kevin and crawled under the table with them. Kevin and I were standing watching Glen. He put the Stillsons onto the shaft of the cylinder and tried to turn it. The whole time he was trying to make this adjustment the line was still running. When Glen was under the table the line stopped. By that time the strip comes off the mandrel and the strip had stopped running. At this time I was still standing beside Kevin at the Tilt Table area on the operators side [north]. Glen crawled straight through to the other side of the Pickle Line without coming back out to the north side and crossing the footbridge.

I watched Glen come out the other side of the line. I then went to the welder controls to set up the tail end of the strip. This is done by shearing the end and running the strip past the welder section to the Tilt Table side. It is then returned to the space bar at the welder where it is straightened and clamped against the space bar. While I was carrying out this process I seen Kevin standing beside the transformer which was near the Tilt Table. I think that he was watching Glen who I know was at the other side of the line. I did not think anything of it that Kevin was standing there as that is where I left him. As I was returning the strip to the space bar I tried to tilt the table to throw a loop and the table would not operate. This was due to the fact there was no air to operate it. At that time I thought to myself that Glen had turned of the air at the supply which I know is at the side of the line where Glen was working [south].

I was waiting for the front end to come up to carry out the same operation on that side. When I carried out this operation which is done manually I commenced the weld cycle which take from 6 secs to 16secs depending on the gauge. When I was carrying out this operation I did not notice if Kevin was still where I had last seen him as I was concentrating on what I was doing...'

And as to the operation:

`The area where the Tilt Table is situated is used to inspect the bottom of the weld after scarfing and that is the only time that an operator would be in that area. When the weld cycle is ongoing there is a lot of noise but someone underneath the table would be aware that a weld was in progress because the line is stopped. I am aware that the top part of the transfer clamp moves but upto that time I was not aware there was a large stabiliser bar beneath the table which moved at the same time as the top section...'

As to his knowledge of Hawkett's intention:

`I knew that Glen had isolated the air to the table and I assumed he was about to isolate the hydraulics next. The hydraulics on the welder operate space bar - die clamps, and the transfer clamp for the trimmer tools, without the hydraulics the welder cuts down. When the hydraulics are isolated the transfer clamp won't operate and therefore the area below the clamp would be safe.'

Mr. Hawkett said in his statement [after Gallagher-Green retrieved the Stillsons from the store];

`Kevin then stayed on the north side and was crouching down looking towards the rein. I then went to the south side and did likewise. At this stage Kevin was in possession of the Stillsons so I yelled to him `Hang on a minute, I'm going to isolate the table.' Kevin was looking towards me and nodded in acknowledgment.

For me to isolate the pneumatic rein I had to turn off the air supply which was located next to where I was standing. After doing so I was to cross to the north side of the machine to cause the welding operator Geoff Edwards to stop the line and then turn off the hydraulics.'

Then when moving towards the bridge he heard the machine operate. Hawkett's initial explanation of Gallagher-Green's attempting to adjust the pneumatic rein before the line was halted was `being so enthusiastic he thought he could adjust the fault quickly.' Gallagher-Green did not know the mechanical operation of the machine and Hawkett had only adjusted it once before. However in the later statement Hawkett gives a different explanation to what happened. He explained that he:

`crouched down and crawled into the area where the cylinder was. I attempted to adjust the shaft with the multi-grips. As I done this the strip was running overhead...[after explaining he could not move the shaft and sending Gallagher-Green to get the Stillsons]...When Kevin returned I went into the space between the Tilt Table cylinder and the side guide base...continued right through...[and when reaching the other side]...I was facing Kevin. Kevin was at this time just under the tilt table and in a space between the tilt table and the side guide base. I also was in the same position but on the south side. We both looked at the shaft while in this position. At this time both Kevin and myself would have been about an arms length from the shaft and below the table...I called to Kevin to hang on a minute, that I was going to stop the line, meaning I was going to isolate the air line.'

After backing out Hawkett only had to move about 12 inches to be in a position to turn off the valve. He then had to go over the bridge to speak to Edwards and turn off the hydraulics. As noted he did not reach the bridge before the welding operation commenced and the incident occurred. On leaving to continue the isolation procedure Hawkett did not see Gallagher-Green get out from under the table. Hawkett explained he was `not fully

aware of the workings of the underside of the transfer clamp' and neither was Gallagher-Green. Hawkett goes on to say in his statement `I was unaware of the dangers associated with entering the tilt table underside when the line was operating'. This was his only explanation for not following the procedures. Hawkett's previous adjustment of the machine was undertaken on a `down day' and as the line was not operating the movement of the tilt table could not be observed.

He agreed that the correct company procedures according to the danger tag regulations would be to isolate before entering the work space under the table.

Mr. Edwards was the elected Occupational Health and Safety Representative for the employees at the plant. He had received a weeks training at the Trade Union Training Association. Although Edwards was the Health and Safety Representative, and admitted the isolation procedures were an important safety area, he did not see the need to have an understanding of the issue. He was not trained in the area of isolation although training was given in lockout procedures. Hawkett was of the view that Edwards would just keep doing his job until he was informed [by Hawkett] that the line was being isolated. This was because it might take some time to complete the procedure. He admitted that he started the procedure without talking to Edwards.

Mr. Edwards was aware that Hawkett was at some stage going to isolate the machine, but continued the operation as:

> *`They hadn't actually come up to tell me they were going to stop the machine.'*

There was no conversation between Hawkett and Edwards as to the intention to isolate. However, Edwards saw Hawkett turn off the valve on the south side of the machine - this turns off the air. Even though Edwards had not seen this process before he believed it was the commencement of the isolation process. He considered there was no other explanation for the turning off of the valve. Apparently the machine can still operate with the air shut off. In answer to the question as to why he attempted to activate the weld cycle - `Because I wasn't told not to do it.'

Had Mr. Edwards received training in isolation procedures he agreed that he would have known in greater detail what Hawkett was doing. However, he also agreed to the effect that knowledge would not have made a difference in to the events in this case. Edwards rotated through different parts of the Pickle Line's operation. It is clear that Edwards knew what was going on but had not identified the risk his actions put on Gallagher-Green. He was not aware of Gallagher-Green's position as it related to the tilt table. He was also unaware of the hazard.

Evidently line stoppages are frequent. However, this was the first time to Edward's knowledge of a problem with the tilt table.

One additional issue to be considered is - whether Edwards' initial contact [as operator] and proximity during Hawkett's first attempts to alter the height lulled the maintenance fitter

into a false sense of security? He may have considered the machine would not be operated? Gallagher-Green may have considered the situation to be safe because of Edwards' initial contact and presence. Although not considered in evidence it would not be unreasonable to pose the possibility.

Knowledge of the danger - movement of the beam

An inspection of the nut used to vary the height of the Transfer Tilt Table indicated it had been adjusted before. Considerable burring on the adjusting nut was visually evident. Some of that damage occurred as a result of Hawkett's attempts with the multi-grips. As the adjustment nut had been used before knowledge of the dangers [or the risks] of entry into the area might be assumed. That would be incorrect.

Mr. Edwards was not aware of the movement of the beam under the sliding transfer clamp. Hawkett was also not aware of its movement although he had adjusted it once before - on a down day. As Gallagher-Green had not previously worked in the area it is unlikely he was aware of its operation.

Mr. John Wolverson, a leading hand shift fitter, employed by BHP since 1984 was familiar with the tilt table. He indicated that the table was `seldom' adjusted. Since his employment it had been worked on about half a dozen times. He had adjusted the height of the table during times the machine was not operating [down time]. As he had worked on this area of the machine he had an understanding of the `parts of the line which move'. On previous occasions Wolverson had seen the transfer clamp move. He agreed that:

> *`You could walk past that beam 1000 times and you wouldn't know that it moved unless you had actually crouched down or being involved with it.' ...*

And of his knowledge of the movement of the beam:

> *`I've known that for a long time, like say, we had a problem years back where the cylinder came apart.'...[then]... `We had to go underneath there and fix up the cylinder.'*

Mr. Wolverson indicated some surprise when discovering how the machine worked as `...it doesn't look as though this part of the welder will move.' It could only be discovered by crawling underneath. Apparently there was no system to ensure any particularities of the machine were notified to other fitters. When the issue of how other fitters would tackle a maintenance problem was discussed Wolverson said:

> *`...you would get as close as you...safely could to the equipment.'*

When asked as to whether the fitter would get close to the level where the repairs were to be effected:

> *`...but if the piece of equipment did not move while you were looking, you wouldn't know it was going to move.'*

Mr. Hawkett stated that although he was familiar with the movement of the top section of the tilt table he was unfamiliar with the underside. In answer to a question; Can you explain...why it is that you failed to appreciate the position that you and Mr. Gallagher-Green were in, that that was not going to be homing in on you as you were on your haunches beside that cylinder? Hawkett said:

> *`We were looking at the cylinder, not looking at the other part of it.'...[and to a further question]...I didn't know that was attached - that would move with the rest of the clamp...'*

Mr. Hawkett relates that he and Gallagher-Green were crouching down examining the cylinder when he said `Hang on a minute, I'm going to `isolate' or `turn it off' probably something like that.' Hawkett saw Gallagher-Green `nod' in response. Apparently both Hawkett and Gallagher-Green were wearing ear plugs because of the noise levels in the factory. Although Gallagher-Green nodded in response it is not possible to further ascertain his level of understanding of the instruction.

It is interesting to note that Wolverson understood that the beam moved because:

> *`During our normal work...we carry out line checks we go through and we check for oil leaks or anything coming loose and this involves crouching down and crawling under things...So, we get a general understanding on basically which parts of the line move.'*

However, a video of the full operation of the sliding transfer clamp presented in evidence clearly shows its operation. The video illustrates that a thorough audit of all adjustment points on the line would have identified the danger. However, the area was not guarded as it was never `recognised as a hazard' [Mr. Terry Opie, Occupational Health and Safety Officer - BHP]. Following the incident the immediate area was guarded and written safety procedures were adopted.

Mr. Opie also agreed the current safety procedures [mesh fence] could be breached.

The `isolation' procedures

As can be seen from the requirements of the Company's `Handbook of Danger Tag and Warning Tag Regulations' before proceeding it is necessary to assess *`where you are exposed to the risk of personal injury.'* It is noted that Hawkett only worked on the tilt table once before during a `down day'. Where there is a `down day' there are no operators present [and, obviously, the line does not operate]. Therefore, in `down day' maintenance the operator would not be approached before isolation procedures commenced.

It is interesting to note that while the `Danger/Warning Tag Regulations' are prescriptive they are silent as to the need to first approach the operator before the `isolation' procedure is to be commenced. The only possible indication that contact is required in the procedure is the comment under the heading `PURPOSE' - `To protect you when working on isolating by instructing others that a control must not be altered.' However, from the evidence there

appeared to be an understanding of all concerned that the operator was to be approached before isolation was to be commenced. Evidently it was part of training.

As indicated the work system that applied to BHP's Western Port Plant was governed by a `Handbook of Danger Tag and Warning Tag Regulations' [Updated June 92]. The summary of the Basic Rules [omitting sections not relevant] states:

> `(a) Before commencing work on any equipment you *must* ensure that the correct isolating procedures have been applied.
> (b) You *must* place DANGER tags before commencing work on any job where you are exposed to the risk of personal injury.
> ....Failure to comply with the above will make you liable to *instant dismissal...'*

and under the heading `ISOLATION OF EQUIPMENT'

> `...(b) For hydraulically operated equipment - closing the relevant shut-off valves or where valves are not provided, switching off and isolating the pumps. Ensure that pressure is released from the system.
> (c) For air operated equipment - closing the shut-off valves and releasing the pressure.'

Currently it is understood these procedures have been reviewed by BHP. In addition `work permits' are being considered. One of the real difficulties is the apparent lack of training in the `risk assessment' area.

Level of training at the plant

Although there was a level of training in safety procedures at the plant there are concerns at the level of understanding. Edwards [the Health and Safety Representative], for example, in his statement to the HSO inspector said:

> *`...I have no formal qualifications but have attended a week safety course at TUTA. I have not attended any other safety courses.'*

and

> *`...there is a book of procedures for operating the machine in the welder's cab. My training on the machine consisted of on the job training by Tom Merks leading hand of the pickle line. This was about 18 months ago and he was with me for about 2 weeks full time. I have not received any further on going training. I went through the book of procedures at that time...I was aware f isolating procedures which is another small booklet which I would have got from Steve Slater. These are handed out about every 12 months to read. There is no formal training on isolating procedure.'*

Mr. Edwards' level of understanding of the `isolation' procedures is explained by the Company on the basis that, as an operator [as distinct from maintenance personnel], he did not need to know isolation procedures. Hawkett acknowledged that when he started work at

BHP he `*underwent induction procedures which included safety procedures, lockout and isolation procedures, also the full understanding of the danger and warning tag system.'* However, he could not recall the last time that he received training in this area of safety. This in spite of the fact that testing on the procedures is on an annual basis.

As to training on isolation procedures Wolverson said:

> `*...I have never been trained in proper isolation procedures'...and...`followed out my own isolation procedures which I had been shown by other, other fitters that's the procedure that I used.'*

Mr. Wolverson appeared confused as to the procedures to be used. He later acknowledged that `general isolation procedures' were in fact followed. He indicated that before the area was to be isolated the operator was informed.

The evidence of the staff on the issue of training was presented during the inquest hearing and there must be an understandable allowance for the possibility of confusion between the questions and answers. However, these [and other] statements during the inquest indicate the need for a critical review of the training methods [and audit]. It is understood this is being undertaken by BHP.

The possible fatigue issue

Mr. Hawkett indicated he had commenced at 11pm and was on a rotating shift. This was his first period of night shift following two days off. The shift process is seven days straight [followed by one day off]. Evidently there are three consecutive shifts with a five day break at the end before starting the day shift. Hawkett had taken an extra day.

He said that he was `*tired on night'... `its just the start of the night shift, you usually don't get a lot of sleep during the day. Because you're body is changing I suppose...the nightshift's especially hard on you. Your not getting enough sleep or what ever. Its just because your body's not used to it and doesn't get time to get used to it before you change again.'* Whilst Hawkett then acknowledges that not appreciating the danger was the explanation for the incident this is a general issue which may need further examination by BHP.

The drug issue

The toxicological analysis at post mortem showed presumptive evidence of amphetamines or stimulants and opiates in urine. The clinical significance of this finding was not likely to have effected this incident. Evidence from the Toxicologist suggested that the analysis could have resulted from self treatment for a cold with preparations available over the counter at chemists. Hawkett commented that Gallagher-Green was `his normal self, and appeared to be fit, well and sober.'

Guarding of Dangerous Machines
[Occupational Health and Safety Regulations (1986)]

The Occupational Health and Safety Regulations [1986] `Guarding of Dangerous Machines' applying at the time of the incident provide a useful indication of responsibility. The relevant section [10] states that guards are to be provided for `all dangerous parts of the plant of a workplace...so as to prevent as far as practicable loss of life or bodily injury'.

The Australian Standards

The Australian Standards [unless called up in specific state/territory regulations] are not mandatory. They provide a useful guide for various aspects relating to occupational health and safety - in the design of machinery and guarding, work systems, hazard control, incident reporting and investigation, etc.

It should be noted that many of the controls and systems provided in the various Australian Standards were in place at BHP's Western Port Works at the time of the incident. Considerable work has been undertaken at Western Port relating to safety since this incident. However, whether the Standards were considered in the original [and ongoing] systems development before the incident is a moot point. Of Australian Standard 1755-1986 in the review BHP [after submitting that the Standard does not apply] states `...Furthermore, at no time have the officers of the Health & Safety Organisation...referred the Company to the Australian Standard for Conveyors.'

It is considered that Australian Standard 1755-1986 `Conveyors, Design, Construction, Installation and Operations' does not in its definition section exclude the `Pickle Line' from its scope. Sheet steel is `conveyed' over a continuous line. Clause 5.1 would operate to require [if the Standard was mandatory]... `Fixed guards shall be provided where the conveyor can be serviced without the removal of the guards [eg; for adjustments, cleaning or lubrication].' It is noted that the Standard did not apply at the time of commissioning of the Pickle Line [which was prior to the introduction of the Standard].

Australian Standard 1470-1986 `Health & Safety at Work - Principles & Practices applies to provide guidance in a number of areas and in particular 6.3.4 [Workplace Training] and the need for supervisors to undertake a `job hazard analysis'. This was not addressed in BHP's review.

And 9.8.4 [Provision of Guards]:

> *`Portions of machinery, plant and equipment being processed that are not constructed or positioned so as to be permanently safe should be guarded or screened to the greatest possible extent.*
>
> *The basic principle is that, unless a danger point or area is safe by virtue of its design or its position, the machinery should be provided with an appropriate safeguard which eliminates danger before access...'*

Here there was a hidden hazard [albeit a hazard that could have been identified by careful audit]. BHP in their Standard Review said:

`...in this particular case the area underneath the tilt table had not been identified as a `danger point or area' (despite frequent internal and external [HSO] inspections], and therefore had not been guarded in the traditional sense. As stated in relation to section 9.8.2, the area in question is not an area requiring anything other than maintenance personnel access, and is not close to operating personnel. The Company requires that all personnel, prior to working on any equipment, ensure that it is fully isolated and de-energised...'

This is not an appropriate way of managing a hazard where guarding can be provided. Mr. Gregory Clapp, BHP Steel Division, Occupational Health and Safety Manager said [of the Company's danger tag warning regulations and training]:

`I believe that the system has always been very adequate, that the training has been very good but constantly improved, it does rely on behaviour, the danger warning tag system and there in lies its inherent weakness.'

That weakness has long been recognised in other industry sectors and needs addressing.

The corporate and HSO explanation for the incident

An examination of both the corporate and HSO explanations indicates a limited view of the multi-faceted nature of the incident. While a limited number of causative factors are identified other potential problems were not investigated. The HSO investigation even in its initial stages was limited and once Hawkett's role became clear other factors were not examined. Evidently there was no detailed internal investigation by BHP with a total preventative focus aimed at identifying all the factors as they relate to this incident. Although it must be noted that following the event a general review of health and safety was undertaken it was stressed the review was ongoing and did not occur as a result of this incident. Evidently the review related to safety procedures throughout all BHP operations.

An examination of the comments of various individuals both at HSO and corporate level indicates a focus on blame related issues. Mr. Stephen Slater, Shift Supervisor in charge of production [in his initial statement] indicated that Gallagher-Green:

`...would have known the operation of the equipment and would have been aware of any dangers in this area.

...I can see no reason why this has happened. As I have said, the line is in normal working order and in my estimation Kevin was aware of its operation.'

Later, at the inquest, Slater was of the view that Gallagher-Green was aware of the isolation procedures but was not aware of the danger. Slater's reason for the change of view

appears to relate to the fact that the beam is not visible from a standing position. Of the training system he said:

> *`Well, its is common knowledge to everyone at BHP Western Port that tradespeople physically do operations and that operators physically do lockouts, that all people involved use Danger Warning Tags. The operators do not have the electrical or mechanical qualifications to enable them to carry out the isolations. Those isolations are done on their behalf by the tradespeople and the operators then put their danger tags on it to protect them and signify that they are the people that are working in the area.'*

Of the reason why the incident happened Slater said:

> *`...because there was a failure to follow the isolation procedure...*[and]*...It's impossible in this instance to look past Mr. Hawkett. Its my firm belief that Mr. Hawkett was going through the routine of isolating. He was - had all the intentions of carrying that out...*[he]*... understands the systems and operates by those systems '*

Mr. Opie and other witnesses indicated that it was:

> *`common sense'... `a normal practice that you stand back and observe the job, so you understand what is wrong with it and then you, also can gauge what equipment you may need and what steps you then have to take.'*

Also that Edwards knew what was going on. Hawkett was effectively of the view that Opie's `common sense' approach of observing the job was the safety procedure. He could not remember the last time he referred to the `safety manual' and the most important safety procedure was the `isolation procedure.'

In its response to the HSO report on the applicability of the Australian Standards BHP states of the employees responsibility to take care for their own safety...[and to]...comply with instructions given for their own health and safety [AS 1470-1986] that:

> *`Had these responsibilities been met on the day in question, it is the Company's belief that the incident would not have occurred.'*

The HSO inspector, Mr. Andrew Gildea, concludes:

> *`I am therefore of the opinion that the leading hand Glen Hawkett set a bad example to the deceased, by entering an area where dangerous machinery was in operation.*
>
> *It is appropriate to assume that the deceased was influenced by the actions of his supervisor Hawkett, when he witnessed Hawkett crawl through the area where dangerous machinery was in operation, ie below the tilt table.*

Further Gallagher-Green may have assumed without further thought for his own safety it was appropriate to follow the example set by Hawkett, and moved closer to the cylinder with the intention of attempting to make the adjustment.'

Apparently a thorough examination of the employees' knowledge of the particular `danger' or `hazard' was not examined before that assessment was made. Neither were other issues such as the possible applicability of the Australian Standards; where safety hazard identification audits either of the line on commissioning or those conducted at regular intervals have fallen down; why a full audit of the training/systems was not undertaken following this event; or why the possible fatigue factor was not investigated. These are to name but a few possible systems problems.

Conclusion

The causes of the incident on the 17th April 1993 at BHP's Western Port Plant were multi-faceted. They range from a failure to adequately audit the plant [for hazards] on commissioning, the failure to have adequate systems to identify potential hazards during maintenance, the failure to effectively audit the line for hazards, the failure to provide guarding for the area [where a latent hazard existed] and the failure of Hawkett to closely follow the isolation procedures [in circumstances where he did not appreciate the danger]. Another factor is Edwards continuing an operation in circumstances where he ought to have queried Hawkett when, by his actions, he indicated an intention to start the isolation procedure.

It must be noted that a detailed audit of the Pickle Line's operation at commissioning would have detected the hazard. Any later ongoing audit aimed at identifying potential hazards would also have identified the problem. A system aimed at encouraging employees to report potential hazards would also have identified the problem. It is worth noting that Mr. Pincott in his evidence indicated that the Company had a `formal hazard audit system' in place before the incident. This system involved `management...operations and maintenance' personnel. It did not detect the hazard. It is reasonable to expect that it should have.

No doubt Gallagher-Green did not appreciate the danger and he probably followed his superior's [Hawkett's] example in an attempt `to get the job done.' Equally Edwards was obviously focused on the same issue - keeping the line running. In a busy and extremely noisy environment there clearly needs to be far more attention on eliminating potential hazards. This case is illustrative of the fact that by the very nature of human behaviour concentrating on `getting the job done' isolation procedures of themselves may not be sufficient. BHP's Occupational Health & Safety Manager began to recognise the problem when he said [of the isolation procedures] `*it does rely on behaviour...and there in lies its inherent weakness.'*

The possible involvement of fatigue resulting from shift changes has not been examined by experts. The system of training [and the qualification of the trainers] and its effect on this incident, apart from the general comment on the problems with the division between operators and maintenance personnel, has not been examined by appropriate experts.

Because of the limited nature of the initial investigation detailed program analysis on systems, design/engineering, training, fatigue in shifts, noise factors, behavioural issues and audit was not done. This should have been done.

Contribution

While it may be considered that Messrs Glen Hawkett and Geoffrey Edwards contributed to the death their contribution must be seen in the context of a number of systems problems relating to safety at the Western Port Plant. Mr. Kevin Gallagher-Green, who had been trained in isolation procedures, remained in position when Hawkett was going to isolate. He was told by Hawkett to `Hang on a minute'. Hawkett, the supervisor, did not seek to remove Gallagher-Green from that area. Edwards continued with the operation when he should reasonably have checked with the leading maintenance fitter, Hawkett.

In considering the issue of contribution, from the perspective of BHP, the decision by the High Court in *McLean v Tedman [1984] ALJR, Vol. 58, p541* was referred to by counsel for the family. The court, in summary, held:

> *`The employer's duty to provide a safe system of work is a duty to establish, maintain and enforce such a system and includes a duty to take account of the employee's negligence, inadvertence and carelessness in carrying out the work'....and... `Accident prevention is unquestionably one of the modern responsibilities of an employer.'.... `in deciding whether an employer has discharged his common law obligation to his employees the court must take into account of the power of the employer to prescribe, warn, command and enforce obedience...'*

The facts of that case involved an injured garbage man who was struck by a car whilst crossing the road. The employer clearly knew of the risk but did not manage it. The evidence of an alternative, safe and practical method of work was given by the driver of the garbage truck:

> *`Q: Did it ever occur to you to cross the street and do them on the other side? A: We have since, we do go down one side and come up the other side because of safety reasons. Q: Because it is a busy street? A: Yes.'*

In that case there was only one clear work procedure and the risk was obvious. The employees were apparently not trained to avoid that risk nor were simple work procedures adopted to avoid the hazard. In the case under consideration apparently both the deceased and Hawkett were trained to avoid hazards through an isolation/tagging process. In the Tedman Case there was no system. In this case there was a structured system of training [with isolation/tagging]. In essence a comparison between this case and Tedman is further complicated by some work undertaken by BHP at the Western Port plant in health and safety issues.

However, what was not done was a detailed safety audit of the Pickle Line on commissioning which would have identified the potential latent hazard and provided lockout. Lockout would allow for, what the judges in Tedman aptly point to as a problem `the employee's negligence, inadvertence and carelessness in carrying out the work'. In this case the employees did not appreciate the danger from the sliding beam under the tilt table.

This case is illustrative of the proposition that training, isolation/danger tagging may not be sufficient when dealing with a latent hazard. Albeit a hazard that should have become obvious when commissioning the machine or during the first adjustment process. The hazard is latent in the sense that, as adjustment is a relatively rare event, employees may not become aware of the problem. In addition the adjustment may be done in `down time' when the problem would not be evident. Therefore, in spite of regular training on safety procedures, inadvertence [or a lack of awareness] may rule in a busy work environment and disaster follow.

BHP failed to identify the latent hazard on the Pickle Line when it was first installed and/or during the regular maintenance adjustment. Modern lockout methods [in addition to the then existing training, tagging and isolation procedures] were a reasonable solution to maintenance and adjustment on this particular section of the line. Automatic lockout did not [and does not at this time] apply to restrict access to the area when adjustment was to be carried out. It should.

The training was apparently fragmented as between operators and maintenance personnel with the result that an operator started the welding process even though he was aware that the maintenance fitter had commenced the isolation process. Whilst it is understood that it is necessary to have a demarcation [for safety purposes] between operators/maintenance the training should be aimed at a greater level of understanding of each function. Even though there was regular examination of operators/maintenance employees' knowledge of safety procedures that knowledge appeared lacking at inquest. It must be noted that safety training [with testing audit] was part of the system at Western Port at the time of the incident.

There was no evidence that the employees involved were aware of the specific hazard and thereby able to identify `risk' under the Company's isolation/tagging procedures. Not having that level of awareness the immediacy of commencing the isolation in accordance with the procedures before the work may not have been evident.

Edwards' initial action in requesting adjustment, moving to a position with Hawkett and Gallagher-Green and observing them in the vicinity of the gap in the table may have given a false sense of security to the work at hand. Unfortunately, he then went back to the operator's panel and started the weld. This is a posibility only. It was not examined.

The `common sense' process of standing back and watching the machine in operation is another way of defining `risk assessment'. It would appear that there was no training in `risk assessment' - vital for the effective operation of the `isolation' procedures [in the event

that mechanical protection is not practical]. A word of caution - one person's view of `common sense' may be very different from another's.

In summary there were a number of factors involved:

(a) There was no evidence of a developed procedure aimed at identifying [and reporting] potential hazards during regular maintenance on the `Pickle Line' [see Wolverston's evidence] ;

(b) There was no evidence of a thorough audit of potential hazards [whether latent or patent] on the `Pickle Line' when the line was first commissioned;

(c) The regular audits of the line aimed at identifying potential hazards did not identify the hazard in tilt table area - they should have;

(d) As the particular hazard had not been identified [because of a lack of adequate reviews] guarding and/or danger signs had not been provided;

(e) Whilst there was a training system in place aimed at lockout, isolation and tagging it appeared to be fragmented between operators and maintenance personnel. In addition, in spite of annual testing, there appeared to be some difficulties in the understanding of the safety training procedures by the relevant personnel; and

(f) There was no evidence that employees directly involved had identified, been trained to identify `risk' or were likely to know of the hazard. `Common sense' apparently was the rule. With a full `risk management' approach to safety this would not have developed.

Accordingly the employer, BHP, also contributed to the death.

Recommendations and Comments

I propose to forward the Findings, Recommendations and Comments to the Attorney General as a matter of information. The findings will be disseminated to the :

- Minister, Department of Business and Employment,
- Chief Executive Officer, Workcover Authority [and its Health & Safety Division],
- The Managing Director, BHP,
- Secretary, Trades Hall Council,
- Monash University Accident Research Centre, and
- The Dean of Engineering, Monash University.

General Comment

Whilst it is clearly recognised that there are significant differences in petroleum offshore drilling operations to the work done in a steel mill the issues in this case are similar and

result from a failure to allow adequately for human error [or behaviour]. The concentration in this case by those directly involved perhaps was on `getting the job done' rather than the safety procedures. The corporation appeared to concentrate on blaming the individuals for the outcome.

There are lessons to be learnt in this area from the Petroleum Industry. In the Offshore Platform [Tuna Fire] which occurred on 24th April 1989, Esso in its report on the incident states (in part):

> ``*to assist in ensuring that this task was properly performed the electrician took the MOV instruction book to the work site.*" *...and...* ``*he was focusing his attention on the mechanics of setting the electrical limits and as part of this he elected to open the valve and check the limit*".

Coronial comment, following a fire inquest, also indicated:

> ``*The precise reason for the fire results from inadequate danger tagging, work permit procedures and a failure of communication leading to the inevitable but understandable human error where concentration was focussed on getting the work done rather than on safety procedures that were inadequately communicated.*"

and

> ``*..the system of work permits and danger tagging procedures is also inadequate and this ought to have been well recognised by Esso prior to this incident. It was certainly recognised in Onshore operations with far more sophisticated, permit, tagging and lockout procedures which were obviously designed for the ever present and well recognised likelihood of human error.*"

The potential consequences of a poorly managed Permit to Work System can be seen by the 1988 Piper Alpha Disaster in the North Sea where 167 lives were lost. And that `human error' was recognised as a factor in offshore drilling operation incidents in a Report on a Meeting of Health of Offshore Oil Drillers [Tunis, May 1985] which stated [of platform accidents]:

> ``*...(most) were traced to errors related to human factors. The personnel errors are due to lack of training, negligence, lapses in safety practices...*"

Probably the most important lesson from events such as the one under investigation is to be found in a general comment in the `Interim Australian Standard' - Safeguarding of Machinery Part 1 General Principles [AS4024 - 1992]:

> ``*Accidents with machinery have often been attributed to* ``*unsafe acts*"*, when a more thorough study would have revealed a design deficiency which did not allow for typical human characteristics or behaviour*"*[p.8, 3.1].*

This case is a prime example. Neither the HSO investigation nor BHP's subsequent approach to the event discussed this issue. The issue was alluded to in the comments [at inquest] by the Company's Health and Safety Manager, Mr. Clapp, when he cautions of the isolation system `*it does rely on behaviour, the danger warning tag system and there in lies its inherent weakness.'*

On balance, it must be noted, that considerable work had been undertaken at the Western Port plant by BHP [both before and after this incident] on health and safety issues. There were isolation/danger tagging, training, some audit procedures and record keeping to name but a few. The company has recently [in 1994] undertaken a review of its safety involving the DuPont Corporation. The significance of DuPont's involvement is its reputation throughout industry of an excellent safety record. BHP is also establishing an incident review procedure. For this new approach BHP must be commended.

Investigation for `prevention' and beyond blame

In addition, rather than attempt to identify all of the factors involved there has been a focus on the employees' responsibility and drawing attention to `frequent internal and external HSO inspections' each failing to identify `a danger point or area.' [BHP Standards Review]. Throughout the inquest regular HSO inspections were alluded to as an explanation for failing to identify the problem area. This again tends to avoid the issue of corporate responsibility for safety.

The investigation was left with the impression that, rather than seek to identify all of the factors that may have resulted in this incident, the concentration was on the factors involving the employees. Mr. John Pincott, former Cold Reduction Manager at the Western Port plant stated in evidence:

> *`[of the non compliance with isolation procedures by Hawkett] [he] appears to have breached the isolation procedures that are required to afford him the appropriate protection...[and]...it is of concern that a senior tradesperson would operate in that fashion'...*

A word of caution as Mr Pincott only discovered that Hawkett was involved about two weeks before commencement of the inquest. The HSO inspector took a second statement from Hawkett in which he admits direct involvement in the incident. BHP was not notified of the subsequent statement and only became aware of the issue on reading of the `Brief' to the coroner. On reading the brief and considering the evidence at inquest Pincott was of the view:

> *`...in relation to Mr. Hawkett's position, [I] need to assess what relevant discipline would apply commensurate with the conduct that he has followed at the time and that would be in conjunction with our industrial relations people, or legal people seeing it is two years after the event. But clearly that if I had been in knowledge of that information, at the time, it would have been, I would suggest a fairly severe discipline applied to Mr. Hawkett...which can go as far as dismissal...'*

Possible responsibility of the employees [including the deceased] was but one of the issues. There were many others. A thorough internal critical incident review investigation aimed at prevention following the event would have identified some of the problem areas. Apparently this was not done [although some level of investigation was evidently undertaken by the company]. A critical review aimed at prevention would have identified the problems with hazard identification and highlighted Mr. Clapp's problem with the isolation system.

It should be noted that a detailed external investigation into liability and workers compensation issues was undertaken. This was regarded as privileged was not seen by the court.

To be effective an incident review process must seek to identify all of the factors [whether design, training, systems, behavioural, etc.]. Investigation to identify all factors with a focus on prevention of future events has long been recognised in some key safety areas - aviation/anaesthetic related mishaps. In that context an internal blame free investigatory process has merit.

Without Mr Hawkett's subsequent statement [even though faced with the risk of dismissal] many of the additional factors may not have been identified. The risk of dismissal needs to be carefully balanced against the need to learn as much as possible about all of the factors surrounding an incident if the aim of the investigation is prevention. Clearly, although discipline and legal liability issues have their appropriate place in prevention, experience has shown in crucial safety areas such as aviation investigation sometimes more may be achieved by the `blame free' process.

The failure of the initial investigatory process [HSO and Corporate] to identify all of the factors highlights the issue. Once again it is necessary to emphasise the need to balance two competing areas - legal liability [criminal and regulatory breaches; civil negligence; compensation issues; etc] and internal discipline with a blame free process aimed at identifying all of the factors. Prevention should be the key direction for both systems. The balancing of the two methods is not easy as each has particular merit. However if death and injury at work is to be reduced a balance must be found. In finding that balance we may have to look at separating the two concepts.

It must be remembered that issues of accountability, either of individuals or corporations, whilst appropriate for any investigation to consider, may cause problems. It is possible that concentration on accountability may cloud issues and limit effective development of preventative countermeasures.

Any investigation, to be effective, must look at:

(a) program analysis;
(b) systems;
(c) training;

(d) design, engineering and maintenance factors;
(e) behavioural factors;
(f) trends and research;
(g) audit;
(h) legal issues [regulatory breaches, etc.]; and
(i) solutions, etc.

Appropriate expertise in these areas may be needed for specific investigations. This was the type of investigation that needed all those skills. A team approach may be needed. In this regard it may be worth considering the Bureau of Air Safety's investigatory system or that employed by the Directorate of Flying Safety, Royal Australian Air Force.

Recommendation 1 - Workcover, HSD

That Workcover, HSD consider reviewing its investigatory procedures and protocols with a `team' approach for appropriate cases. Such an approach would require experts with diverse skills.

The Bureau of Air Safety investigatory model may be useful to consider. A word of caution - there needs to be a careful balance between investigation with legal liability issues in mind and the `blame' free process. Each has a valuable part to play in the prevention of injury and injury related death.

Recommendation 2 - BHP [Western Port]

That BHP [Western Port] consider reviewing its incident [near misses, injury and death] investigatory procedures and protocols with a `team' approach for appropriate cases. Such an approach would require experts with diverse skills.

The Bureau of Air Safety investigatory model may be useful to consider. A `blame free' approach may assist in better identifying problem areas - leading to solutions.

The relevance of the Australian Standards to prevention [also in HSD and corporate incident investigations]

AS 4024.1 [and AS 4024.2 Interim Australian Standard - Safeguarding of Machinery, Part 2, Presence sensing systems] both provide a useful framework in which to consider improved safe design, installation, operation, maintenance of machinery and work practices. Whilst the latter Standard applies to modern warning systems the former still provides an up to date structure on which to consider systems improvements to avoid the type of injury involved in this inquest.

It is interesting to note that neither the `Interim Standards' nor any other Australian Standards were mentioned by the occupational health and safety specialists giving evidence for the employer at this inquest. Evidence was given that isolation/danger tagging

procedures, etc. were to be part of the subject of a lengthy review at the Western Port Plant. However, even then, there was no additional comment on the Standards.

Also officers from the then Health and Safety Organisation, Victoria did not raise the issue of the Australian Standards. The inquest was adjourned for a lengthy period for the inspector from HSO to undertake further investigatory work. The matter of the application of the Australian Standards had to be raised by the Coronial Service [November 1995] before the issue was investigated. The initial/additional investigation process by the inspector involved caused considerable delay to the inquiry.

Following the issue of the Standards being raised BHP [Western Port Works] appropriately put a considerable amount of resources into looking at the issue. An `Australian Standards Review - Kevin Gallagher-Green Inquest' was prepared [attached]. This review followed a written report by the inspector from HSO [also attached]. The conclusions of the BHP review differ significantly with the inspector's report. However, a thorough examination of all of the applicable standards would indicate further potential for systems improvements.

What is of concern is that specialist Health and Safety experts [whether at BHP or HSO] do not appear to have considered Australian Standards as part of a review following the incident. The BHP Standards Review argues that one of the Standards [AS 1755-1986] does not apply and that:

> *`at no time have officers of the Health & Safety Organisation..., who have inspected the pickle line on numerous occasions, referred to it as a conveyor system, or referred the Company to the Australian Standard for conveyors.'*

This may be illustrative of a less than thorough approach to the safety systems applying at the time of the incident. If sound alternatives had been instigated this comment would not apply. The failure to identify the hazard and take steps to eliminate it is a problem.

However, it would also not be unreasonable to expect a large organisation to pro-actively seek to identify all standards and systems [whether local or international] in an endeavour to find the best possible practice for reducing the risk of injury, thereby improving safety and minimising problems for production. No doubt the new Australian Standard - `Safeguarding of Machinery' 4024.1 - 1996 will be considered.

Recommendation 3 - Workcover, HSD

Workcover - HSD consider examining the application of the Australian Standards to aspects of investigations into deaths/injuries at work. Where relevant work practices, training, design, hazard identification and incident reporting may need consideration.

The importance of regular and thorough examination of Australian [and international] standards for applications cannot be underestimated in the area of improvements in safety systems. Hence appropriate investigations need to target these areas of best practice to assist in finding solutions.

Recommendation 4 - BHP [Western Port]

BHP [Western Port] consider re-examining the application of the Australian Standards to aspects of work practices, training, design, hazard identification and incident reporting as they apply to the Pickle Line.

The importance of regular and thorough examination of Australian [and international] standards for applications cannot be underestimated in the area of improvements in safety systems.

Supervision of the investigation - Workcover, HSD

There were significant difficulties in the investigation ranging from a failure to re-interview management after Hawkett explained his actions [and not informing the Company of the new issues], the failure to consider a variety of issues [including the Australian Standards] and the difficulty of obtaining further reports.

Currently there is a Central Investigation Unit for HSD and it is understood that its supervisory responsibilities are limited. This may need reviewing.

Recommendation 5 - Workcover, HSD

Workcover, HSD consider reviewing the Central Investigation Unit's supervisory role for work related death investigations.

Guarding of the tilt table adjustment area - automatic lockout/warning signs

One must not lose sight of one of the principal causes of this incident - the failure of the employer to adequately identify danger points on the Pickle Line and provide fail-safe guarding systems to avoid inadvertent entry into a hazard situation. Also there were no warning signs advising of the danger.

Although the eye beam was not normally visible, attention to detail when the machine was commissioned, should have identified the potential nip point near the table adjusting nut under the tilt table. This area should have then been guarded. The system currently employed still does not fully address the risk of entry where the employee does not appreciate the hidden hazard.

It is of concern that apparently an `independent [engineering] investigation into the operation of the machine...disclosed no defect in it.' This investigation was undertaken by BHP. Clearly there was a hidden hazard - an engineering investigation should have identified this problem and provided solutions. This report was not seen by the court.

This is yet another case regularly observed in the coronial jurisdiction where original machinery design issues lead to potential for injury. In addition attention to detail in identifying hazards when commissioning plant is vital for the management of safety issues. Machinery manufacturers, designers, engineers and educational institutions have a role in this area.

Recommendation 6 - BHP [Western Port]

That BHP [Western Port] consider providing a secure fenced area with locked gate providing automatic lockout of the tilt table welding operation on entry. This would prevent inadvertent operation when an employee has entered the area.

In addition `Danger signs' need to be considered.

Recommendation 7 - Engineering Department, Monash University

The findings are referred to the Engineering Department, Monash University with the intention of highlighting an opportunity for detailed research in this area.

Hopefully detailed research will lead to long term improvements in teaching, design and engineering solutions for safety problems.

Engineers, designers [with their associations] and machinery manufacturers would no doubt benefit from such research.

Full audit of `Pickle Line' for potentially hazardous [latent/patent] maintenance points

While it is understood that an audit has been conducted of the pickle line in the light of the multi-faceted nature of this incident this issue may require revisiting. What is of concern is the evidence of Mr. Pincott:

> *`Question [Mr. Griffin]: So the guard itself does not prevent injury?*
> *Answer: No.*
> *Question; It is the adherence to the isolation procedures?*
> *Answer: Correct.*
> *Question: Are there other parts of the machine process, the whole 300 meters which and I suppose it goes without saying, also is equally dangerous? [the underlining is mine]*
> *Answer: Yes.*
> *Question: If they are not isolated?*
> *Answer: Yes.*
> *Question: The Department of Occupational Health & Safety have been over the line a number of times over the years?*
> *Answer: Yes [and there had never been a request to guard].'*

The reassessment of this issue is vital as can be seen by the comments by the Company's Health and Safety Manager, Mr. Clapp, when he cautions of the isolation system `*it does rely on behaviour, the danger warning tag system and there in lies its inherent weakness.'*

Recommendation 8 - BHP [Western Port]

BHP [Western Port] consider re-examining the audits of the Pickle Line in view of the matters raised in this inquest. There may be other danger areas that need guarding. If necessary a new audit should be considered.

Work Permit Procedures for Hazardous Areas - where guarding is not practicable

It is also clear that specific `work permit' procedures should have been instituted for entry into areas such as the tilt table. This would have been a minimum approach in the event guarding was not practical - this may have avoided this event.

There may have been a problem with a perceived need by Hawkett to initially assess the adjustment, and in not perceiving a danger, saw no problem in entering the area and then conducting isolation processes. This may indicate a need to develop a separate work permit procedure designed for `initial inspection' - an `initial inspection work permit'. This may assist employees in directing their attention towards developing a `job hazard analysis' [AS 1470-1986, Cl 6.3.4].

It should be noted that this comment should not be taken to justify a lesser approach to safety as applying to the tilt table - adequate guarding is the solution.

Recommendation 9 - BHP [Western Port]

BHP [Western Port] consider developing an `interim inspection work permit' to assist in clarifying the message to employees that even moving into plant with an intention to merely assess maintenance/adjustment needs requires `risk assessment' and safety measures.

This would be as a precursor to full `work permit' and lockout/isolation.

The `Danger Tag and Warning Tag' Regulations at Western Port - the need for training in `risk identification'

Whilst BHP Western Port Plant had training, isolation and danger/warning tag procedures which addressed the work practices the human behavioural factors do not seem to be adequately addressed. It is noted that the system is currently under review.

The work system that applied to BHP's Western Port Plant was governed by a `Handbook of Danger Tag and Warning Tag Regulations' [Updated June 92]. The summary of the Basic Rules [omitting sections not relevant] states:

``(a) Before commencing work on any equipment you *must* ensure that the correct isolating procedures have been applied.
(b) You *must* place DANGER tags before commencing work on any job where you are exposed to the risk of personal injury.
....Failure to comply with the above will make you liable to *instant dismissal...'*

Here there was not full appreciation of the risk of personal injury. There is a need to train employees in `risk assessment' and not rely on `common sense' as the sole guide. Apparently `job hazard analysis' was not part of BHP's systems. Hazard analysis [or `risk assessment'] is understood to be part of Victoria Police's Operational Safety & Tactics Training. This may be a useful system to consider.

Recommendation 10 - BHP [Western Port]

BHP [Western Port] consider the introduction of a training program aimed at improving employees' ability in the area of `risk assessment', `risk identification' or `job hazard analysis'. A risk assessment system should be considered where isolation procedures, etc. are the only alternative.

The new Occupational Health & Safety [Plant] Regulations 1995

Whilst it is not intended to comment on the new `Occupational Health & Safety [Plant] Regulations 1995 and the non-regulatory approach to workplace health and safety the recommendations are designed with this new regulatory thrust in mind [See generally Regulations 702 to 708, et seq].

Graeme Johnstone
STATE CORONER

Senior Constable P.Ashby, Assisting the Coroner,
Mr.G.Gilbert for Geoffrey Edwards,
Mr.B.McCullagh for Glen Hawkett,
Mr.B.Griffin for BHP, and
Mr.P. Misso for the Family.