Department of Industry
Resources & Energy

Mine Safety

Investigation report

Report into the death of Mark Daniel Galton at Boggabri Coal Mine on 21 May 2014

Report prepared by the NSW Mine Safety Investigation Unit

Published by NSW Department of Industry, Skills and Regional Development

Investigation report to the Secretary of NSW Department of Industry, Skills and Regional Development

Investigation into the death of Mark Daniel Galton at Boggabri Coal Mine on 21 May 2014

Published report date: August 2015

More information

NSW Mine Safety Investigation Unit

www.resourcesandenergy.nsw.gov.au/safety

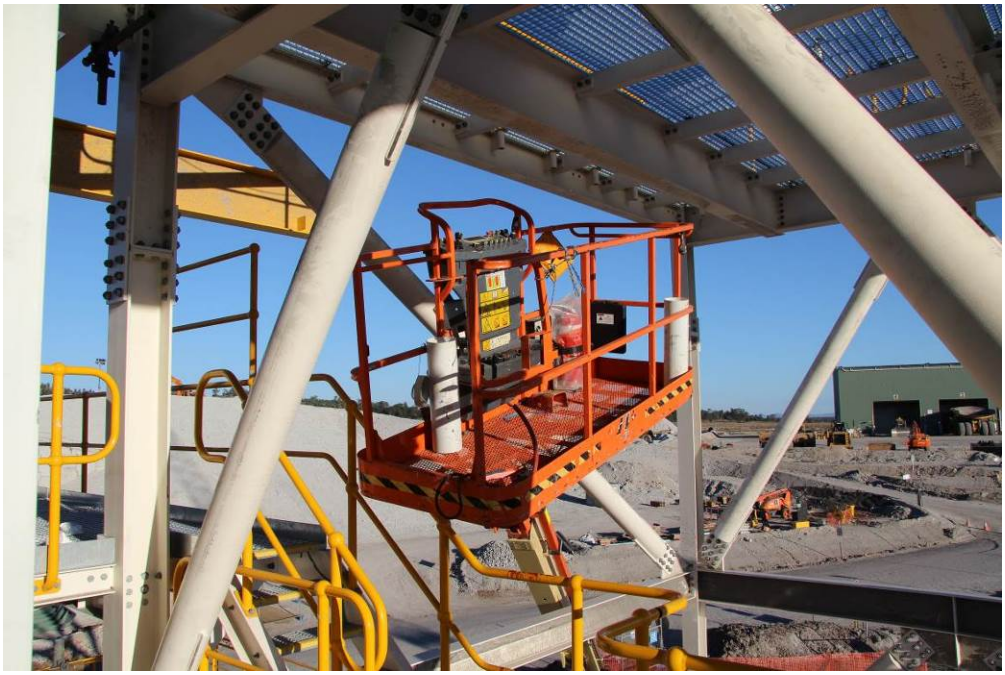
Executive summary

Incident overview

At 8.48 am on Wednesday, 21 May 2014, Mark Daniel Galton, a rigger employed by Thiess Sedgman Joint Venture (Theiss Sedgman) died when his head and neck were crushed between a mobile elevated work platform (MEWP)[1] and the underside of a large, horizontal steel beam.

The incident occurred inside a partly constructed multi-level steel frame referred to as ST202 at the coal handling and preparation plant construction site at Boggabri Coal Mine. The underside of the steel beam was 12.5 m above the concrete floor.

Figure 1. Position of the MEWP after the recovery of Mr Galton inside the ST202 structure.



Mr Galton, 51, was relocating the platform to ground level after tightening bolts on the structure. During the movement of the platform over walkway handrails, a crush point was created between the platform frame above the control console rising towards the steel beam. Mr Galton was alone in the platform.

He had a designated spotter on the ground and asked a leading hand rigger on a nearby level to observe him during movement of the platform over a walkway.[2] The leading hand rigger called out a warning to Mr Galton when he saw there was a gap about 5cm between Mr Galton's head and the steel beam above. Mr Galton stopped the platform and verbally acknowledged the warning.

Neither Mr Galton's designated spotter nor the leading hand rigger saw the actual incident.

[1] Definition of *AS 2550.10-2006 1.3.7 'A mobile machine that is intended to move persons, tools and material to working positions and consists of at least a work platform with controls, an extending structure and a chassis, but does not include mast climbing work platforms'.*

[2] The LHR was assisting Mr Galton but was not the designated 'spotter' for the task. The designated 'spotter' for Mr Galton was located at ground level at the time of the incident.

The leading hand rigger next observation was that Mr Galton was trapped between the frame above the platform control console and the overhead beam. He initiated an emergency response over the two-way radio.

The first attempts to free Mr Galton were unsuccessful. The platform was then tilted using its ground controls. Mr Galton was released and he fell to the floor of the platform. Workers accessed the platform and transferred Mr Galton to the second floor landing and began first aid. Emergency services attended the scene at 9.16 am. NSW Ambulance paramedics ceased CPR about 9.30 am.

The platform involved in the incident was a JLG 600 AJ 18.3 m rough terrain diesel knuckle boom.[3] It was owned and maintained by Coates Hire Operations Pty Ltd and was on a hire agreement to Theiss Sedgman at Boggabri Coal Mine since 22 March 2014.

Theiss Sedgman was contracted by the mine operator to build the coal processing plant at Boggabri Coal Mine about 17 km northeast of Boggabri in the Gunnedah coalfields of NSW.

Cause of death

The direct cause of Mr Galton's death was cervical spine trauma.

The autopsy report summarised the following:

- Transected upper cervical column and spinal cord (C2-C3 level).
- Fractured larynx with extensive soft tissue haemorrhage.
- There was no evidence Mr Galton had suffered a heart attack leading up to the incident.
- Toxicology negative for drugs and alcohol.
- Normal blood carbon monoxide saturation (1%).

Investigation observations

The specific cause of the platform rise cannot be established.

The platform was over a walkway handrail and rotated to the right (relative to the operator's control console) and nearly parallel to the alignment of the raised jib and boom.

The incident happened during a day shift. Mr Galton arrived at the mine site at 5.55 am and was onsite for 2 hours and 53 minutes when the incident occurred.

Mr Galton was working his ninth consecutive 11-hour shift of a 10-day roster.

The investigation is unable to establish if Mr Galton's fatigue level contributed to the incident.

The investigation has considered five potential cause theories and ranked them in the order of most likely to least likely.

These are:

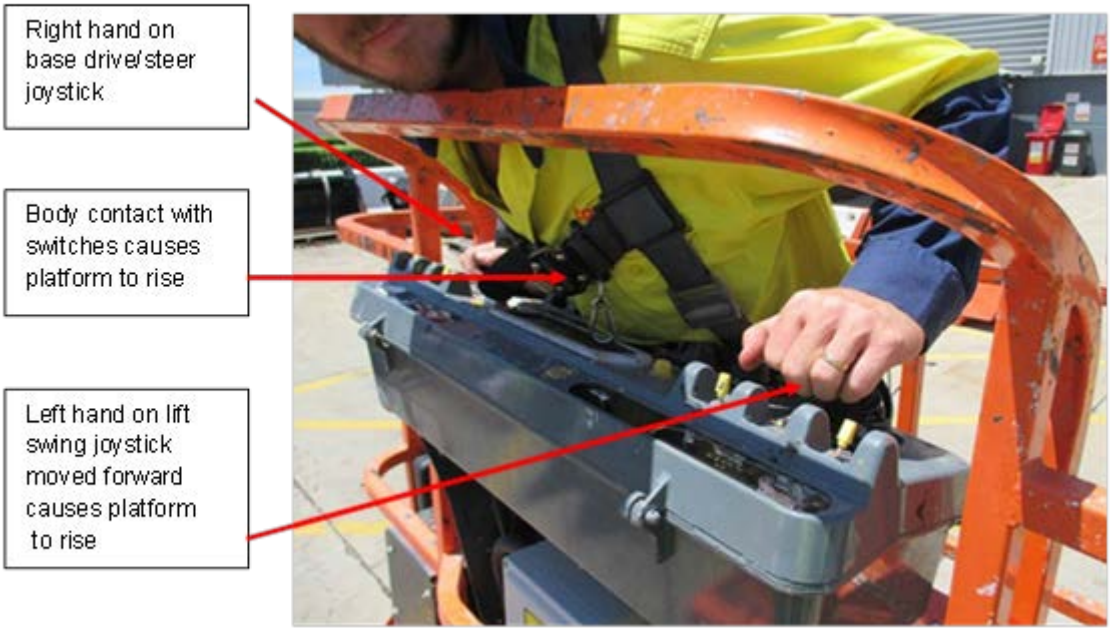
1. **An unintended platform rise** caused by Mr Galton coming in contact with one or more control switches on the platform console, which activated the platform rise functions. In this scenario the main rise control device (the lift swing joystick) was not activated by Mr Galton however the covered footswitch was activated enabling a seven-second window for potential machine movement.

The reason for the movement of Mr Galton forward over the console could either be considered as:

Voluntary – he made a decision to look over the console to obtain a better view of the position of the platform jib and boom relative to steel structures below or:

Involuntarily – his head came into contact with the steel beam, which moved his body forward over the console.

Figure 2. Simulation of an operator in a forward leaning position with his body in contact with control switches that can activate platform to rise. In this position the left hand can apply forward motion to the lift swing joy stick and activate platform to rise. The right hand can be placed on the base drive/steer joystick. The operator's right foot was able to activate the footswitch to permit platform control function.



2. **An unintended platform rise** as a result of Mr Galton either incorrectly selecting a platform control switch or applying the wrong direction of movement to one or more platform control devices. Or Mr Galton selected the base drive/steer joystick to move the platform base to move the platform sideways over the walkway handrail. As the rear wheels moved down the ramp it caused the platform to rise (platform pendulum effect). Or excessive platform movement caused by incorrect control function ramp time settings.
3. **An intended platform rise** activated by Mr Galton as he accepted the risk of moving the platform in proximity to the beam. In review of the circumstance of the incident there was no evidence of intentional self-harm by Mr Galton.
4. **Inadvertent movement** of the platform caused by a defect.
5. **External force** applied by the environment to the plant caused the platform to rise.

Observations concerning systems to control the risk of crush injury:

Apart from the steel frame above the platform control console, which was directly involved in the crush injury there were no secondary protection devices to prevent Mr Galton from being crushed while operating the MEWP.

The risk of a person being trapped between the platform and a fixed overhead structure was foreseeable. The risk was clearly identified in risk assessments and equipment manuals published before the incident. The risk was also identified in a range of risk management documents found at the mine site.

The controls put in place to manage the known risk were lower order hierarchy of risk control measures.

The documented controls included:

- MEWP training qualifications awarded by a registered training organisation.
- High risk licence awarded to the platform operator by a government regulatory agency.
- Verification of competency to operate the specific model of platform at the site.
- Risk assessment of the specific model of platform introduced to the work site.
- Work area plans, Work Area Plan Risk Assessment, Critical Safety Controls.
- Safe Work Method Statements (SWMS) and Job Safety Environment Analysis (JSEA) included use of platform.
- Shift tool box talks.
- 'Start Card' created by operators at the start of the work task.
- Working at height permit (WAH permit) (Noting that Mr Galton had not signed onto a permit for the platform task on the day of the incident).
- Operator pre-start inspection and defect report for the MEWP (signed by Mr Galton on 21 May 2014).
- Spotter being present during MEWP tasks.
- While there were examples of documented generic risk assessments for use of MEWP at the site there was no specific risk assessment considering the task of using a MEWP under a fixed structure within ST202. These risk control measures did not prevent the incident from occurring.

Observation concerning the use of secondary guarding devices on MEWPs

1. In July 2010, overseas regulatory authorities and platform end user groups published best practice guidance for MEWPs and information on secondary guarding.[4] The Australian hire and rental industry was informed of the guideline in February 2011.[5]
2. In October 2011, a secondary guarding device registered as SkyGuard® was designed and manufactured by JLG (America). By late 2012, the device was made available to European MEWP user groups.
3. In May 2012, JLG informed the Australian hire and rental industry that SkyGuard® could be previewed at the 2012 hire and rental industry convention.[6]
4. In February 2013, JLG informed the Australian hire and rental industry that SkyGuard® was available as an aftermarket kit on all JLG booms manufactured from 2004.[7] Australian Design Registration had not been obtained for SkyGuard® at that time.
5. In May 2013, a United Kingdom equipment hire registry web page published information to MEWP user groups related to SkyGuard®. An extract of the publication stated:

   '*JLG SkyGuard® provides operators with enhanced control panel protection. When activated by approximately 23 kg of force, SkyGuard® stops all functions in use at the time. The reverse functionality momentarily "undoes" most functions that were in use at the time of activation for less than a second's worth of time*.'

[4] UK HSE and IPAFF

[5] Hire and Rental News published February 2011 page 22

[6] Hire and Rental News published May 2012 front cover and page 3

[7] Hire and Rental News published February 2013 page 34

Figure 3: JLG SkyGuard® secondary protection device fitted above a JLG platform control console. ADR received for SkyGuard® by JLG on 31 May 2014.[8]

6. In July 2013, European Standard *EN280:2013 Mobile Elevating Work Platforms* was updated (with a transition period of 18 months to January 2015) to require secondary guarding options to be fitted to all MEWPs. The current Australian MEWP Standards for safe use is dated 2006.[9]
7. On 14 May 2014, Australian Design Registration (ADR) for SkyGuard® was submitted by JLG.
8. Before 14 May 2014, JLG had not received any purchase orders from Australian JLG MEWP users to fit the SkyGuard® secondary guarding device.
9. On 30 May 2014, ADR for SkyGuard® was awarded by Worksafe Western Australia and received by JLG for the 600 AJ model on 10 June 2014.
10. ADR for SkyGuard® was received after Mr Galton's incident and approximately 17 months after the device was made available in Europe.
11. Australian regulatory authorities had published information relating to fatal incidents and risks associated with use of MEWP before Mr Galton's incident.[10]
12. In November 2014, Safe Work Australia (SWA) identified that there were seven fatal incidents involving users of elevating work platforms being crushed against roofing beams during the period 2006 to 2011.[11]

Remedial safety measures

Following Mr Galton's incident, Thiess Sedgman undertook a range of continuous improvement programs:

[8] http://rermag.com/aerial-work-platforms/skyguard-aftermarket-accessory-jlg-boomlifts publication date 1 May 2013

[9] AS2550.10-2006 Cranes, Hoists and Winches Part 10 MEWP

[10] NSW Workcover Safety Alerts WC03042 WC 03987, NSW Trade and Investment Mine Safety Alert SA06-15, WA Department of Mine s and Petroleum Resources safety Alert No 151 and No 162

[11] Safe Work Australia – Work related fatalities associated with unsafe design of machinery, plant & powered tools 2006-2011 – Published November 2014

- After the incident, Thiess Sedgman reviewed available secondary guarding device options that could be fitted to the various brands and models of MEWP at the site.
- In July 2014, Thiess Sedgman revised the MEWP spotter training package and completed the training.
- In or about July 2014, Thiess Sedgman updated the generic site induction assessment and the Boggabri Coal CHPP induction PowerPoint presentation to incorporate information from the MEWP skills review (VOC) package.
- From 20 August 2014, Thiess Sedgman required secondary control devices to be fitted to MEWPs operating in and under structures or where an overhead crush risk exists at BCM.
- In August 2014, Thiess Sedgman developed and implemented a supervisors MEWP presentation and supervisors MEWP scenarios assessment program to help supervisors and leading hands to better understand the specific controls which should be used in various circumstances.
- In August 2014, Thiess Sedgman developed and implemented a VOC authorisation assessment for MEWP authority levels for operators.
- In August 2014, Thiess Sedgman developed other initiatives as part of Work Area Pack Risk Assessment (WAPRA) for working in MEWPs. This included toolbox talks on MEWP selection, revising and processing work packs to incorporate information identified in the WAPRA, and revising the WHS Area Inspection Form to incorporate a MEWP section based on the Thiess Critical Safety Control (CSC) Prevention of Falls.

Recommendations

The incident highlights the importance of having an effective risk management program in relation to specific complex three dimensional movements of mobile elevated work platforms in proximity to fixed structures.

When a MEWP is required to move in proximity to fixed structures, higher order risk management controls to prevent crush injury should be identified and implemented. This is in addition to the existing industry emphasis on lower order risk controls such as operator high risk work licence, specific MEWP operator certification, verification of competency, work at heights permit and a spotter being present.

When considering the recommendations below, mine operators are reminded of their obligation to take a combination of measures to minimise risk, if no single measure is sufficient for that purpose.

Recommended practice for industry

MEWP access in proximity of fixed structures:

- Assess if the risk of crush injury can be removed by using an alternative access method.
- If the risk of crush injury cannot be removed, reduce the risk by selecting a fit-for-purpose MEWP with secondary guarding devices fitted.
- Assess and control crush injury risk from an inadvertent activation of platform controls due to body contact with controls or the incorrect selection of controls.
- Assess and control crush injury risk due to control function ramp times creating greater movements of the platform than intended.
- Assess and control crush injury risk due to the platform pendulum effects when working at height in close proximity to fixed structures.

Work permit system –

Pathway of a MEWP moving in proximity to fixed structures

- Undertake a specific task risk assessment when a MEWP pathway requires complex three dimensional positioning of the platform, jib, boom and base when in close proximity to fixed structures.
- When undertaking complex three-dimensional movements of a platform in close proximity to fixed structures, the task risk assessment should consider the proposed sequence of platform movement using a combination of either:
  - platform alignment and rotation angle relative to the jib
  - jib angle and telescope length
  - upper boom angle and telescope length
  - lower boom angle and telescope length
  - base position, base rotation angle and direction of base movement
  - function speed selection.
- When operating a MEWP in proximity to fixed structures apply *'No Go Zone'* separation distances similar to risk reduction strategies implemented when operating MEWP in proximity to aerial conductors (overhead power lines).
- Reduce the risk of crush injury by assessing and planning the specific access pathway the MEWP is proposed to take in and out of the work area and ensure that sufficient clearance is maintained between fixed structures and the platform at all times.
- If the sufficient clearance between fixed structures and the MEWP platform cannot be maintained at all times, make alternative access arrangements.
- Ensure the MEWP operator and spotter are clearly aware of fixed structures in proximity to the path of the MEWP.
- Supervisor required to sign off and consult with people associated with the activity as part of the work permit system.
- If appropriate in the circumstance of the task, consider placing hard barrier warning systems to delineate the '*No Go Zone'* (e.g. flag and rope marker lines) to give visual warning to the operator and spotter of the proximity of the platform approaching a fixed structure.
- Consider using electronic warning systems (e.g. electronic detection devices attached either to the fixed structure or the platform) that can audibly and visibly warn the operator and spotter of the proximity of the platform to a fixed structure. The application of electronic warning systems are being developed to resolve reliability and user interface challenges identified by MEWP manufacturers.

Training and competency assessment

- Ensure during verification of competency (VOC) for a specific type of MEWP that a competent assessor verifies that the operator is competent and able to accurately and consistently select the correct range of control functions to move the platform and the base.
- The verification of competency assessment should include operating the MEWP over a pre-planned pathway (without any risk of crush injury) to verify that the operator can accurately and consistently operate the MEWP over the full range of movement of platform and base.
- If the MEWP operator cannot demonstrate consistent and accurate MEWP control then the operator should be provided with further training with the specific MEWP and undertake competency reassessment.

Inspection of MEWP control devices

- Operators and maintainers of MEWPs should ensure close inspection of the rubber protective covers of platform controls to identify deterioration such as cracking and splitting, which can allow dust and water ingress and cause corrosion on electrical control circuit boards.

Manufacturers, importers and suppliers of MEWPs

- Manufacturers, importers and suppliers of MEWPs so far as is reasonably practicable, should ensure that the MEWP is without risk to the health and safety of operators who use the MEWP at a workplace for the purpose for which it was designed or manufactured, or who carry out any reasonably foreseeable activity at a workplace.
- Manufacturers, importers and suppliers of MEWPs should ensure that sufficient testing or examination is undertaken that may be necessary for the performance of the duty.
- Manufacturers, importers and suppliers of MEWPs should ensure that adequate information is made available concerning any conditions necessary to ensure that MEWPs are without risk to health and safety when used for a purpose designed or manufactured.

Access industry associations and industry regulators

- Further develop and provide information and training programs for use by MEWP-registered training organisations and assessors undertaking training and verification of competency of MEWP operators.

Australian Standards Committee ME005

- Consider review of AS 1418.10:2011 *Cranes, Hoists and Winches Part 10 Mobile Elevating Work Platforms* for consistency with European MEWP standards.

Contents

1. Purpose of the report

This report concerns the investigation into the fatal crush injury of Mark Daniel Galton. This report was prepared for the Secretary of NSW Department of Industry, Skills and Regional Development. It presents information from the investigation conducted by the department's Investigation Unit into the cause and circumstances of the incident and makes recommendations to enhance industry safety.

The purpose of this report is to assist the Secretary, as regulator of the work health and safety legislation at mines, to learn about the incident and to share information with the industry and the community so that steps can be taken to improve industry safety and to prevent incidents of a similar nature from reoccurring.

2. Background of the investigation

The department's Investigation Unit

The unit investigates the nature, cause and circumstances of major incidents in the NSW mining and extractives industry.

Its role is to carry out a detailed analysis of incidents to ensure that lessons can be applied for the safety of workers at mines, and to give effect to the department's Enforcement Policy.

The unit is autonomous within the department and reports to the Secretary. It is separate from the department's Mine Safety inspectorate and is not involved in the activities of the inspectors or the day-to-day inspection of mines.

Legislative authority to investigate

The investigation was conducted under the *Work Health and Safety Act 2011* (WHSA). Investigators had authority to conduct an investigation into this matter because the incident occurred at a coal workplace regulated by the department.

The department's response to the incident

The department received notification of the incident from the mine. Department officers attended the mine on 21 May 2014 and issued a WHSA section 198 Non-Disturbance Notice requiring preservation and non-disturbance of the scene.

A WHSA section 195 Prohibition Notice was issued on 22 May 2014 to the mine operator prohibiting the use of any boom-type MEWP at the site until a detailed risk assessment was completed regarding the risk of MEWPs colliding with fixed objects.

In accordance with departmental policy, the incident was automatically referred to the Investigation Unit. Investigators attended the incident scene and conducted investigation activities using WHSA powers to obtain information and documents from individuals and companies.

Department officers have observed demonstrations of secondary protective devices fitted to MEWPs at the site during June 2014 and issued *Coal Mine Health and Safety Act 2002 (*CMHSA*)* section 150 Government Official advice notices to the site operators.

NSW Police

NSW Police officers attended the incident scene about 9.30 am on 21 May 2014, collected witness statements and took photographs. NSW Police have prepared a report for the NSW Coroner's Court, Narrabri.

Investigation activities

The Investigation Unit's activities included:

- incident scene photography and taking of exhibits
- interviewing witnesses
- collecting information and documents from individuals and companies
- observing testing of the MEWP involved in the incident
- organising specialist inspection and testing of the MEWP's lift swing joy stick control unit
- conducting an industry review of secondary guarding on MEWPs to prevent crush injury

The Investigation Unit published an information release on the department's web site on 4 June 2014. The document contained preliminary information about the incident.

3. Mark Galton

Mr Galton accepted employment as a rigger classification level 'B' with Theiss Sedgman on 28 February 2014. Mr Galton attended the mine site on 4 March 2014 and undertook a site induction of Thiess Sedgman management systems. He had 11 weeks of employment at the mine site.

Autopsy report for the Coroner

The direct cause leading to Mr Galton's death was cervical spine trauma.

Autopsy report summary:

1. Transected upper cervical column and spinal cord (C2-C3 level).
2. Fractured larynx with extensive soft tissue haemorrhage.
3. There was no evidence Mr Galton had suffered a 'heart attack' leading up to the incident.
4. Toxicology negative for drugs and alcohol.
5. Normal blood carbon monoxide saturation (1%).

Mr Galton's training qualifications and competency

Mr Galton held a valid national licence to perform high risk work (application dated 21 December 2012). He had held this licence for 1 year and 5 months.

Mr Galton held registered training organisation certificates of competency dated 25 June 2013 and 14 November 2013 to operate MEWPs.

Mr Galton had undertaken a Thiess Pty Ltd verification of competency on the first day of induction to Boggabri Coal Mine site to operate the specific model of MEWP involved in the incident. The verification of competency was conducted and signed by Mr Galton's supervisor (Supervisor 1) on 4 March 2014.

The designated 'spotter' (Spotter 2) for the other platform at ST202 told investigators that he had performed the same work of tightening bolts at ST202 using the incident MEWP the day before the incident. On the morning of the incident, Spotter 2 did not continue with the work task because of a discussion between Spotter 2 and Mark Galton during which Spotter 2 said Mr Galton 'put up his hand' to undertake the bolt tightening task at ST202.

Spotter 2 told investigators that in his opinion he had observed competency issues with Mr Galton operating a MEWP before the day of the incident. Spotter 2 also said that Mr Galton had

required extra time to complete his VOC in Queensland. Spotter 2 said he had given Mr Galton instructions on how to get the platform into a position where he needed to get to at the site.

The issue of Mr Galton's training and competency was reviewed during the investigation including the registered training organisations, MEWP assessors and other workers at the site who had observed Mr Galton operating MEWP. There was no other information identifying any issue with the competency of Mr Galton to operate MEWP.

Mr Galton's hours of work

Mr Galton arrived at the mine site at 5.55 am on 21 May 2014 and was at work for 2 hours and 53 minutes when the incident occurred.

Mr Galton was working the ninth consecutive day shift of his 10-day roster. He worked a total of 88 hours and 15 minutes by the time of the incident. Generally, Mr Galton worked an 11-hour day shift roster between 6 am and 5 pm.

In his previous roster, Mr Galton had taken four rostered leave days from 9 May 2014 to 12 May 2014.

Before this leave Mr Galton had worked 84 hours and 3 minutes on the previous 10-day roster between 29 April 2014 and 8 May 2014.

Occasions Mr Galton operated similar plant

Records indicate Mr Galton had operated a JLG 600 AJ MEWP on at least two occasions at the mine before the day of the incident.

Mr Galton signed the 'Operator Safety Check' records for the incident JLG 600 AJ No 1058702 on two occasions: 8.30 am on 7 April 2014 and 7.10 am on 21 May 2014.

On 21 May 2014 Mr Galton also completed the Thiess Sedgman operator's pre-start inspection and defect report number 75239 for incident MEWP No 1058702 on which he ticked 'yes OK' to all the machine function checks.

Mr Galton signed onto a WAH permit at ST801 on 20 May 2014 with the leading hand rigger. It is not known if Mr Galton operated a JLG 600 AJ on that date.

Spotter 2 told investigators that he had operated the incident MEWP on 20 May 2014 and had no functional issues with it. On that occasion another operator had completed the pre-start Operator Safety Check records for the incident MEWP on 19 and 20 May 2014.

Mr Galton signed onto two WAH permits on 22 April 2014 and 23 April 2014 for MEWP activity at ST801. However it is not known if he personally operated a JLG 600 AJ on either of those dates.

Mr Galton undertook VOC on a JLG 600 AJ MEWP on 4 March 2014 it is likely that he operated a JLG 600 AJ MEWP on that occasion to obtain VOC.

4. Boggabri Coal Mine

Idemitsu Australia Resources Pty Ltd (IAR) through its wholly owned subsidiary Boggabri Coal Pty Ltd owns the Boggabri Coal Mine and significant land holdings in the Gunnedah Basin of NSW. Boggabri Coal Mine is within Coal Lease No 368. An adjacent authorisation area, A355 is also held by Boggabri Coal Pty Ltd. The resources within CL368 and A355 are mostly located in the NSW-owned Leard State Forest.

Boggabri Coal Mine was established in 2006 with a nominal production capacity of 1.5 million tonnes per annum (Mtpa). At the time of writing, the operation requires coal to pass through a crushing system at the ROM pad before being loaded into oversize B-double trucks. These trucks haul the coal approximately 17 km via private road haul road to the Boggabri Coal Pty Ltd owned train-loading facility where coal was loaded onto trains and transported to the Port of Newcastle.

The Boggabri Coal Expansion Project (Boggabri Coal Pty Ltd) will increase the capacity of the mine to 6.9Mtpa by mid-2015.

Boggabri Coal Mine lease details

The incident site was within Coal Lease No 368 (CL 368 -*Coal Mining Act 1973*) which was held by Boggabri Coal Pty Ltd.

CL 368 was originally granted on 15 November 1990. In accordance with the provisions of Section 114(1)(a) of the *Mining Act 1992* the Minister signed an instrument of renewal of the lease on 9 May 2013 and the lease was renewed until 14 November 2032.

Figure 4. Boggabri Coal Mine CL368 and the location of incident.

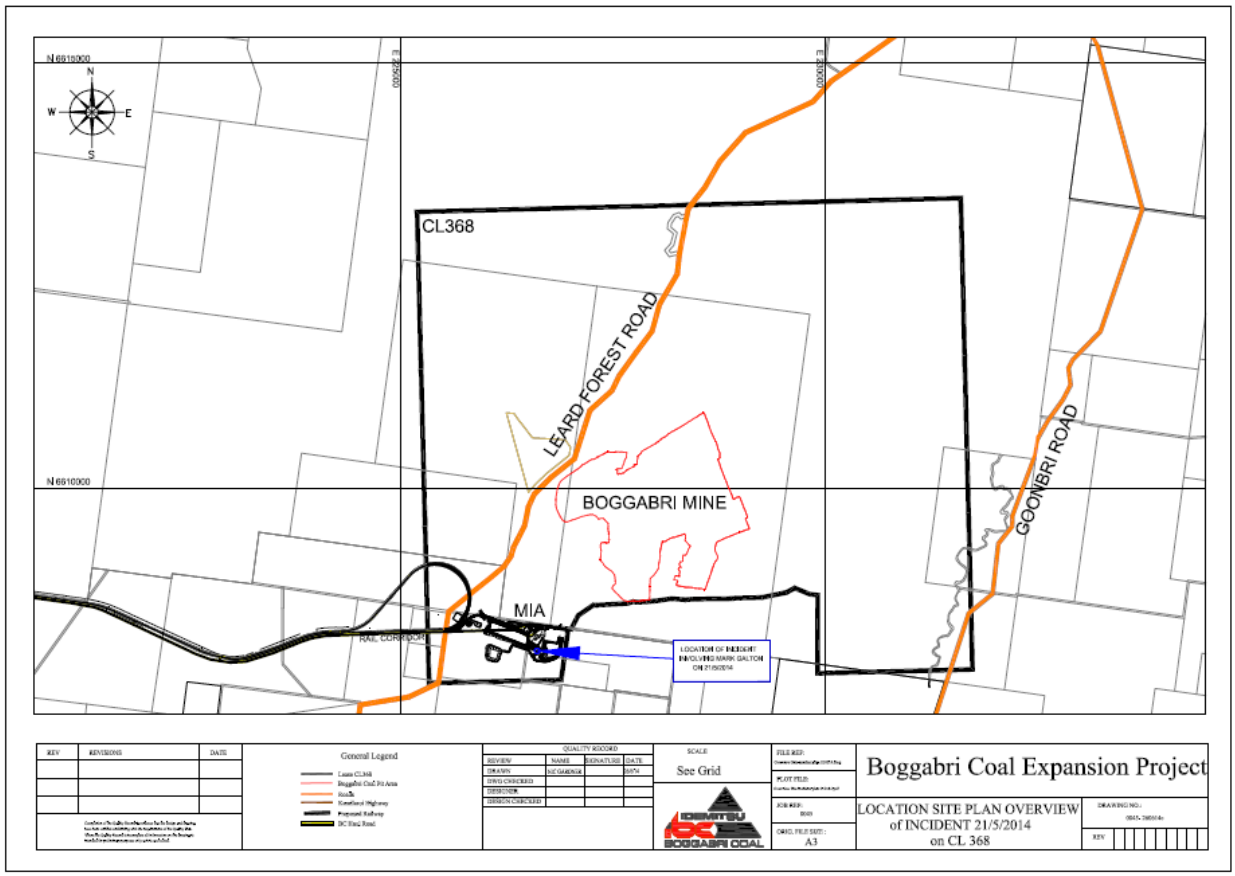
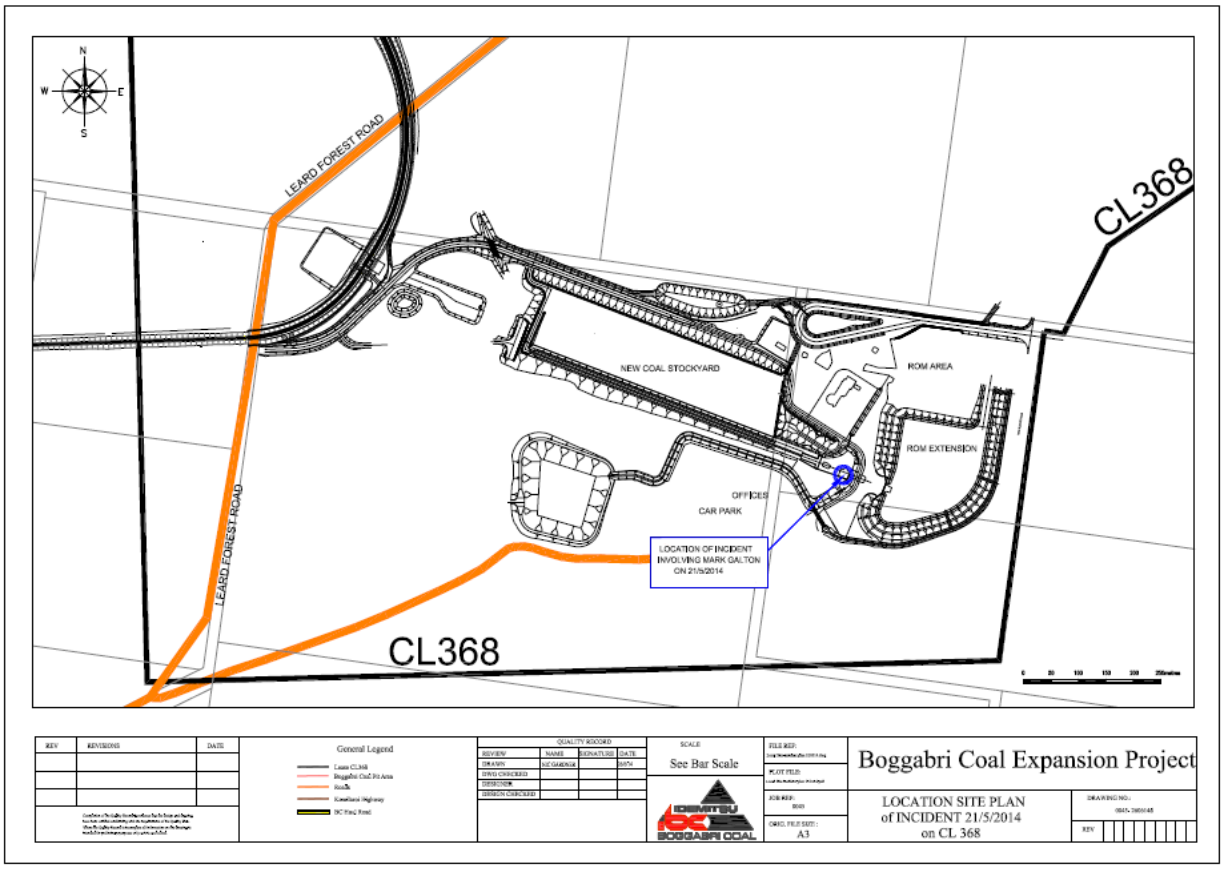


Figure 5. Boggabri Coal Expansion Project in relation to the incident site.



Second phase design and construct contract

Thiess Sedgman won a competitive tender in November 2010 to deliver a tender for the Boggabri Coal Mine Coal Handling Processing Plant as part of the early contractor involvement phase. Sedgman Limited also delivered a feasibility study in November 2010 focusing on the product stockpiling, reclaim and train load out.

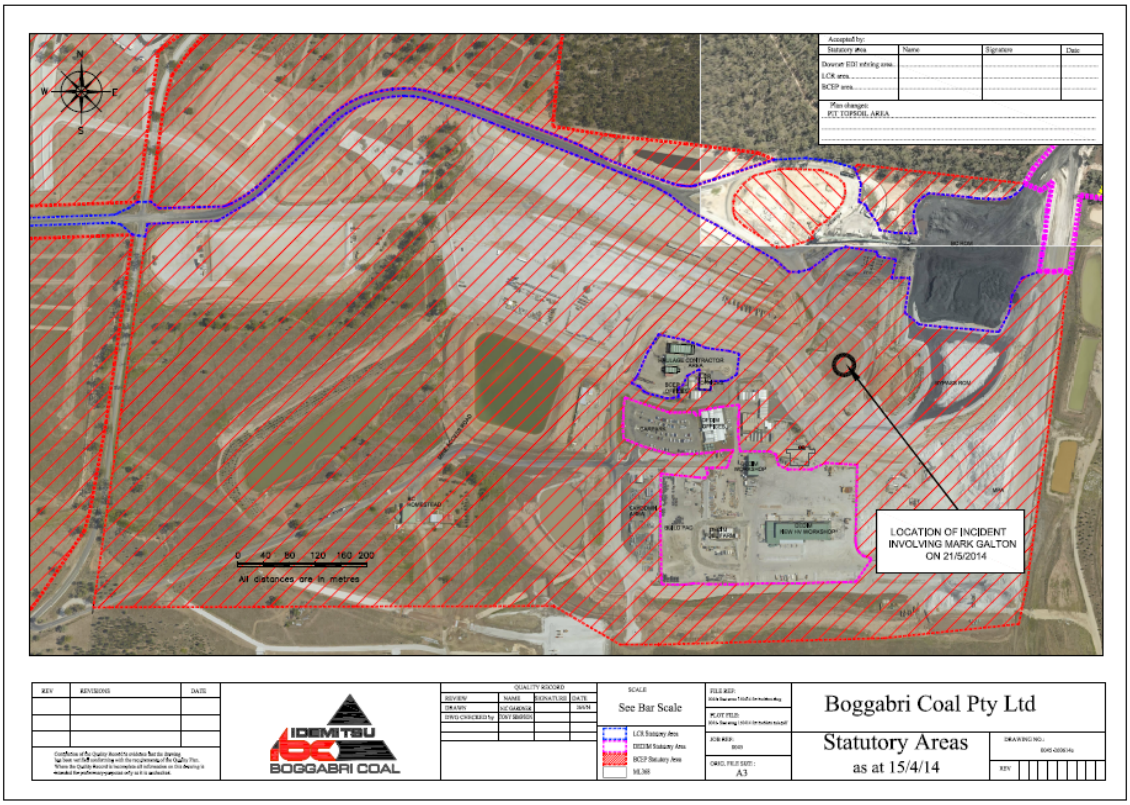
A second phase design and construct contact agreement was signed on 12 September 2013 between Boggabri Coal Pty Ltd (the principal) and Thiess Sedgman (the contractor).

Thiess Sedgman is an unincorporated joint venture between Thiess Pty Ltd (Thiess) and Sedgman Ltd.

Statutory control of the incident site

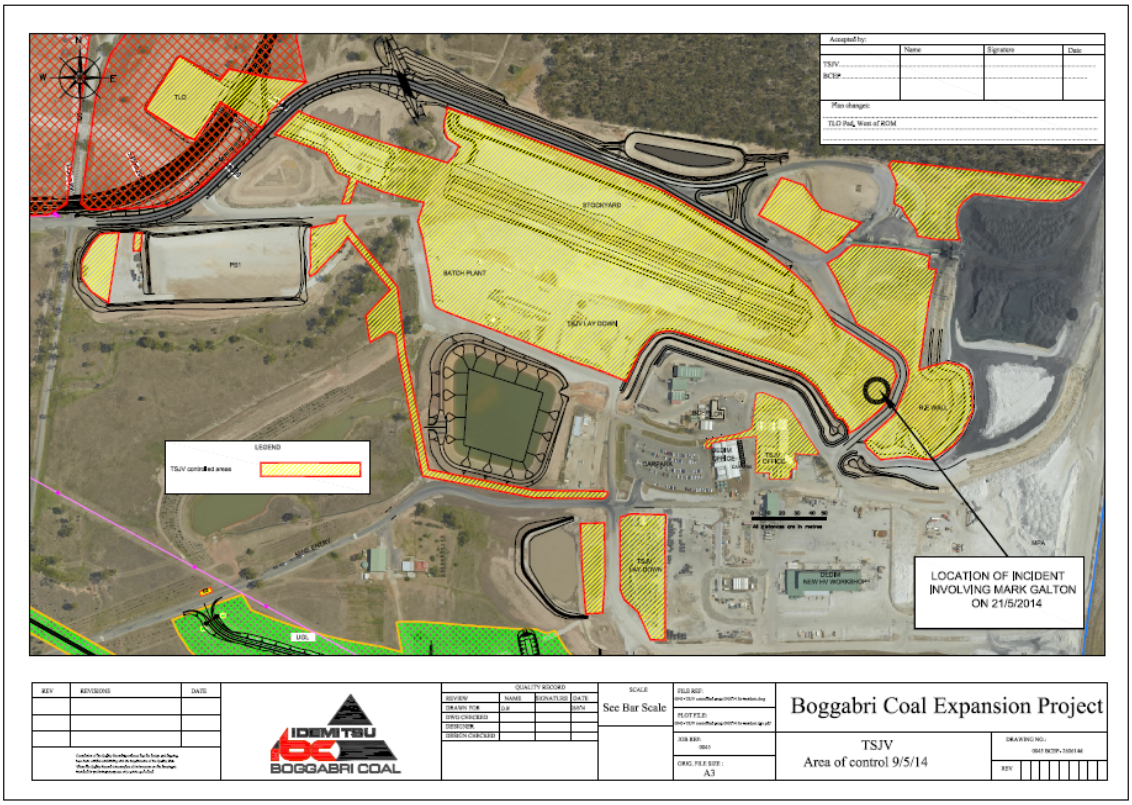
The incident involving Mr Galton was within the statutory area allocated by Boggabri Coal Pty Ltd to Boggabri Coal Expansion Project.

Figure 6. Boggabri Coal Expansion Project statutory area of control in red hatch and the incident site.



Boggabri Coal Expansion Project had further allocated statutory control to Thiess Sedgman at the specific location where Mr Galton's death occurred.

Figure 7. Thiess Sedgman statutory area of control in yellow and the incident site.



5. Thiess Pty Ltd

Thiess is an Australian proprietary company limited by shares with a registered office in South Brisbane, Queensland. The single shareholder is Leighton Holdings Limited listed at St Leonards, NSW.

6. Sedgman Limited

Sedgman Limited is a listed Australian public company limited by shares with a registered office in Milton, Queensland. SL was established in 1979 and listed on the ASX in 2006.

Sedgman Limited has more than 800 employees globally with offices in China, Mongolia, Africa, South America and Canada. SL is a provider of mineral processing and infrastructure solutions to the resource industry with operations across coal, iron ore, copper, gold, lead and other base metals.

Sedgman Limited is involved in the design, construction and operation of coal handling and preparation plants in Australia. The projects and engineering division provides integrated services across the complete life cycle from initial feasibility, to construction, operation and completion.[12]

7. Thiess Sedgman Joint Venture

Thiess Sedgman Joint Venture is an unincorporated joint venture agreement between Thiess and Sedgman Limited. On 18 February 2005, Theiss Sedgman was registered with ASIC as a Business Name in Queensland.

Thiess Sedgman Joint Venture is the 'Principal Contractor' for all construction work under the Second Phase Design and Construction Contract at Boggabri Coal Mine.

Thiess Sedgman Joint Venture was Mr Galton's employer. On 25 February 2014, Mr Galton was offered an employment letter. On 28 February 2014, Mr Galton signed an employment acceptance and began work at Boggabri Coal Mine on 4 March 2014 where he declared in writing he had read and understood 13 mandatory site operating procedures for site induction.

The agreements between the companies

On 12 September 2013, Boggabri Coal Pty Ltd (the principal) signed a 'formal instrument of agreement' with Thiess Sedgman (the contractor) for the Second Phase Design and Construct Contract for the coal handling preparation plant at the mine.

In February 2014, Thiess and Sedgman Limited entered into the unincorporated joint venture agreement for the Second Phase Design and Construct Contract for the processing plant, which retrospectively operated from 16 September 2013.

The joint venture agreement required a 'Management Committee' consisting of two senior employees of Thiess and two senior employees of Sedgman Limited to receive and review reports from the Theiss "Project Manager' which included health and safety and incident reports for activities at Boggabri Coal Expansion Project.

The joint venture provided supervisory responsibilities at the expansion project and included daily site coordination meetings between supervisors and the daily pre-start meeting with work crews. Work crews would then attend the location where supervisors employed by Thiess

[12] http//www.sedgman/about us

monitor and maintain site standards as required under the Theiss Sedgman Health and Safety Management Plan.

The joint venture produced monthly reports that included safety management reporting concerning the joint venture health and safety management plan.

8. JLG Industries Inc. (Australia branch) the importer of the plant

JLG Industries Inc. was founded in Pennsylvania, USA in 1969. The first JLG aerial platform was sold in 1970. JLG is an Oshkosh Corporation Company listed on the New York stock exchange.[13].

JLG Industries Inc. (Australian branch) imports the 600 AJ boom lift device into Australia.

On 28 February 2007, JLG provided a statement of importers design adherence 'Certificate of Assurance' for the 600 series elevated work platform.

On 25 June 2007, design registration in the Northern Territory of Australia was obtained for a 600A type articulated boom lift.

On 29 March 2010, JLG provided a 'Certificate of Assurance' for the 600AJ EWP.

In October 2011, JLG Industries Inc reviewed secondary platform guarding applications for MEWPs in America. The outcome of the review was a device that became to be known as SkyGuard® a platform switch. The review by JLG opted for SkyGuard® over provision of hard barrier guards surrounding the platform console.

SkyGuard® for the 600 AJ MEWP was not available in Australia at the date of incident involving Mr Galton.

SkyGuard® was commercially available in the United Kingdom prior to January 2013.

On 14 May 2014, design registration for 600 AJ SkyGuard® was submitted to WorkSafe Western Australia. On 30 May 2014, Worksafe WA design registered SkyGuard®. The design registration was received by JLG on 10 June 2014.

JLG had identified the risk of crush injuries

On 17 February 2011, JLG produced design risk assessment and control measures for the 600A series MEWP. The risk assessment identified the hazard of crushing, striking as a result of sudden or unintended movements.

Identified risk assessment control measures to reduce the risk were:

1. Function ramping time may be adjusted to suit the owner.
2. Braking and a foot switch that needs to be depressed for any function to operate, is provided to prevent inadvertent movement.
3. Emergency stop buttons are in place to halt movement in the case of an emergency.
4. Controls return to neutral when released.
5. Brakes are spring applied (electric over hydraulic release).
6. Only one set of controls may be used at a time.
7. Ground controls are recessed.
8. Optional padding for platform rails is also available.

[13] http//www.jlg.com/about

The control measures above when ranked reduced the likelihood of occurrence from very low to rare and consequence of occurrence was not altered and remained at numerous fatalities.

An earlier JLG risk hazard assessment dated 29 September 2009 identified when *'operating boom functions'* and in *'proximity to overhead structures'* there existed a *'crushing hazard due to operator striking obstruction and being forced on to machine controls and unable to stop movement'*.

JLG documented controls included a seven second timer applied to the footswitch operation and platform control console designed with features to physically guard the toggle switches against damage and inadvertent operation.

On 2 December 2014 investigators identified that a platform rise could be achieved by bodily contact with a control panel toggle switch. The platform rise could only be achieved when the documented controls of covered footswitch was intentionally activated by the operator and then only within the seven second timer window.

If there was more than seven seconds between the selection of functions, the footswitch must be released and depressed again to restore power to the controls. Releasing the footswitch removes power from all platform controls, halting all functions immediately.

The emergency stop button serves as the primary power supply switch for all platform controls. In the event of an emergency, this switch is deactivated to cease operation of the platform control inputs regardless of footswitch activation. Deactivation of the functions is immediate, without any ramping action. All function controls are designed to return to neutral position, once released, stopping further movement.

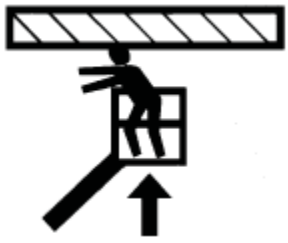
JLG published crushing hazard safety information

On 25 August 2010, JLG published an 'Operation and Safety Manual' for the 600AJ MEWP.

The safety manual specifies measures operators should take to avoid the risk of crushing due to sudden or unintended movements. The safety measures identified in the manual included:

'Safety Precautions' – 'Crushing and Collision Hazards'

1. Approved head gear must be worn by all operating and ground personnel.
2. Check work area for clearances overhead, on sides and bottom of platform when lifting or lowering platform, and driving.



3. During operation, keep all body parts inside platform railing.
4. Use the boom functions, not the drive function, to position the platform close to obstacles.
5. Always post a lookout when driving in areas where vision is obstructed.
6. Keep non-operating personnel at least 1.8 m away from machine during all driving and swing operations.

7. Limit travel speed according to conditions, visibility, slope, location of personnel, and other factors which may cause collision or injury to personnel.
8. Be aware of stopping distances in all drive speeds. When driving in high speed, switch to low speed before stopping. Travel to grades in low speed only.
9. Do not use high speed drive in restricted or close quarters or when driving in reverse.
10. Exercise extreme caution at all times to prevent obstacles from striking or interfering with operating controls and persons in the platform.
11. Be sure that operators of other overhead and floor level machines are aware of the aerial work platform's presence. Disconnect power to overhead cranes.
12. Warn personnel not to work, stand or walk under a raised boom or platform. Position barricades on the floor if necessary.

JLG informed investigators that the presence of the control system interface features and the specific warnings and instructions outlined in the Operation and Safety Manual appropriately mitigated the risk of crushing when the MEWP is operated by a competent operator.

JLG recommends minimum training and competency to operate MEWP

JLG has identified that it is not a registered training organisation or approved trainer of the Elevated Work Platform Association of Australia (EWPAA) and does not offer high risk work training. However, JLG does offer familiarisation training to customers in Australia which is intended to complement the training provided by registered training organisations and EWPAA. The training includes technical, servicing and maintenance requirements of the 600 AJ MEWP.

JLG recommends the following minimum training required to operate the MEWP. In section 1-1 of the JLG Operation and Safety Manual for the plant, JLG directs operators as follows:

- Read and understand the manual before operating the machine.
- Do not operate the machine until complete training is performed by authorised persons.
- Only authorised and qualified personnel can operate the machine.
- Read, understand and obey all dangers, warnings, cautions and operating instructions on the machine and in the manual.
- Use the machine in a manner that is within the scope of its intended application set by JLG.
- All operating personnel must be familiar with the emergency controls and emergency operation of the machine as specified in this manual.
- Read, understand, and obey all applicable employer, local and governmental regulations as they pertain to operation of the machine.
- In addition, per WHSA Regulations of 2011, operators are required to possess a licence to perform high risk work.

JLG recommended minimum operating distance measurements

JLG provided information in the Operation and Safety Manual identifying minimum operating distances to structures:

- Keep the chassis of the machine at least 0.6 m (2 foot) from holes, bumps, drop-offs, obstructions, debris, concealed holes and other potential hazards on the floor/surface.
- Do not place boom or platform against any structure to steady the platform or to support the structure.

- Exercise extreme caution at all times to prevent obstacles from striking or interfering with operation controls and persons in the platform.

9. Coates Hire Operations Pty Ltd the owner of the plant

Coates Hire Operation Pty Ltd (Coates Hire) is a major equipment rental company operating across all states of Australia.

Coates Hire bought the MEWP involved in the incident from JLG on 4 March 2011.

Coates Hire held a copy of the JLG statement of importers design adherence 'Certificate of Assurance' for the model 600AJ dated 29 March 2010.

The hire of the MEWP involved in the incident was supplied by Coates Hire under a supply agreement for hire of plant and equipment with Thiess Sedgman. The MEWP arrived at the coal mine on 22 March 2014.

As at 21 May 2014, Coates Hire owned 381 JLG 600 AJ boom lifts nationally.

Coates Hire maintenance records identify that after the incident, between on 21 May 2014 and 7 November 2014 JLG has provided Coates Hire with five replacement platform control console lift swing joystick rubber boots as a result of inspection and replacement of damaged rubber boots. The rubber boots are designed and supplied to be used on all current series JLG diesel powered boom lifts. Coates Hire (at the time of writing) owned 1639 JLG units.

Coates Hire modifications to the JLG 600 AJ MEWP

Coates Hire modified the 600 AJ MEWP to align with MDG 15 specification which included:

- battery isolator
- fan and belt guards
- extinguisher on base and in basket
- conduit on leads
- reflective tape

Coates Hire added further safety information signs to the existing JLG safety information signage on the 600 AJ MEWP based on Elevated Work Platform Australia (EWPA) recommendations.

Figure 8: Coates Hire signage modification to platform control console.

Signage:

Signage provided by Manufacturer (OEM) as follows:

Fig 1: OEM signage (A) provided in platform including refer operator manual, electrical hazard, tip over hazard and excessive side force hazard.

Additional electrical hazard decal (B) provided by Coates Hire per Elvated Work Platform Australia (EWPA) recommendation.

Figure 9: Coates Hire signage modification to base ground control.

Fig 2: OEM signage provided adjacent to Ground Controls including Emergency Stop, refer operator manual, electrical hazard, tip over hazard, excessive side force hazard, crushing hazard and Emergency Control operation.

Additional electrical hazard decal (B) provided by Coates Hire per Elevated Work Platform Australia (EWPA) recommendation.

Service record decals (C) provided by Coates Hire

Figure 10: Coates Hire signage modification to engine bay side.

Fig 3: OEM signage provided on engine bay side of EWP including crushing hazard (A) and directional arrows (B) provided on both sides of EWP.

Battery Isolator decal (C) provided by Coates Hire.

Figure 11: JLG signage on base identifying crushing hazards.

Fig 4: OEM signage provided on rear of EWP including crushing hazard (A) and Swing Area (B).

Coates Hire inspection and maintenance of the MEWP involved in the incident

Coates Hire maintenance records identify the MEWP involved in the incident had received a pre-hire three monthly safety check on 7 March 2014 at which operational functionality of platform controls was checked before hire.

Coates Hire maintenance records identify the MEWP received a 'B' service annual inspection and service conducted by maintenance employees on 6 March 2014. The hour meter was recorded at 883 hours.

The platform arrived at the coal mine on 22 March 2014. A folder containing the 'EWP safety check and routine maintenance logbook' was found attached to the platform of the MEWP.

Coates Hire was asked to identify if they were aware of any reported or repairs to issues concerning the platform control functions. Coates Hire stated:

> *'No reported issues with basket control function prior to 21 May 2014' and 'No reported issues with basket raise speed prior to 21 May 2014'.*

A JLG warranty service dated 26 October 2011(hour meter 153.0) identified an electrical fault with a joystick lift on the MEWP. The lift swing joystick was replaced on 27 October 2011.

Coates Hire published crush injury safety information

Coates Hire provided an 'EWP safety check and routine maintenance logbook' which was attached to the MEWP and included a 'Hazard and Risk Assessment – Plant Operation' document dated 23 July 2013.

The Coates Hire risk assessment identified the hazard and risk of crushing (squashing). The addition to the assessment of the hazard and risk of crushing was made in October 2011.

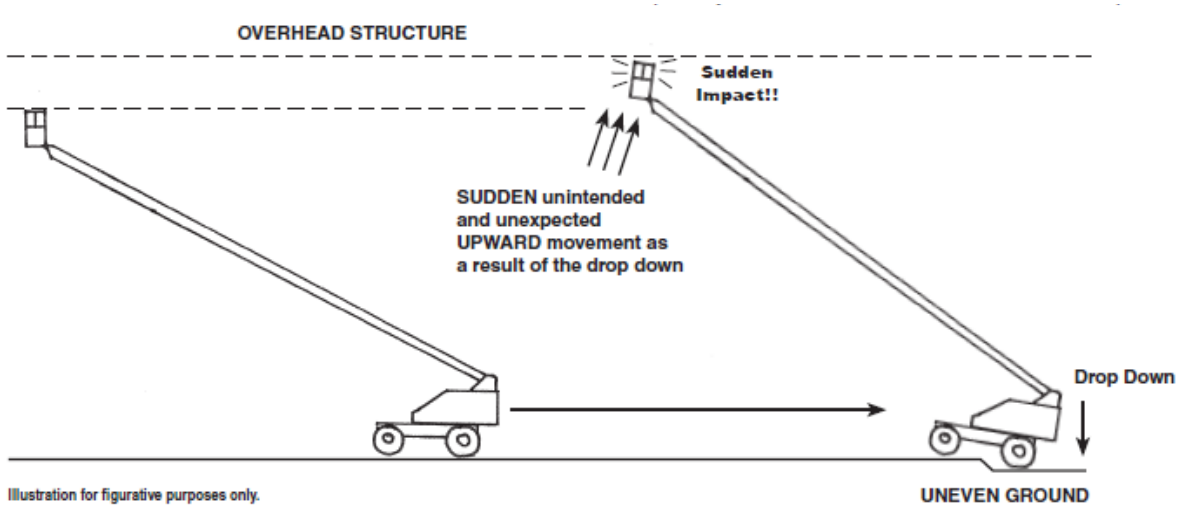
The identified risk stated:

> *'Person(s) in basket being crushed between the basket and overhead structure(s) if the boom is driven under overhead structures on uneven ground or up and down kerbs or slopes'*

The control measure in the assessment stated:

> *'Remember the leverage factor and ensure ample clearance above the basket to cater for any unexpected amplified upward basket movement'.*

Figure 12: Coates Hire hazard and risk assessment – plant operation knuckle booms page 2

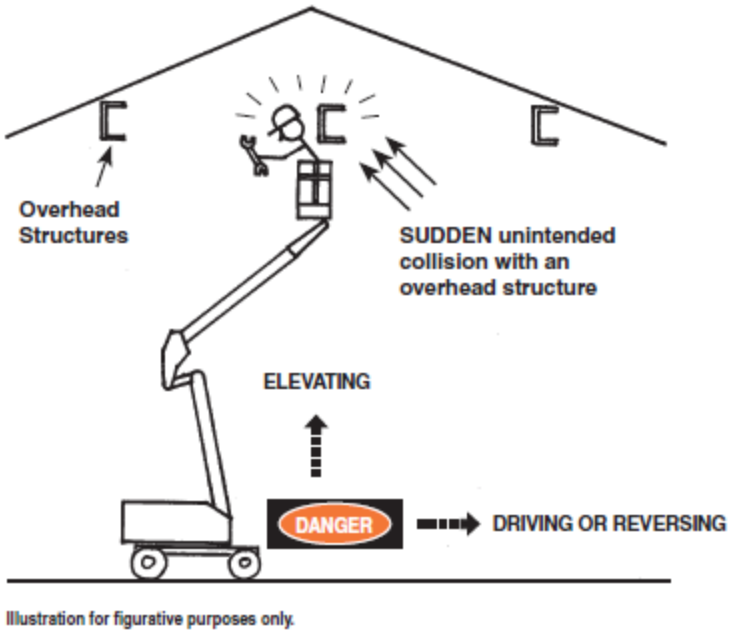


'Serious crushing injury or death if person(s) in basket collide with an unseen overhead structure.'

Another control measure stated:

*'When working near or in between steel beams or other overhead structures always **"Look up, Around and Behind"** BEFORE elevating, driving or reversing.'*

Figure 13: Coates Hire hazard and risk assessment – plant operation knuckle booms page 2



Another identified risk stated:

'Being trapped between the plant and materials or fixed structures'

The control measure to the risk stated:

1. *Avoid congested work areas*
2. *Remain within the confines of the platform when operating*
3. *Ensure sufficient clearance between the platform and overhead obstructions.*

10. The plant

The plant involved in the incident was a JLG 600 AJ 60 foot (18.3m) rough terrain diesel knuckle boom type mobile elevating work platform (MEWP). Coates Hire web-based information states:

'Knuckle booms are specifically designed to access areas that require an up and over approach. This helps work around obstacles such as fixtures, machinery, walls or other restrictions in the path'.[14]

MEWP specifications

Machine model:	JLG 600AJ
Item asset code:	1058702
Serial number:	0300144012
Date of manufacture:	28 February 2011
Date of commissioning:	February 2011
Date of purchase (CHOPL)	4 March 2011
Last date of	
Annual inspection:	6 March 2014
Max. height:	18.29m (60ft)
Boom length:	18.42m
Working radius:	12.07m
Platform SWL:	230kg
Overall width :	2.44m
Engine:	Deutz Diesel F4M2011F
Drive:	4 wheel drive
Transport weight:	11.9 tonne

[14] www.coateshire/access-hire/knuckle-booms-hire

Figure 14: JLG operational and safety manual 600AJ machine nomenclature page 2-9

1. Platform
2. Platform Control Box
3. Rotator
4. Articulating Jib
5. Fly Boom
6. Base Boom
7. Main Boom Assembly
8. Telescope Cylinder (Inside)
9. Upright
10. Fly Boom
11. Base Boom
12. Lower Lift Cylinder
13. Ground Control Box
14. Steer Wheels
15. Frame
16. Drive Wheels
17. Swing Bearing
18. Turntable
19. Tower Telescope Cylinder (Inside)
20. Boom Assembly
21. Upright Level Cylinder
22. Main Lift Cylinder
23. Slave Level Cylinder
24. Articulating Fly Lift Cylinder
25. Footswitch

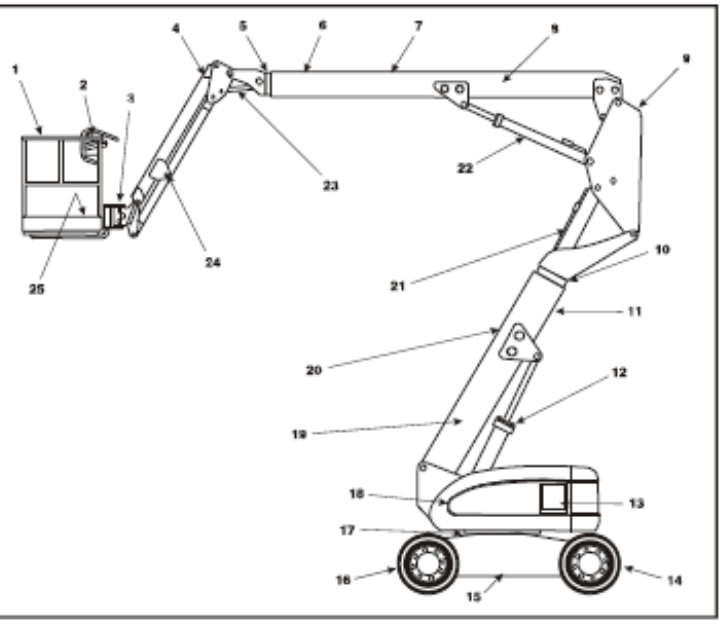


Figure 2-1. Machine Nomenclature - 600AJ

The 600A model articulating boom lift was design registered (registration number N7070) in the Northern Territory to design code AS1418.10 (classification GP-B-SUB-GP3) on 25 June 2007.

The NT design registration was granted based upon the supplied manufacturer's specifications from JLG Industries Inc. and reciprocal to the design approvals from Queensland Workplace Health and Safety design No. Q15939 (26 November 1996), Victorian WorkCover Authority design No. V964019 (27 November 1996) and WorkSafe Western Australia design No. 086690 (27 September 1996).

JLG has two statement of importers design adherence 'Certificate of Assurance' for Boom Lift 600 series dated 28 February 2007 and the 600 AJ dated 29 March 2010.

JLG stated on the certificate that they complied with duties required of a person who imports plant under Australian *Occupational Health and Safety Regulations 1996* and the design process required by Regulation 4.25.

JLG Industries Inc, Pennsylvania, sold the incident MEWP to JLG Industries, Australia, on 1 April 2011. JLG Industries, Australia, sold the incident MEWP to Coates Hire on 4 March 2011.

Platform control console

JLG provide a standard platform control console across the range of JLG MEWP models.

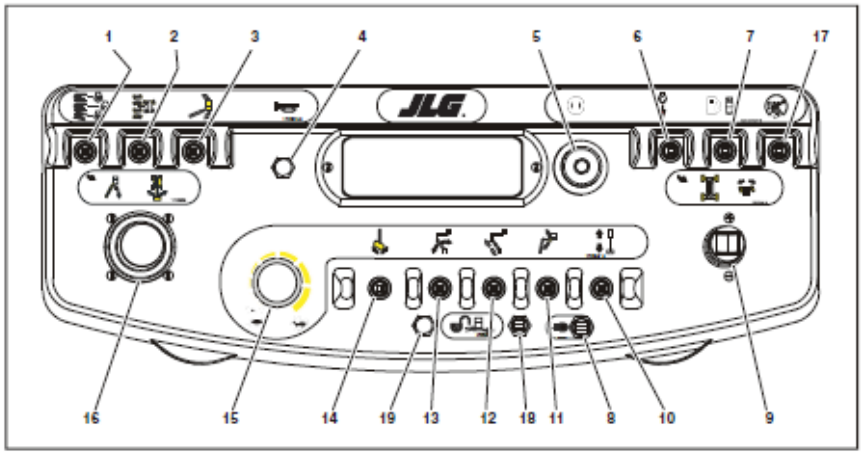
The platform tilt lift and swing joystick is on the left hand side of the console. The joystick on the right hand side of the console operates the drive and steer function to move the base of the MEWP.

A dial to select the speed function (low to high speed) is on the left hand side adjacent to a bank of functional switches, which are between raised mouldings and are an integral component of the console.

A power emergency stop button is in the middle top area of the console.

Figure 15: Incident MEWP control console – platform returned to ground level on 23 May 2014.

Figure 16: JLG 600 AJ operational and safety manual platform control console

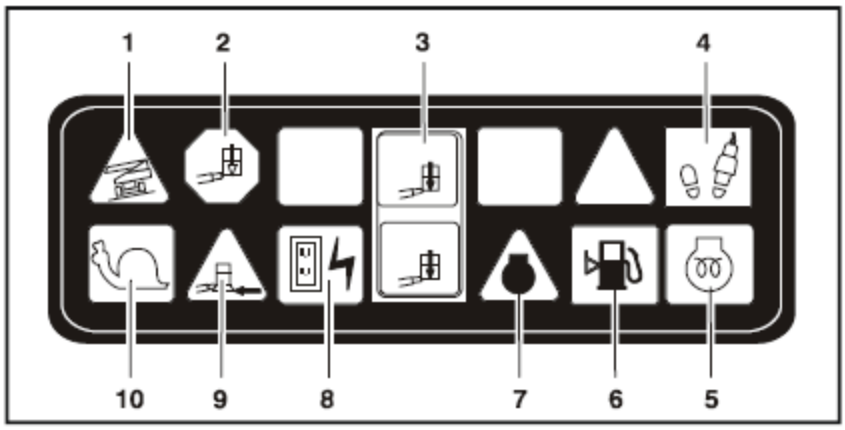


1. Drive Speed
2. Steer Select
3. Platform Leveling Override
4. Horn
5. Power/Emergency Stop
6. Aux. Power
7. Fuel Select
8. Lights
9. Drive/Steer
10. Telescope
11. Jib
12. Tower Telescope
13. Tower Lift
14. Platform Rotate
15. Function Speed
16. Main Lift/Swing
17. Drive Orientation Override
18. Soft Touch Override
19. Soft Touch Indicator

Figure 3-5. Platform Control Console - w/Drive Orientation

Figure 17: JLG 600AJ operational and safety manual platform control indicator panel

SECTION 3 - MACHINE CONTROLS AND INDICATORS



1. Tilt
2. Overload
3. Capacity
4. Enable
5. Glow Plug
6. Low Fuel
7. Engine Malfunction
8. AC Generator
9. Soft Touch
10. Creep

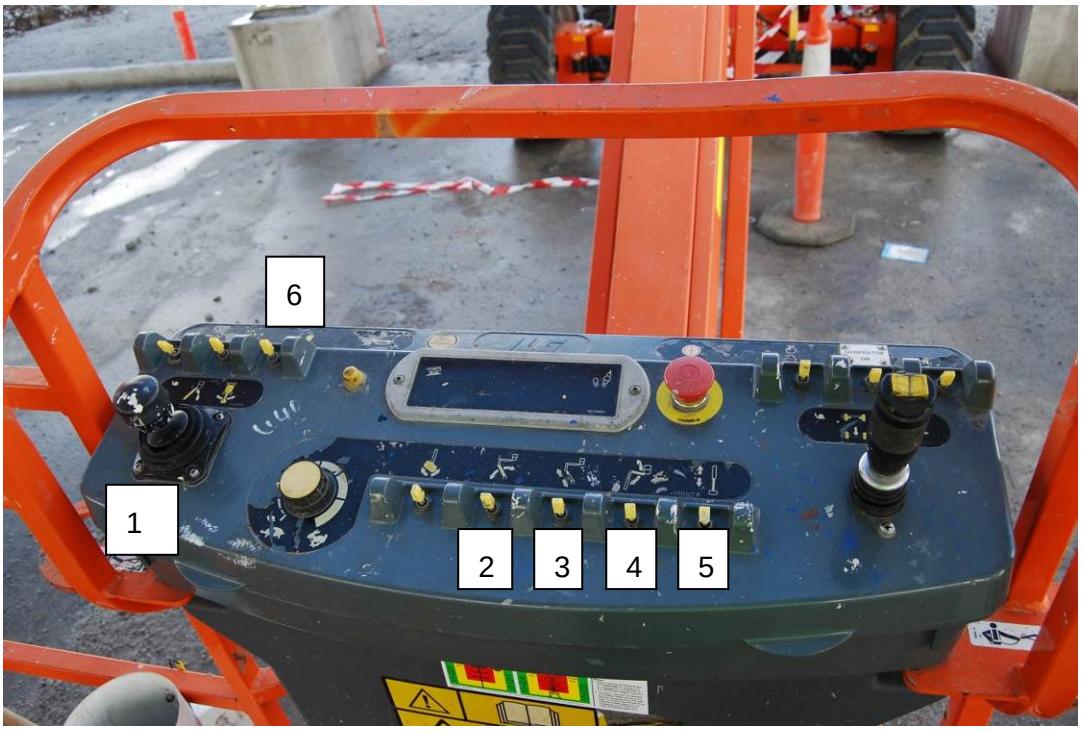
Figure 3-6. Platform Control Indicator Panel

3-16 – JLG Lift – 3121204

Platform rise controls

JLG identified six individual platform console controls that cause a rise in the platform.

Figure 18: Identification of the six platform raise controls on the platform control console



1. Main lift swing joystick move **forward**
2. Tower lift toggle switch to **forward position**
3. Tower telescope toggle switch **to forward position**
4. Jib toggle switch **to forward position**
5. Telescope toggle switch **to backward position**
6. Platform levelling over ride switch **to forward position**

There are two directions of switch operation that can cause the platform to rise i.e. forward or backward. Potentially an incorrect raise or lower operation could occur if the operator moves a switch in the wrong direction.

OEM Controls Inc. lift swing joystick

The 'hall effect' lift swing joystick (Model HJS9M 14133) is manufactured by OEM Controls Inc. (America) and supplied to JLG (USA) for the 600AJ MEWP.[15]

The joystick has a centre detent (mechanical maintained centre detent, lift under cap to allow joystick movement or function).

The device has an international protection (IP) code of IP54. [16]

The joystick model HJS9 has received a TUV Rheinland of North America certification for electromagnetic compatibility (EMC) testing against various electrical testing standards (EN and IEC standards).

Control speed range

JLG identified the control speed range (lowest to highest speed) for each control function to raise the platform upwards as:

Main lift up:	26-32 seconds
Tower lift up:	37-50 seconds
Tower telescope out:	15-23 seconds
Jib up:	22-34 seconds
Telescope out:	35-50 seconds

The platform speed control knob is set to full speed (turned clockwise completely). Function speeds may vary due to cold, thick hydraulic oil.

Available upward force applied to the platform

JLG identified the maximum available force that can be applied by the MEWP to raise the platform upwards as:

Platform level up:	2800 psi (19.305Mpa)
Jib up:	1500 psi (10.342Mpa)
Main lift up:	3000 psi (20.684Mpa)

[15] The 'Hall Effect' is the production of a voltage difference (the Hall voltage) across an electrical conductor, transverse to an electric current in the conductor and a magnetic field perpendicular to the current

[16] The IP Code, International Protection Marking, IEC standard 60529, sometimes interpreted as Ingress Protection Marking,[1] classifies and rates the degree of protection provided against intrusion (body parts such as hands and fingers), dust, accidental contact, and water by mechanical casings and electrical enclosures. It is published by the International Electro technical Commission (IEC).

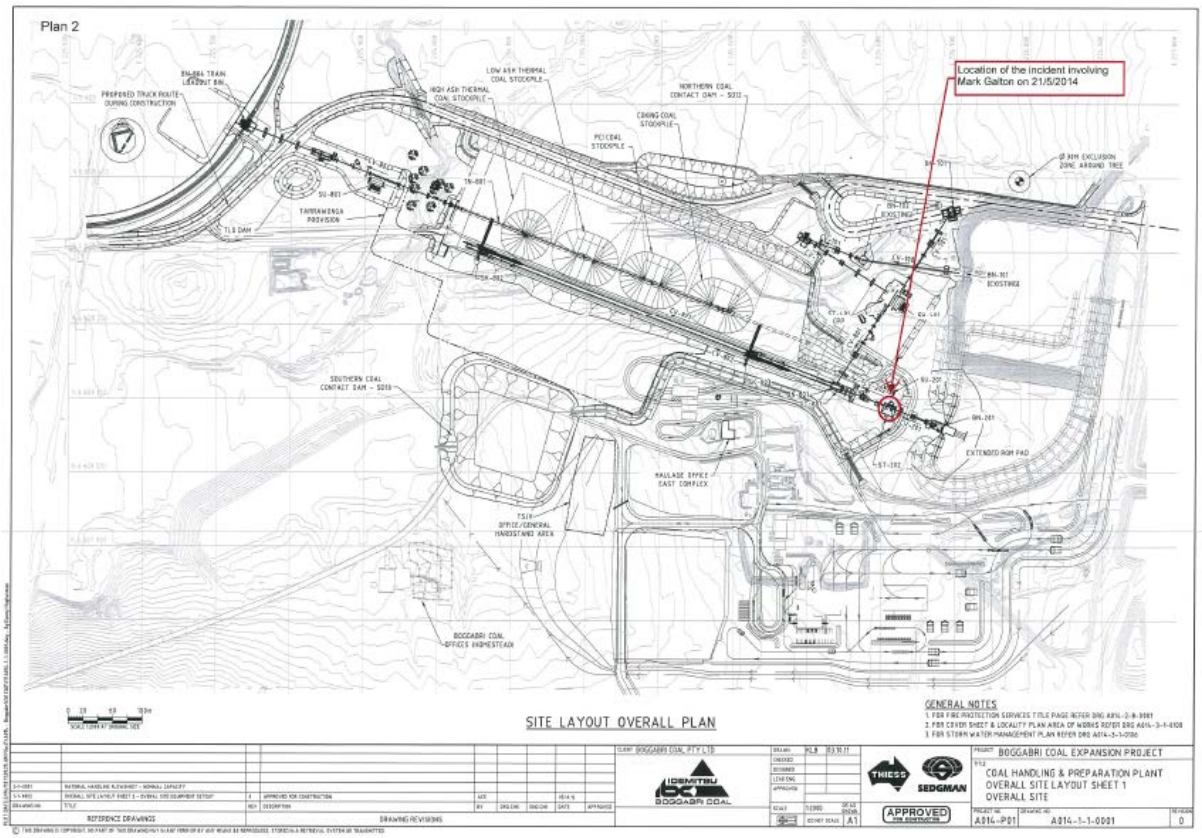
Tower lift up:	3000 psi (20.684Mpa)
Telescope out:	3000 psi (20.684Mpa)
Tower telescope out:	3000 psi (20.684Mpa)

When the maximum upward force is applied and the relief pressure is reached the hydraulic fluid will bypass the valve and not build any more pressure in excess of the relief pressure.

11. The incident site

The incident occurred at the partly constructed coal bypass and sizing station referred to as ST202.

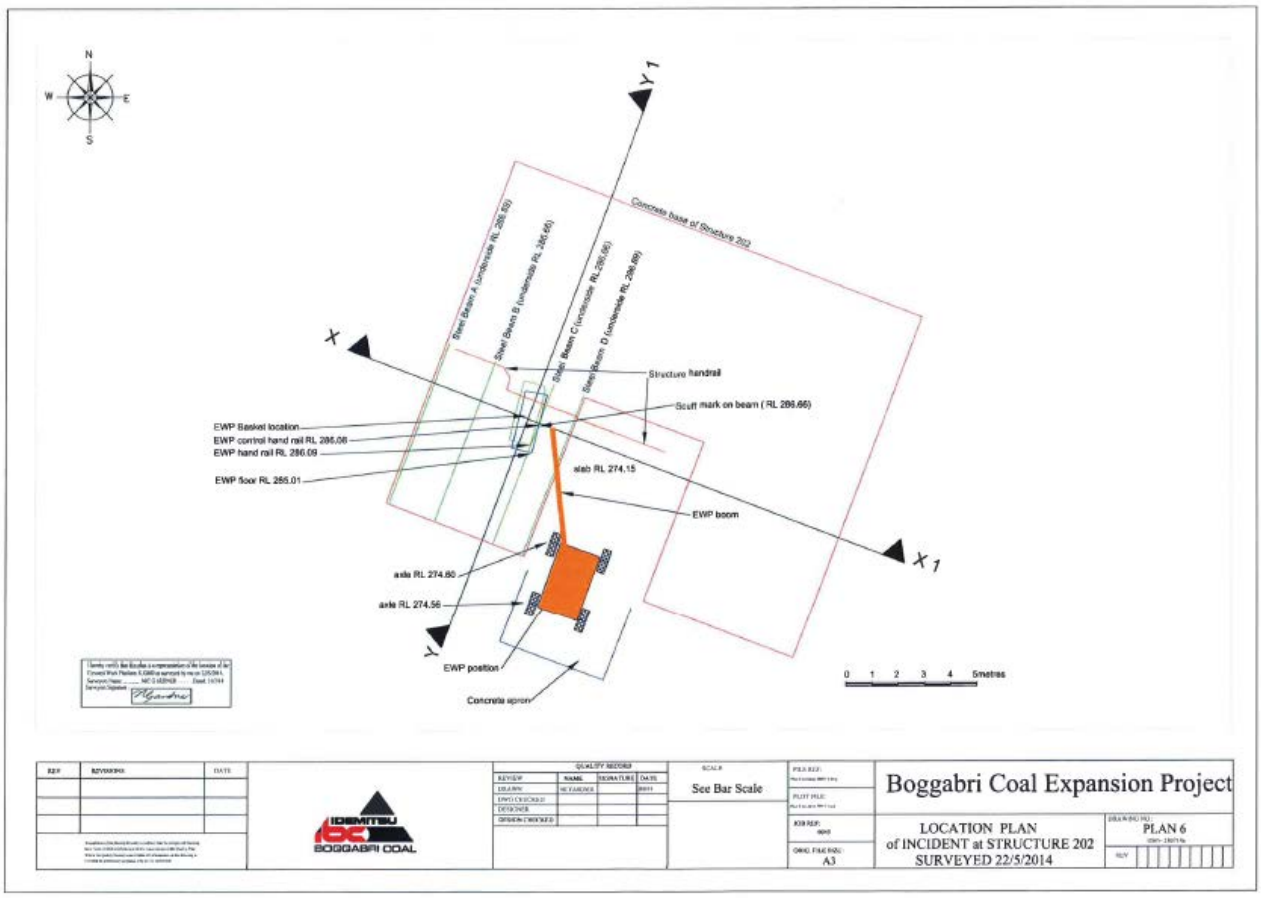
Figure 19: The incident site known as ST202.



ST202 was partly constructed to three floors comprising structural steel, steel mesh, steel stairways and conveyor equipment. Mr Galton was working under the third floor section comprised of four steel beams and covered by a mesh floor.

The underside of the steel beam that Mr Galton was crushed against was 12.5 m above the concrete floor ground level.

Figure 20: Incident site – top view.



The left hand side of the platform was observed after the incident to be over the handrail of the second floor walkway.

In this position, the platform would need to be moved sideways (to the right from the operator's perspective) before the platform could be lowered to prevent contact with the handrail.

The position of the platform was rotated to the right relative to operating the platform control console and approaching parallel with the raised jib and boom.

Figure 21: Incident X-X1 cross section plan – view towards north east.

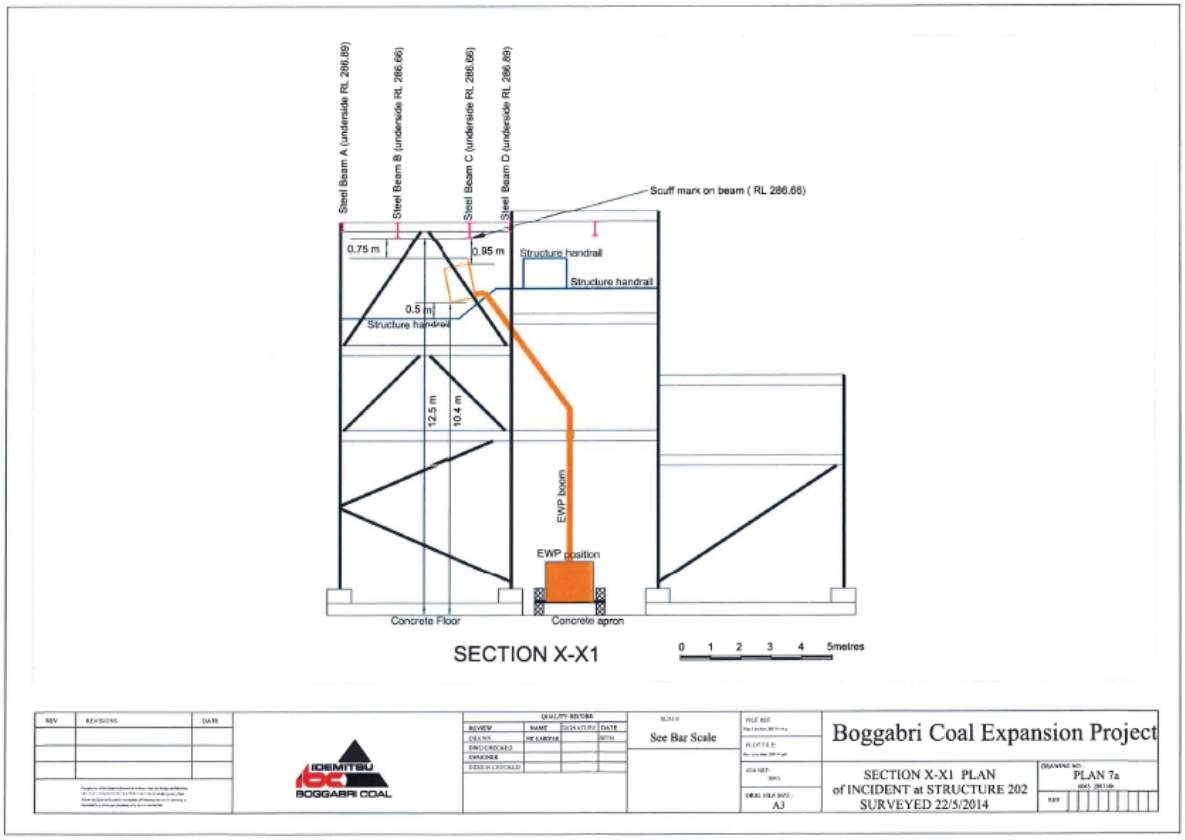


Figure 22: Incident Y-Y1 cross section plan – view towards north west

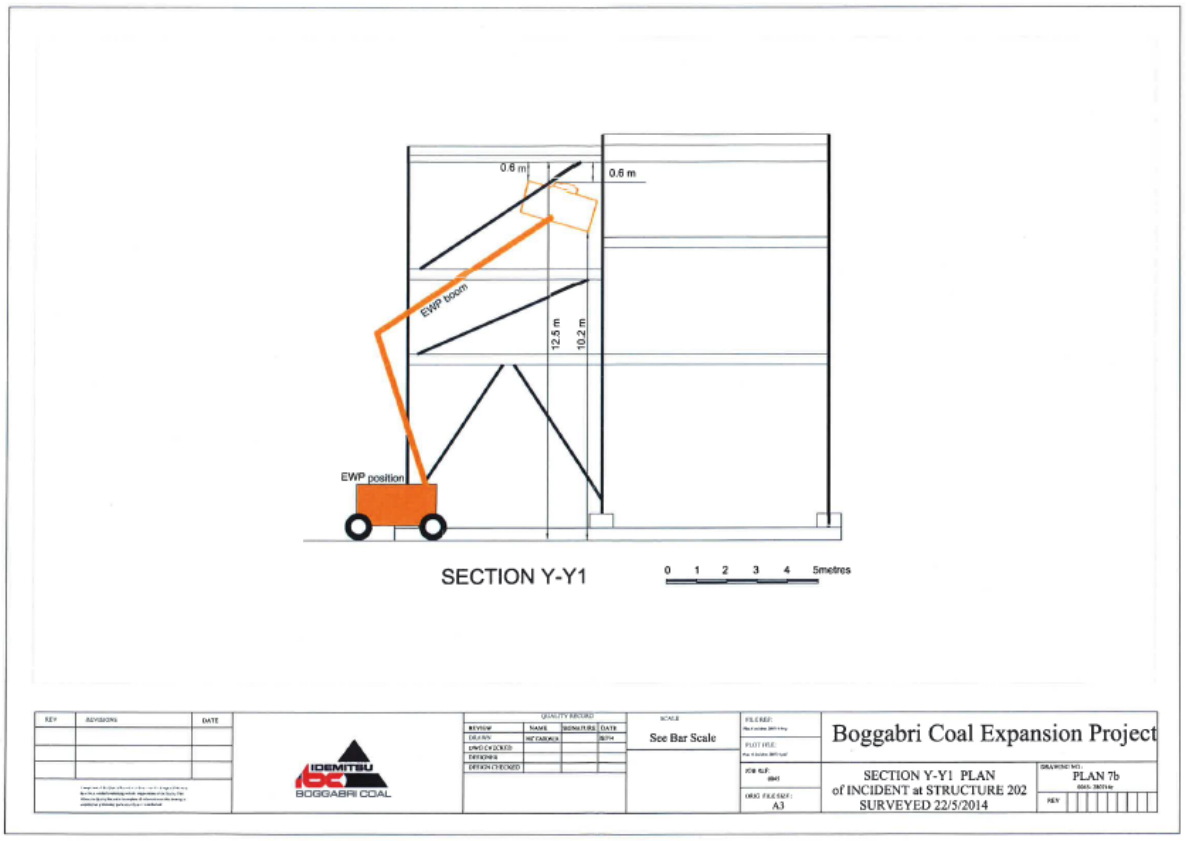


Figure 23: View east towards ST202 and equipment in vicinity of the scene.

Figure 24: Incident site and the installed steel components of ST202 on 21 May 2014.

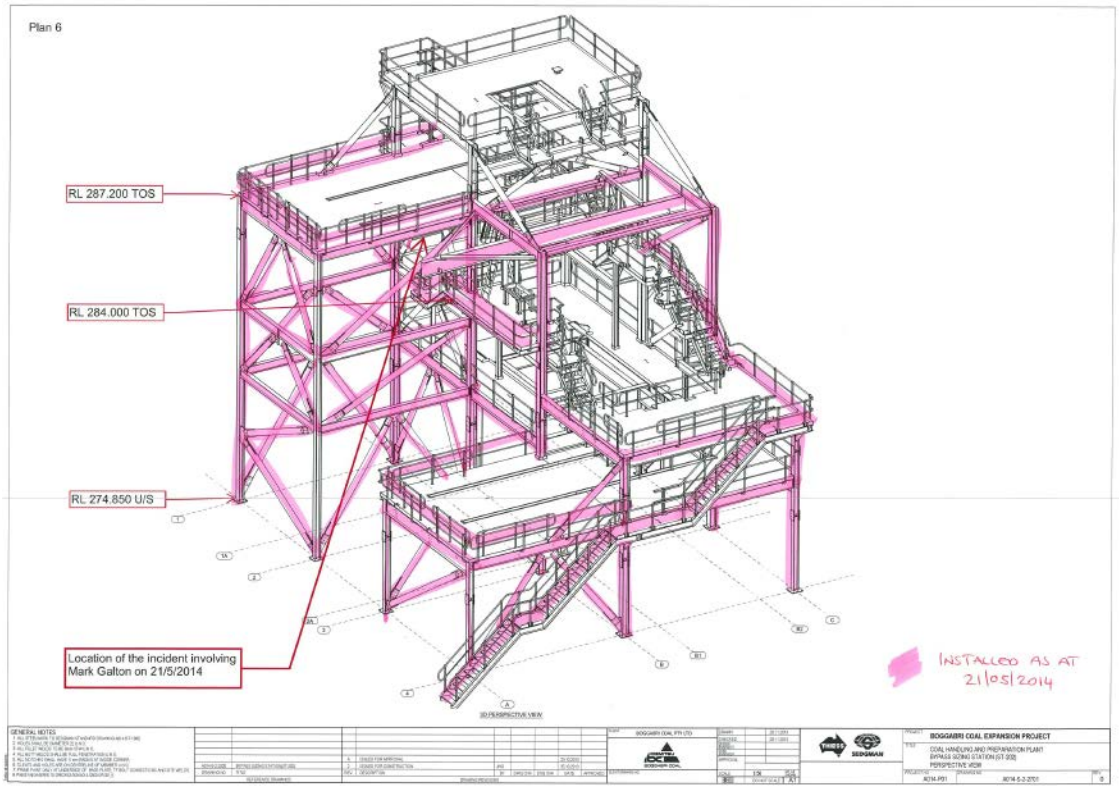


Figure 25: View north west towards main access stairway onto ST202 taken during the process of lowering the platform from under the third floor level.

12. The incident chronology

A chronology of events has been compiled from various sources.

The working at height permit dated 20 May 2014

A Working at Height Permit (WAH permit) was signed by Mr Galton and the leading hand rigger on 20 May 2014. The permit was countersigned by two supervisors.

The work location was ST 801 for installing steel work and chutes.

The ST801 WAH permit was not applicable to the work undertaken at ST202 on 21 May 2014.

Another permit for ST202 was signed by two other operators for work at heights conducted at ST202 on 20 May 2014.

Thiess Sedgman told investigators that Mr Galton did not have to create a new permit for ST202 because the other permit for ST202 continued to apply. However, it is noted that Mr Galton had not actually signed onto the ST202 WAH permit.

6.30 am - The prestart meeting on 21 May 2014

Mr Galton logged onto the mine site gate log at 5.55 am on 21 May 2014.

Mr Galton attended the pre-start meeting at 6.30 am in the site offices at Boggabri Coal Mine and during the meeting signed onto the Theiss Sedgman prestart sign on sheet for the ‘green’ crew roster.

There were 10 other people listed on the ‘green’ roster who signed onto the same pre-start sheet. There were 11 other people on the ‘purple’ roster who signed onto the same pre-start sheet.

The pre-start meeting was presented by Supervisor 1. Other staff also attended the meeting.

Supervisor 1 filled out a pre-start meeting record that identified issues of:

- reading out timber email
- no pedestrian access to CPP yet-vehicle only
- keeping on top of calling up when entering other areas.

There were no recorded issues raised by the work team on the sheet.

The record identified that union representatives would be on site at 9 am. Work activity included ST *'202'*. A hand written notation was made to '*hand out safety slogan stuff*'.

Mr Galton's role was typed onto the two pre-start sheets as '*rigger'.*

The allocated daily work task sheet attached with the prestart sign on sheet was filled in by Supervisor 1 and the allocated work area for Mr Galton was handwritten as '*bolts'* and the task was handwritten as *'bolts'*.

There were four other 'green' crew workers assigned to ST202 or the 'bolts' task. There were two people from the 'purple' crew also allocated to work at ST202.

The lead hand rigger was also allocated the task of 'bolts'.

Information provided by people who attended the prestart meeting said there were no instructions at the pre-start meeting that Mr Galton was to operate a MEWP that morning.

The pre-start meeting was a roster cross over between the 'green' and the 'purple' crews, which meant that the two allocated crew supervisors were present during the day and that people from the two different crews could be allocated to work together on the day.

7 am - The 'Start Card' created on 21 May 2014

A Thiess Sedgman 'Start Card' was created at 7 am on 21 May 2014 at ST202.

The specific JSEA nominated on the 'Start Card' was No. 0258.0 dated 5 March 2014 which was for the *'180t Kobelco Crawler Crane for general lifts and operation'*. This was not the correct JSEA for the work being undertaken by Mr Galton on 21 May 2014.

However, it should be noted that a Start Card dated 20 May 2014 for work described as *'rattling steel'* on which Mr Galton and the lead hand rigger had signed, stated that the specific JSEA was No. 0292-2 dated 6 April 2014 which was for '*Sizing station structural erection of structural steel at ST202'*. JSEA 0292-2 specifically addressed the potential hazards with use of MEWP and rattling bolts.

Mr Galton had signed onto JSEA 0292-2 on three separate occasions on 5 April 2014, 6 April 2014 and 18 April 2014.

JSEA No. 0292-2 had been reviewed by a health, safety and environment employee on 10 April 2014 and amended on 20 May 2014.

The description of work was listed as steel erection, general lifts and in a different coloured pen the words *'& bolting'* were added. Supervisor 1 was identified on the 'Start Card' as being the supervisor however he was not present during the creation of the 'Start Card'.

The main hazards listed on the 'Start Card' were;

- pinch points
- working at heights
- swinging loads

There were seven signatures including Mr Galton's on the 'Start Card'. There was no supervisor's name or signature identifying that a review of the 'Start Card' had taken place.

7.10 am - Prestart inspection by Mr Galton

At 7.10 am on 21 May 2014, Mr Galton signed the MEWP operator safety check record sheet in the platform.

Mr Galton also filled out and signed the Thiess EWP operator's prestart inspection and defect report No 75239 and recorded the MEWP start hours were 949/4. All of the tick boxes on the report were ticked 'OK' and 'Yes' and no defects were reported by Mr Galton.

The work task allocated to Mr Galton

Spotter 2 for the second MEWP being operated at ST202 on the day of the incident told investigators he had been doing exactly the same task in a MEWP in the same location as Mr Galton the previous day.

Supervisor 1 allocated Mr Galton to the '*bolts'* task but it was not clear if the role was to be the spotter or working from the MEWP. Spotter 2 said that they would talk between each other to decide which operator did what task.

Spotter 2 told investigators that he had not continued with the bolt rattling task on 21 May 2014 and he had a conversation with Mr Galton concerning how many more bolts needed rattling. However Spotter 2 could not recall how Mr Galton was allocated the task to rattle bolts on the day of the incident. It appears that the task allocation was a decision made by the riggers at ST202 on the morning of the incident.

Spotter 2 told investigators the second MEWP began work at 7.45 am and Mr Galton lifted his MEWP platform into the air after that.

8 am - Supervisor observes and speaks to Mr Galton

About 8 am Supervisor 1 walked past ST202 and recalled seeing Mr Galton in his harness and getting ready to use the platform. In passing he spoke with Mr Galton about how he was going and Mr Galton replied: *'It's all good'.*

Supervisor 1 also recalled seeing two people wearing the spotter's identification vests and that no machines were working at the time. Supervisor 1 then left the area to inspect the stacker pad.

8.45 am - Verbal warning given to Mr Galton

Mr Galton's spotter (Spotter 1) was normally the crane driver and this was the first time he had undertaken the spotter role at the Thiess Sedgman site. Spotter 1 remained at the ground level for the duration Mr Galton operated the platform.

During the task, Mr Galton asked the leading hand rigger, who was on a walkway at an adjacent level to assist him with observing the platform movement. The leading hand rigger was not the nominated spotter for the task and was not wearing a spotter identification vest.

Spotter 1 was aware that the leading hand rigger was assisting Mr Galton during movement of the platform.

The leading hand rigger saw Mr Galton move the platform from where he had been tightening bolts. During this, another rigger (Rigger 1) walked through the area and discussed attendance at the 9 am union meeting with the leading hand rigger. The conversation took place about 8.45 am in close proximity to where Mr Galton was working.

Rigger 1 left the walkway area and the leading hand rigger said to Mr Galton:

> '*Ok Mark, you're free to go'.*

The leading hand rigger turned back towards where he was working. It was at this point in time that the leading hand rigger noticed from the corner of his eye the platform go upwards.

The leading hand rigger said to Mr Galton:

> '*Stop, what are you doing?'*

Mr Galton stopped the platform movement and acknowledged the verbal warning with the response:

> *'Yeah okay.'*

In this position the leading hand rigger observed that Mr Galton's head was about 5 cm below the horizontal steel beam and he was standing upright with both hands on the platform controls and facing towards the mine (facing towards the jib, boom and base of the MEWP).

The leading hand rigger turned away after hearing Mr Galton's response and his next observation was:

> '*Then I saw Mark facing east still in a standing position leant forwards over the control panel in the EWP. He had both hands still on the controls with his head coming forward but still upright as if he was looking forwards towards the mine. His head was jammed in between the beam above and a hand rail which is over the control panel.'*

The lead hand rigger then made an emergency call over the two-way radio system.

8.48 am - The emergency radio call

At 8.48 am Supervisor 1 heard the leading hand rigger's emergency radio call in which he said:

> *'Emergency, emergency, emergency. Worker trapped in basket.'*

Spotter 1 was on the ground talking with Spotter 2 (who was allocated to the second MEWP operating on the other side of ST202).

Spotter 1 did not see the actual incident take place however he heard the leading hand rigger call emergency over the radio.

Spotter 1 saw that Mr Galton was at the controls looking upwards but he was unable to identify from the ground level that Mr Galton was in a crush position.

8.50 am - Supervisor attends the scene

At 8.50 am Supervisor 1 reached the bottom of the stairs and shouted to people in the vicinity to *"mark the time 8.50"* for the start of the rescue process.

The rescue attempts and recovery of Mr Galton

Initial unsuccessful attempts were made by workers who were on the third floor level and directly above Mr Galton to relieve the crush pressure exerted by the platform.

The workers on the third floor level pushed down on the platform handrail using a steel bar but could not release Mr Galton.

Rigger 1 then went down ST202 stairways to the MEWP base control station where he used the controls to move the platform and released Mr Galton.

Mr Galton was then seen to fall to the floor of the platform.

Another supervisor (Supervisor 2) heard the leading hand rigger's radio call and went up the walkway adjacent to the platform, where he saw Mr Galton lying in the platform.

Supervisor 2 then got into the platform and unsuccessfully tried to return it to the ground level (The engine was running at ground level but he was unable to operate it from the platform). Supervisor 2 then made the decision to recover Mr Galton from the second floor level. He asked for the MEWP ground controls to be used to move the platform, which was located above the walkway handrail. The platform was then lowered to the handrail.

Supervisor 2 cut the compressed air hose into the platform. He recalled that the hose was not under tension at the time.

Several workers then recovered Mr Galton from the platform onto the second floor walkway. Mr Galton did not respond to the resuscitation efforts made by workers.

At 9.16 am the scene was attended by NSW Ambulance paramedics. Paramedics instructed site workers to cease CPR about 9.30 am. NSW Police officers attended the incident scene about 9.30 am.

13. Examination of circumstances of the incident

Electronic recording devices at the site

There was no electronic/video recording of the work area from surrounding buildings available to assist the investigation. There was other areas of the site being monitored but not where this work was taking place.

Background circumstances to the incident

1. Mr Galton was operating the platform control console and was alone in the platform.
2. There is no evidence that the ground control console was being operated by another person.
3. Environmental conditions were not considered to be contributory.

   Site weather recording data identified the following:

   - Cool and sunny autumn morning
   - Temperature ranged from a minimum of 7.7°C to a maximum of 23.2°C
   - A low wind speed was recorded at 1.1 m/s from 144 degrees at 8.45 am
   - Previous rain fall was recorded nine days earlier on 12 May 2014 at 0.2 mm and on 11 May 2014 at 1.8 mm

4. The incident MEWP log book operator safety check record was signed by Mr Galton on two dates (7 April 2014 and 21 May 2014). It appears likely this was the second occasion that Mr Galton was operating the MEWP involved in the incident.
5. A single compressed air line hung from equipment in the platform to the ground level. There is no evidence that release of excess tension in the compressed airline caused the platform to rise.
6. The maximum upward force available that could be applied to the platform ranged from the 'jib up' pressure of 10,342kpa (1500psi) to 'main lift up' and 'telescope out' pressure of 20,684kpa (3000psi).
7. It was observed after the incident that the platform console speed control knob was positioned to the slow (turtle) speed setting.

8. Mr Galton was working the 9th day shift of his roster and had logged 88 hours and 15 minutes on the 10-day roster at the time of the incident.
9. Mr Galton had arrived at the site at 5.55 am and he had been at the site for 2 hours 53 minutes when the incident occurred.
10. Mr Galton's personal safety equipment included a working at heights harness, a safety helmet without any additional sun protection devices attached and clear safety glasses.

The position of the wheels on the MEWP base

The MEWP base was on smooth concrete flooring of ST202. The front wheels were on a flat concrete slab within ST202. The rear tyres were on a concrete ramp that provided access onto the slab. It was identified by survey that there was a 4 cm difference in height from the front to the rear axle due to the slope of the ramp.

There was no evidence of any ground movement (failure of concrete) underneath any of the four rubber tyre wheels of the MEWP.

Figure 26: MEWP base on concrete floor.

There was no evidence that any of the MEWP tyres had failed or deflated causing instability on the raised platform.

It is not known whether Mr Galton selected the base drive/steer joystick to move the platform sideways across the top of the walkway handrail by moving the base of the MEWP.

As the rear wheels moved down the ramp it potentially caused the platform to move in an upwards direction (a pendulum effect on the platform).

The load contained in the platform

The maximum operating load (SWL) permitted in the platform was 230 kg.

The investigation has not determined the exact load in the platform at the time of the incident. However, it is considered unlikely in review of the items removed from the platform that the combined total load in the platform exceeded 230 kg.

Witness accounts are not clear as to whether Mr Galton's yellow tool bag, which was fully loaded with tools and was found on the gantry walkway after the incident was in the platform at the time of the incident.

Figure 27: Mr Galton's yellow tool bag and a working at heights harness found on the walkway adjacent to the platform.

The investigation has not determined the load applied to the platform created by the suspended weight of air hose going down to the ground level compressor.

The combined load most likely supported by the platform included:

1. Mr Galton and his working at height equipment PPE
2. air receiver box
3. rattle gun (equipment referred to as a nut runner)
4. air hose (black colour) to rattle gun
5. air hose to ground level (red colour to compressor)
6. tools, rattle gun sockets and various size nuts and bolts

Figure 28: Photograph of a person holding the rattle gun and air hoses leading to and from the air receiver box all of which were in the platform with Mr Galton.

Figure 29: Photograph of items found in platform console storage bin.

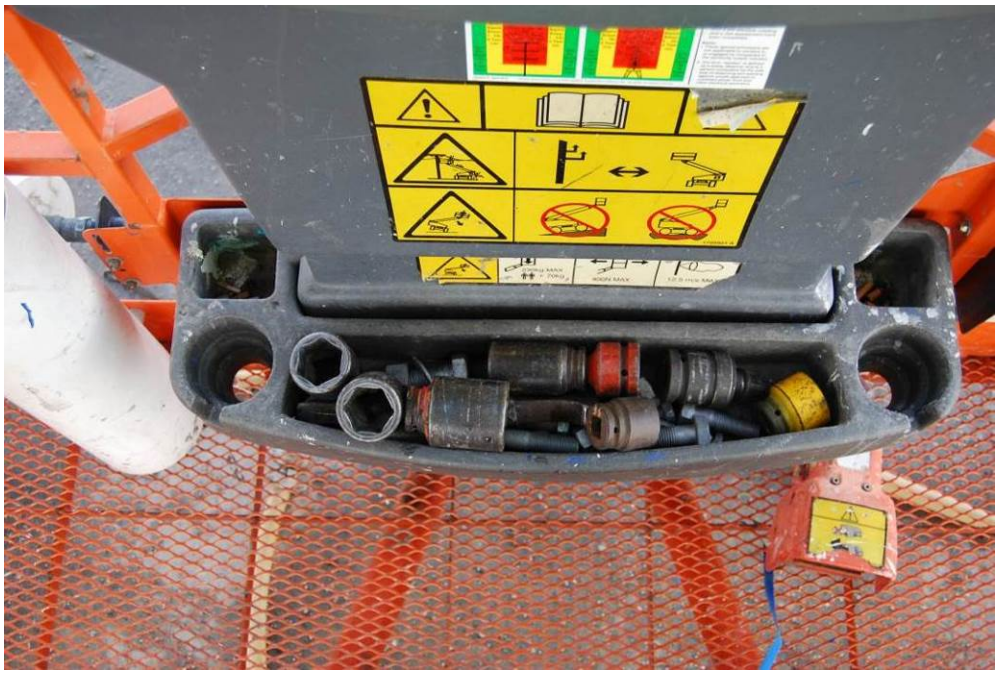


Figure 30: Photograph of items including tools rattle gun sockets, various size nuts and bolts found in the platform console storage bin and from the platform floor.

Figure 31: Photograph of PPE lanyard, shifter, red hose remnants, shifter and small plastic bottle found on the platform floor near the exit door.

The platform control console speed setting

Supervisor 2 was the first person into the platform following the incident but could not recall the speed setting on the platform control console. Supervisor 2 said there were no alarms or other warning systems that indicated any issue with the MEWP when it was moved using the ground control. Supervisor 2 remained near the platform until police arrived. The platform was not moved again after the movement to recover Mr Galton.

A photograph of the platform control console taken by a department officer at 5.07 pm on 21 May 2014 identifies the speed control was turned towards the slow speed setting. The platform was lowered to the ground on 23 May 2014 and a photograph of the platform control console identifies the status of the speed control knob turned towards the slow speed setting.

Figure 32: Platform control console position at 5.07pm on 21 May 2014.

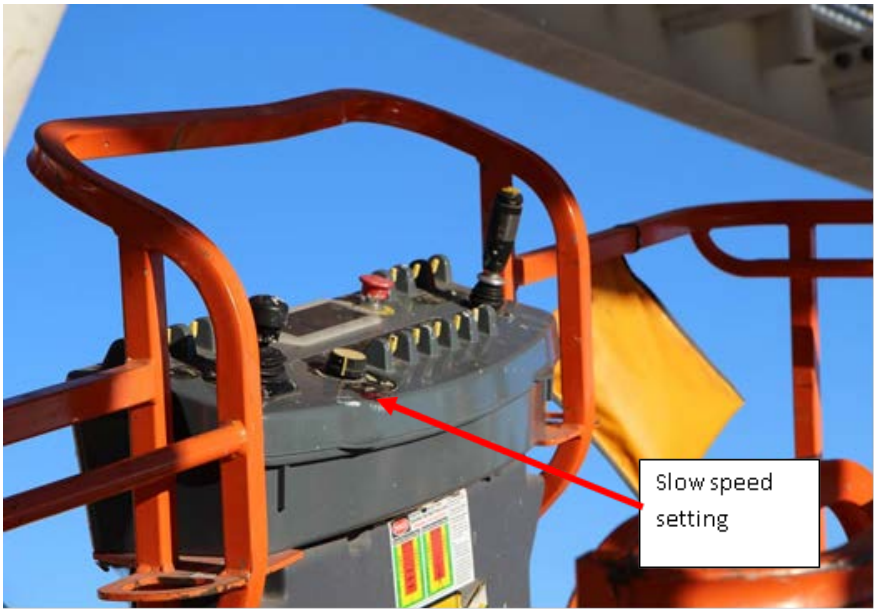


Figure 33: Platform control console at 2.12 pm on 23 May 2014 when returned to ground level.

The position of the platform, jib, fly boom, base boom and MEWP base

The platform was observed to be rotated to the right (in relation to the operator console position) and close to being parallel with the raised jib. The fly boom was raised but not extended. The base boom was raised.

Figure 34: View from the walkway of the position of the raised base boom, fly boom and jib in relation to the rotated platform.

Figure 35: View looking down from the walkway of the positioning of the jib, fly boom and base boom in relation to the position of the MEWP base.

Lowering the platform after the incident

The position of the platform after the recovery of Mr Galton was observed to be rotated on the articulating jib rotator parallel with and to the left hand side of the turntable of the MEWP. The platform was across the top of two yellow painted handrails of steps on a walkway under the third floor level of ST202. The platform was lowered onto the top handrail of the steps during the recovery of Mr Galton.

Figure 36: Platform and articulating jib position in relation to the stairway handrail.

Figure 37: Platform, jib, fly boom and base boom position in relation to the turntable of the MEWP and ST202. Photo taken while lowering of the platform from the ground control box of the MEWP on 23 May 2014. Spotters were positioned on the second floor walkway and on the ground level during the lowering of the platform.

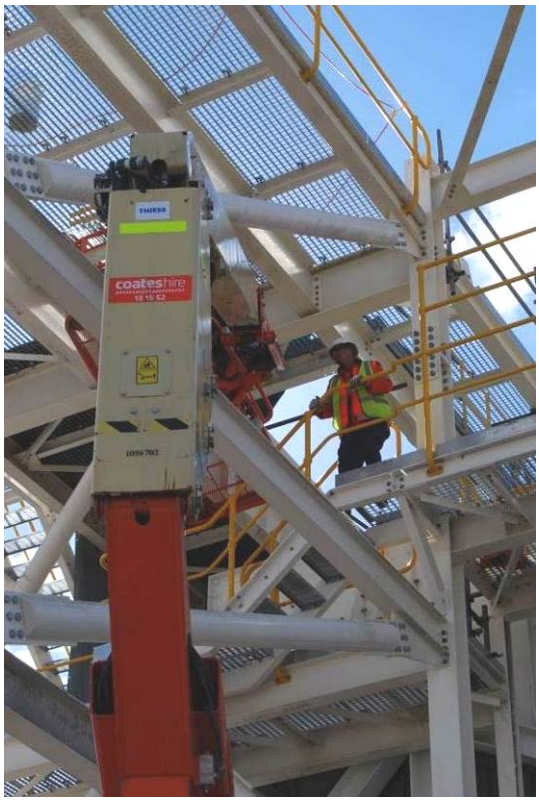


Figure 38. View of the base boom, upright and main boom position in relation to the second floor and third floor horizontal steels, the angled cross brace connecting floor the two floors and the handrail of the second floor walkway. The spotter is standing on the second floor walkway observing the platform movement controlled from the ground control box. Photo taken during lowering of the platform on 23 May 2014.

Observation during lowering of the platform after the incident identified that the platform initially required to be moved horizontally sideways to clear the top of the handrails and then lowered adjacent to the walkway handrail. The main boom moved closer to the steelwork.

Figure 39. View of the platform moving parallel with the steelwork and lowered adjacent to the walkway steps handrail. Photo taken during lowering of the platform on 23 May 2014. The spotter is on the second floor walkway. The articulating jib and main boom have moved closer to the steelwork of the structure.

The platform was then rotated 90° to allow movement parallel to the walkway handrail and then moved horizontally through a space bounded by the second floor steelwork underneath the platform, the underside of the angled cross brace pipe work above the platform control console and the walkway handrail adjacent to the platform. The platform was also tilted downwards towards the handrail to pass underneath the angled cross brace.

Figure 40: View of the platform rotated adjacent to the walkway steps handrail and tilted underneath the angled cross brace pipe. Photo taken during lowering of the platform on 23 May 2014.

When the platform was outside of the steel frame work of the second and third floors it was able to be lowered vertically back to the ground level.

Figure 41: View of the platform outside of the second floor main frame and being lowered vertically past the first floor. Spotters relocated to the first floor area and the ground level. Photo taken during lowering of the platform on 23 May 2014.

Figure 42: View of the platform outside of the main frame and being lowered past the first floor. Spotters relocated to the first floor area and the ground level. Photo taken during lowering of the platform on 23 May 2014.

Deflection of the platform control console bar

The platform control console protection bar had an 8 mm permanent downward deflection.

The maximum force that could be applied by the MEWP hydraulics was 20.684 Mpa or 211 kg/cm².

It is considered plausible the downward deflection in the console protection bar was not present before the incident and was caused as a result of the crush incident.

Figure 43. Measurement of the 8mm downwards deflection on the platform control console protection bar.

The work task at the structure

ST202 was partly constructed to three floors. Mr Galton was working under the third floor section.

The underside of the steel beam that Mr Galton was crushed against was 12.5 m above the concrete floor ground level.

Mr Galton had completed the task of tightening nuts and bolts on the structure frame using a compressed air powered rattle gun.

Construction work was finishing at ST202 for the purpose of workers to attend a union meeting which was planned to start at 9 am.

Mr Galton was in the process of relocating the platform across and over a stair walkway handrail and then to move downwards negotiating the articulating jib and upper boom of the MEWP through steel diagonal cross-members of the partially constructed steel frame building to return the platform to ground level without contacting any of the steelwork.

The spotter allocated for the task

A leading hand rigger was on a walkway adjacent to the platform Mr Galton was operating at the time of the incident.

The leading hand rigger was not the designated ‘spotter’ allocated to Mr Galton.

Mr Galton had asked the leading hand rigger to assist him by observing the platform as it moved into the area of bolts requiring to be tightened. The leading hand rigger did not observe any issue with the operation of the MEWP during the platform positioning task.

The leading hand rigger was on his second day of duty at the site and had previously given instructions to Mr Galton at the Thiess Caval Ridge construction site in Queensland. However the leading hand could not recall previously observing Mr Galton operate any MEWP at the Queensland site. The leading hand rigger’s role on the day was to familiarise himself with the site and inspect and mark any bolts or other components that needed further work.

Another person was designated the role of ‘spotter’ (Spotter 1) for the MEWP Mr Galton was operating on that morning.[17] Spotter 1’s role was normally a crane driver and this was the first occasion he was designated ‘spotter’ at the site.

Spotter 1’s training records indicate that he held ‘spotter’ authorisation’ and a VOC for JLG 600 AJ MEWP, which were both dated 1 May 2014 at the mine.

Spotter 1 was not carrying a two way-radio with him on the day of the incident.

Spotter 1 was aware that the leading hand rigger was assisting Mr Galton with observing platform movement from the upper level and he considered that this was undertaking a ‘spotter’ role.

Spotter 1 said Mr Galton was elevated for about an hour before the incident and he had made no observation of Mr Galton having any issues operating the MEWP.

Spotter 1 told investigators that he had observed on other occasions MEWP operators bending down in the platform while operating MEWP close to fixed structures at the mine site.

[17] The spotter has to undertake a specific site training course and is required to wear a specific vest with large identification of ‘SPOTTER’ on the rear

The working at heights permit was not applicable for ST202

Mr Galton and the leading hand rigger had signed onto a 'Working at Heights Permit' (WAH permit) dated 20 May 2014 (the day before the incident) for another structure (ST801) for the purpose of installing steelwork and chutes. The WAH permit for ST801 was not applicable to the work Mr Galton was undertaking at ST202. A different WAH permit for ST202 had been signed by two other workers on 20 May 2014 but not by Mr Galton or the leading hand rigger.

Mr Galton, the leading hand rigger, Spotter 1 and four other workers had signed onto the Thiess Sedgman prestart work document on the morning of the incident. The main hazards identified in the prestart document were pinch points, working at heights and swinging loads.

Plant defect investigation

The plant defect investigation findings are based upon the following sources of information:

1. The MEWP involved in the incident was inspected by an independent assessor on 11 and 12 June 2014. The assessor was of the opinion that it was in correct and proper working condition at the time of inspection. The assessor's opinion was that the MEWP appeared to be generally well maintained and serviced, operated as expected and within the bounds specified by the manufacturer.
2. The rubber boot on the main lift-swing joystick on the platform control console was found to be damaged (a cracked rubber boot) on inspection. It is not known how long the rubber boot had been cracked before the incident. There was no evidence of reporting of any damage to the rubber boot on prestart inspection records or Coates maintenance records. The cracked boot enabled ingress of moisture and foreign particles onto internal electrical circuit board components.
3. A visual examination of the lift-swing joystick control conducted by Bureau Veritas identified evidence of corrosion from the top gimbal shaft to the bottom electrical circuit board. The encapsulating resin on the hall-effect sensor/transistor was found to have been ground during manufacturing. Corrosion was identified on the hall-effect transistor however no obvious sign of tracking could be visually identified.
4. On 26 October 2011, a JLG service record No. 78699 identified that the MEWP involved in the incident had a joystick lift fault. The lift swing joystick was replaced on 27 October 2011. The Coates Hire service mechanic could not recall the actual electrical fault with the MEWP.
5. Coates Hire maintenance records identify the MEWP had received a pre-hire three monthly safety check on 7 March 2014 at which operational functionality of platform controls was checked before hire.
6. Coates Hire maintenance records identify the MEWP received a 'B' service annual inspection and service conducted by Coates Hire maintenance employees on 6 March 2014. The hour meter was recorded at 883 hours.
7. The MEWP arrived at Boggabri Coal Mine on 22 March 2014. A 'Hired-In Plant Inspection Report' was completed by a Thiess Sedgman employee and a Theiss Sedgman sticker was issued on 22 March 2014. The hour meter was recorded at 885 hours
8. A 'Boggabri Coal Expansion Project Plant and Equipment Hazard Assessment' was undertaken on the MEWP to introduce the machine to site on 22 March 2014.
9. The potential hazard of being trapped between plant and fixed structures was identified in the assessment. Two controls for the hazard identified were:
    a) Operator to be ticketed and deemed competent to operate equipment with additional controls of VOC and familiarisation carried out on equipment.
    b) Spotter present in EWP basket to guide operator.

10. The investigation obtained information from all operators who had completed pre-start inspection reports for the incident MEWP and none identified any issue with unintended activation of the MEWP platform before the incident.
11. The Theiss Sedgman EWP operator pre-start inspection and defect record (No 7538) were completed on 20 May 2014. There were no issues identified in the report. The start hour meter was recorded at 947/2 hours.
12. Mr Galton had completed a Theiss Sedgman EWP operator prestart inspection and defect record (No 7539) before operating the MEWP on 21 May 2014. There were no issues identified in Mr Galton's written report. The start hour meter was recorded at 949/4 hours.
13. The MEWP hour meter had recorded a total of 66 hours running time at Boggabri Coal Mine from the last service record to the incident date.

Wenn Wilkinson Associates report on MEWP

Mechanical Engineering consultants Wenn Wilkinson Associates inspected and tested the MEWP involved in the incident on 11 and 12 June 2014 at JLG premises in Port Macquarie.

In summary the Wenn Wilkinson Associates report identified:

1. In general the machine appeared to be well maintained and logs were completed.
2. The last 25 significant operations were downloaded from the control system. There were no signs of repeating fault. Error messages were consistent with events attributable to errors in operation and the events were resolved enabling operation to continue.
3. Machine settings were within manufacturer specification including control function ramp time settings.
4. Personality settings were different to default settings. Operational speed settings were within manufacturer specification.
5. Protective mechanisms associated with the footswitch operated as expected.
6. The rubber boot on the lift/swing joystick was broken and replaced.
7. A hydraulic oil sample was taken from the machine and tested within specification for water content and viscosity for the type of oil.
8. It was the opinion of the assessor the JLG MEWP was in correct and proper working condition at the time of inspection (noting the observed damage to the rubber boot on lift swing joy stick). It appeared to be generally well maintained and serviced, operated as expected and within the bounds specified by the manufacturer.

Bureau Veritas report on the lift swing joystick

The damaged OEM Controls Inc. manufactured Lift Swing joystick (HJS9M14133 part no 1001118417 serial no 330763 153) seized from the JLG MEWP was inspected by consultants Bureau Veritas Asset Integrity and Reliability Services Pty Ltd (Bureau Veritas) on behalf of the department.

In summary the Bureau Veritas report stated:

> *'Visual examination of the joystick unit indicated the absence of mechanical-related failure which could have caused the possible malfunction of the unit. The primary damage was identified to be the rubber protective boot cracking. However the condition of the circuit board was also found to be less than optimal which had been introduced during the manufacturing process. Further investigation would be required to verify the functionality of the circuit board.'*

Figure 44: Extract of Bureau Veritas report – Figure 3.

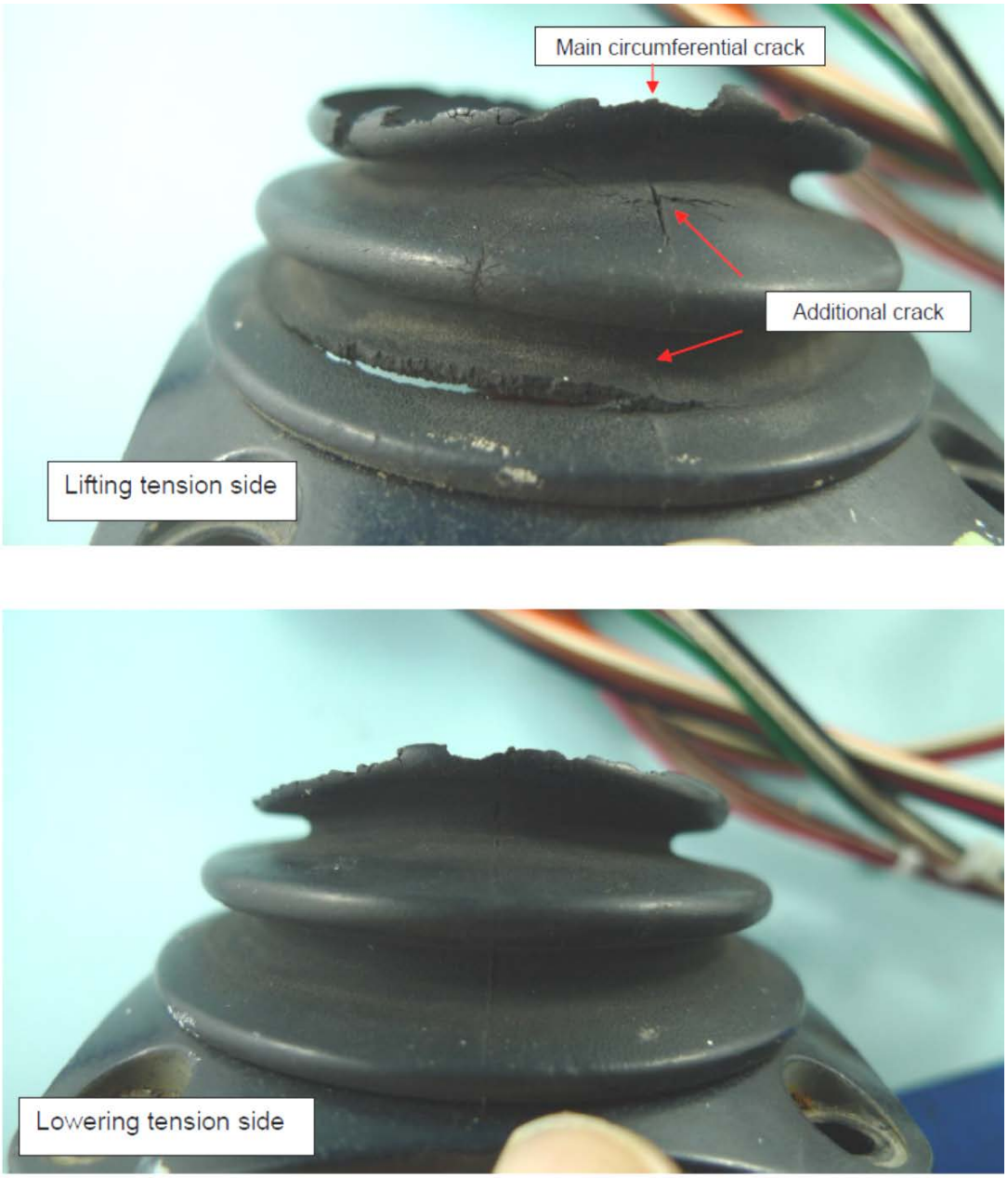


Figure 3 Views showing the multiple crack indications below the major circumferential crack on the lifting tension side, while the lowering tension side was free of any visible damage.

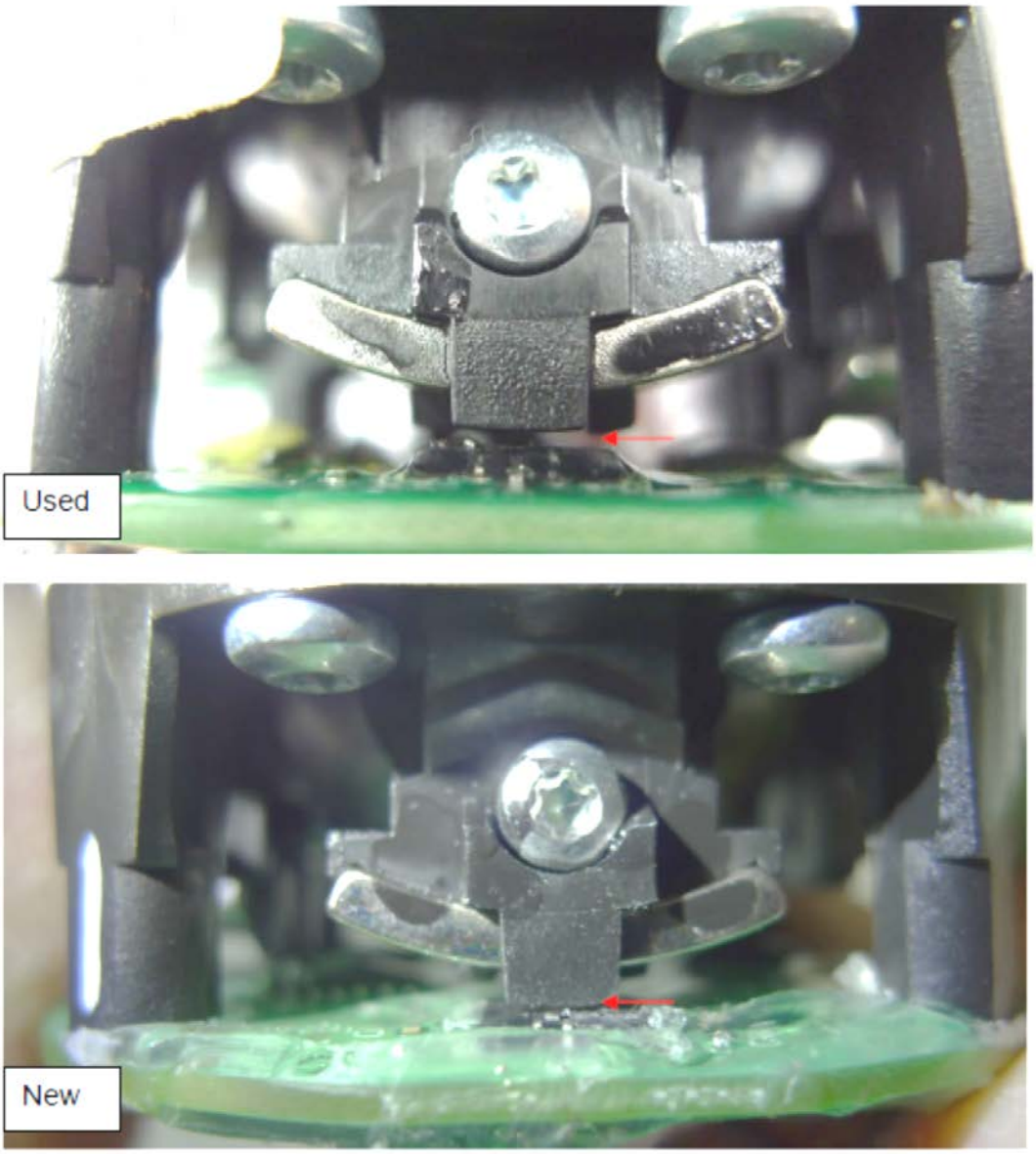


Figure 6 Views of the magnetic gate and the hall-effect sensor on the circuit board, note the difference in clearance between the two components.

Figure 45: Extract of Bureau Veritas report – Figure 6.

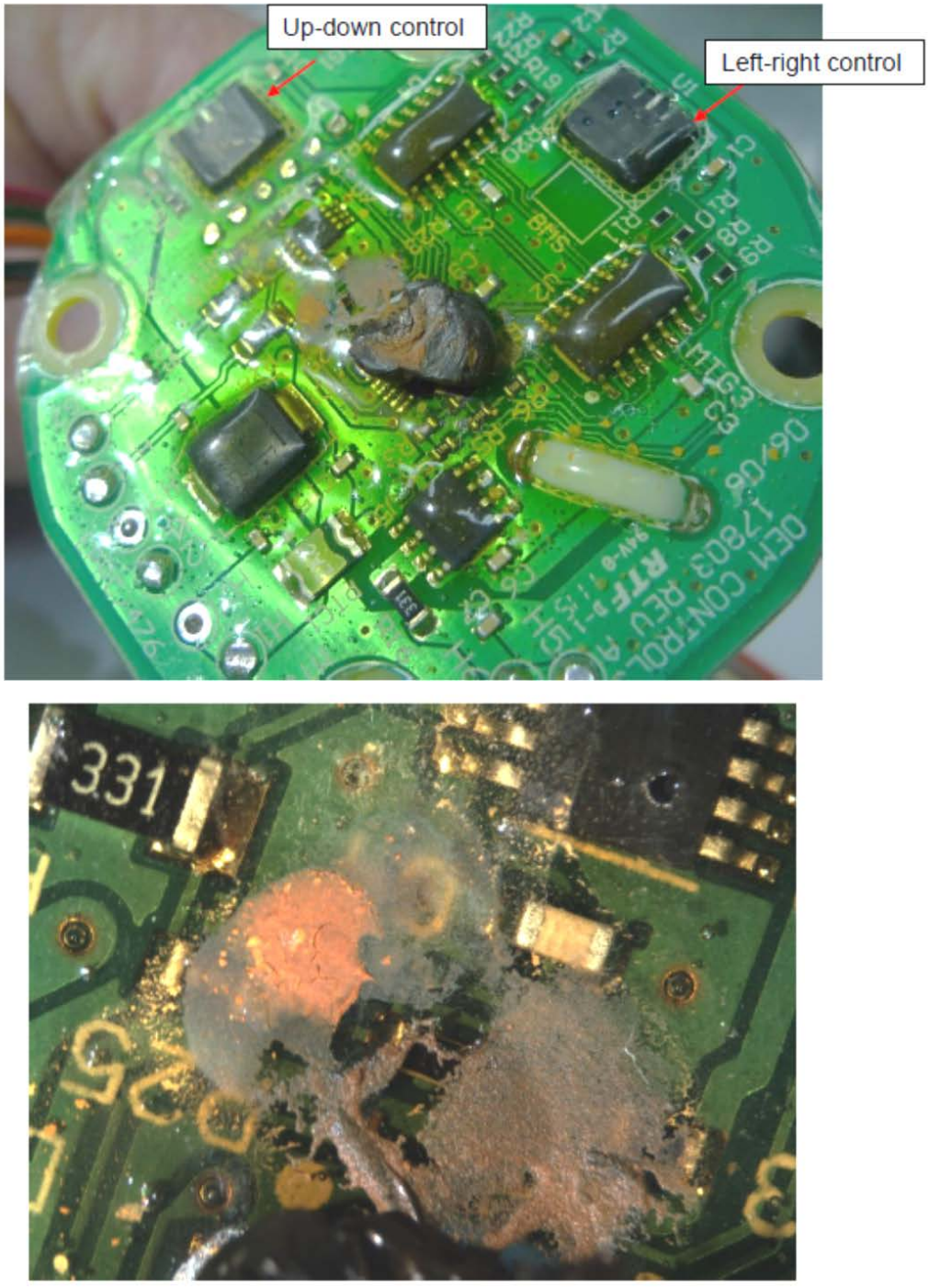


Figure 9 The used circuit board condition, note the presence of corrosion and grease deposit.

Austest Laboratories report into the lift swing joystick

Based on the recommendation of the Bureau Veritas report, the department engaged Austest Laboratories to conduct environmental damp and heat cyclic testing conducted in accordance with AS60068.2.30 Climatic Testing standards.

Two climatic tests were conducted inside a climatic chamber:

Test cycle 1: Climatic variable conducted over 12 hours 40 minutes powered with periodic functional checks at 25°C at 50% relative humidity (RH) then down to 0°C then to 30°C at 95% RH then to 25°C at 50% RH

Test cycle 2: Climatic variable conducted over 12 hours 40 minutes powered with periodic functional checks at 40°C at 93% RH then to 25°C at 50% RH.

During the two cycles the state of the electrical output lines were continuously monitored and recorded by a data logger. Functional testing was tested by periodic manual movement of the joystick lever through all possible positions with a minimum 10 second dwell time at each position.

In summary the Austest Laboratories report stated:

> *'JLG lift swing joystick control unit identified by Model No HJS9M14133, Part No.1001118417, Serial No. 330763 was submitted for climatic testing. The test item was subjected to combined temperature and humidity testing in accordance with AS60068-2-30 standard for a total of 24 hours.*
>
> *The test item was assessed for correct electrical output during application of the required climatic severities.*
>
> *The test item functioned satisfactorily during exposure to the required climatic test severities.*
>
> *The test item has responded correctly to all manual inputs applied during climatic testing. No abnormal electrical outputs were observed at any point during the tests.*
>
> *All spikes visible in figures attached to the report correspond to the time when the chamber was opened and manual movement of the joystick arm performed.*
>
> *No apparent mechanical damage was observed on the test item during the external visual inspection carried out upon completion of the climatic testing.'*

Electromagnetic effects on the operation of the JLG MEWP joystick unit

OEM Controls Inc provided an Electromagnetic Compatibility (EMC) Report for the hall-effect joystick model HJS9. The test report was conducted by TUV Rheinland of North America to various EN and IEC standards for electrical discharge, electromagnetic radiation and voltage dip and variations applied to the joystick.

Based on the manufactured joystick standards identified in the TUV report and from visual observation at the site there was no visual evidence of any significant sources of EMC in the vicinity of ST202 (e.g. welding lines, HV power lines, signalling cables etc) that would have caused the console lift swing joystick to create an incorrect signal to the MEWP base control to cause the platform to rise.

14. Incident causation review

Mr Galton received fatal injuries as a result of a crushing force to his head and neck area applied by the MEWP as a result of becoming trapped between the steel bar located above the platform control console of the MEWP and the underside of a large horizontal steel beam in ST202.

The cause of the upwards movement of the platform toward the underside of the steel beam was created by a force (actual pressure unknown) applied by the electro/hydraulic functions of the MEWP.

The specific cause of the platform rise cannot be established.

The platform was positioned over a walkway handrail and rotated to the right (relative to the operators control console) and nearly parallel to the alignment of the raised jib and boom.

The incident occurred during a day shift. Mr Galton had arrived at BCM site at 5:55am on 21 May 2014 and had been at the site for 2 hours and 53 minutes when the incident occurred.

Mr Galton was working the ninth consecutive 11 hour shift of a ten day roster pattern. The investigation is unable to establish if Mr Galton's fatigue level was contributory to the incident.

The investigation has reviewed and ranked the following likely causation theories in the order of most likely to least likely.

The investigation has identified five potential causation theories:

1. That it is possible to achieve an unintended sustained platform rise caused by an operators body coming in contact with one or more control switches located in the lower row of switches on the platform console within a seven second time window permitted by the machine.

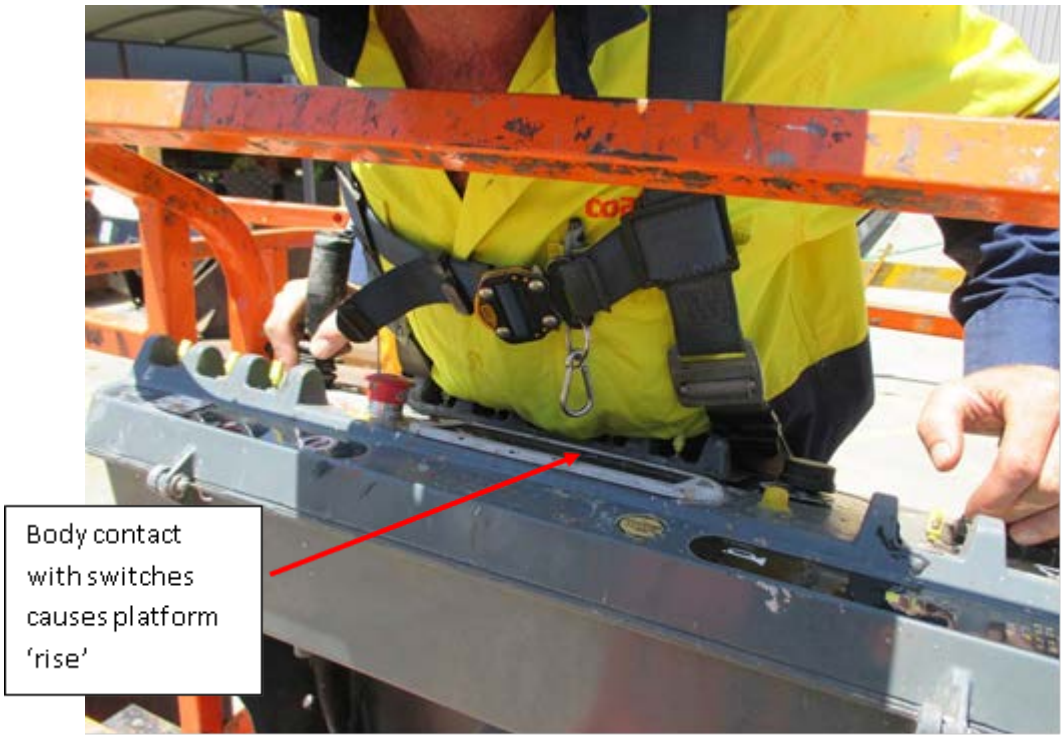
   The unintended rise was achieved in the circumstance where a switch on the platform console is activated by bodily contact within the seven second time period permitted by the timer following activation of the foot switch.

   Platform rise can be achieved in this circumstance without operating the joystick control or any other raise function.

   It is considered that an unintended activation of a control switch potentially may have occurred when Mr Galton either moved forward, or was forced into a forward leaning positon over the platform control console by the steel work above his head.

   In the circumstance of unintended switch activation by clothing the MEWP would continue to apply an upward force even though Mr Galton may not have operated the left hand joystick control.

Figure 47: Simulation of an operator in forward leaning position and bodily contacting platform switches can activate platform 'rise'. In this position the left hand can apply forward motion to the lift swing joystick and activate platform 'rise'. The right hand can be placed on the drive/steer joystick. The operator's right foot was able to activate the footswitch to permit platform control function.



The platform lift/swing joystick control device (when the detent device is lifted on the joystick) is moved in a 'forwards' direction to achieve a 'rise' in the platform.

It is noted that Australian Standards provide differing guidance as to the direction of control 'action' to achieve 'effect'. Safety of Machinery standard *AS/NZS 4024.1906:2014* recommends an 'away from the operator' action to achieve an 'upwards' effect.[18]

Whereas remote control mining equipment standard *AS/NZS4240.1:2009* recommends a 'rearward' control action to achieve a 'rise' effect.[19]

In consideration of the circumstance of the event it is possible Mr Galton moved his body forward over the control console either:

- Voluntarily (his own decision to lean forward to look forward over the console) or,
- Involuntarily (he came into contact with the steel beam which moved his head and body forward over the console)

Although Mr Galton's body position at the time of the crush was not directly observed by the LHR it is plausible that Mr Galton had leaned forward over the console to obtain a better view of the position of the platform boom or jib in relation to the ST202 steelwork which was underneath the platform.

[18] *AS/NZS 4024:1906:2014* Table 1 classification of final effects and Table 2 Classification of actions

[19] *AS/NZS 4240.1:2009* Remote control systems for mining equipment Part 1. 2.3.10.4 Direction of control movements Table 1 Function Up or raise – rearward, Function Down or lower - forward

2. Mr Galton intended to **lower** the platform after hearing the verbal warning, however:
    a. Mr Galton selected the wrong control switch.
        i. There were six control options available to cause the platform to rise and these control functions could be used in combination.
    b. Mr Galton selected the correct control switch but applied the incorrect direction of movement to the control device.
        ii. Forward motion of the lift swing joystick caused the platform to rise
        iii. Other control switches required different direction of movement to lower the platform
        iv. A simultaneous combination of control switch and joystick control caused the platform to rise. Control switches had differing direction of movement application including: move forward and move backward to achieve a platform rise.
    c. Mr Galton intended to move the platform sideways and operated the base drive/steer joystick which moved the rear axle down the concrete ramp and caused an upward movement in the platform (platform pendulum effect).
3. Mr Galton intended to **raise** the platform after hearing the verbal warning:
    a. Mr Galton accepted the risk created by the steel beam above his head.
    b. Mr Galton's situational awareness was reduced due to focussed attention directed to looking over the control panel and down towards the position of the jib and boom to prevent any contact with ST202 steelwork.
    c. Mr Galton's situational awareness was affected by the base of steel beam 'D' located directly in front of his eyesight was 230mm higher than the base of steel beam 'C' that he was directly located underneath.
    d. Mr Galton was wearing a safety helmet and clear safety glasses. The safety helmet remained on his head during the incident. There were no additional sun protection devices fitted to the safety helmet which could potentially reduce situational awareness.
    e. There is no evidence that any of Mr Galton's actions were intentional self-harm.
4. The investigation has examined the potential for an unplanned movement of the MEWP platform due to a malfunction of a platform control device.

    The was no evidence that a defect in the MEWP caused the platform to rise however the potential for causation cannot be totally discounted in light of finding the damaged rubber boot and corrosion on the electrical circuit board on the lift swing joystick.

    To corroborate the finding all operators who had signed pre-start inspection reports for the incident MEWP prior to 21 May 2014 could not recall to investigators any unplanned movement of the platform during operation.

    There was no evidence of an unplanned movement of the platform during the post incident inspection and testing program of the MEWP undertaken after the incident at JLG premises at Port Macquarie.

During the assessment of the MEWP the manufacturers electronic analyser device was connected to the electrical control system of the MEWP. The analyser device did not detect any defects with electrical or hydraulic control systems.

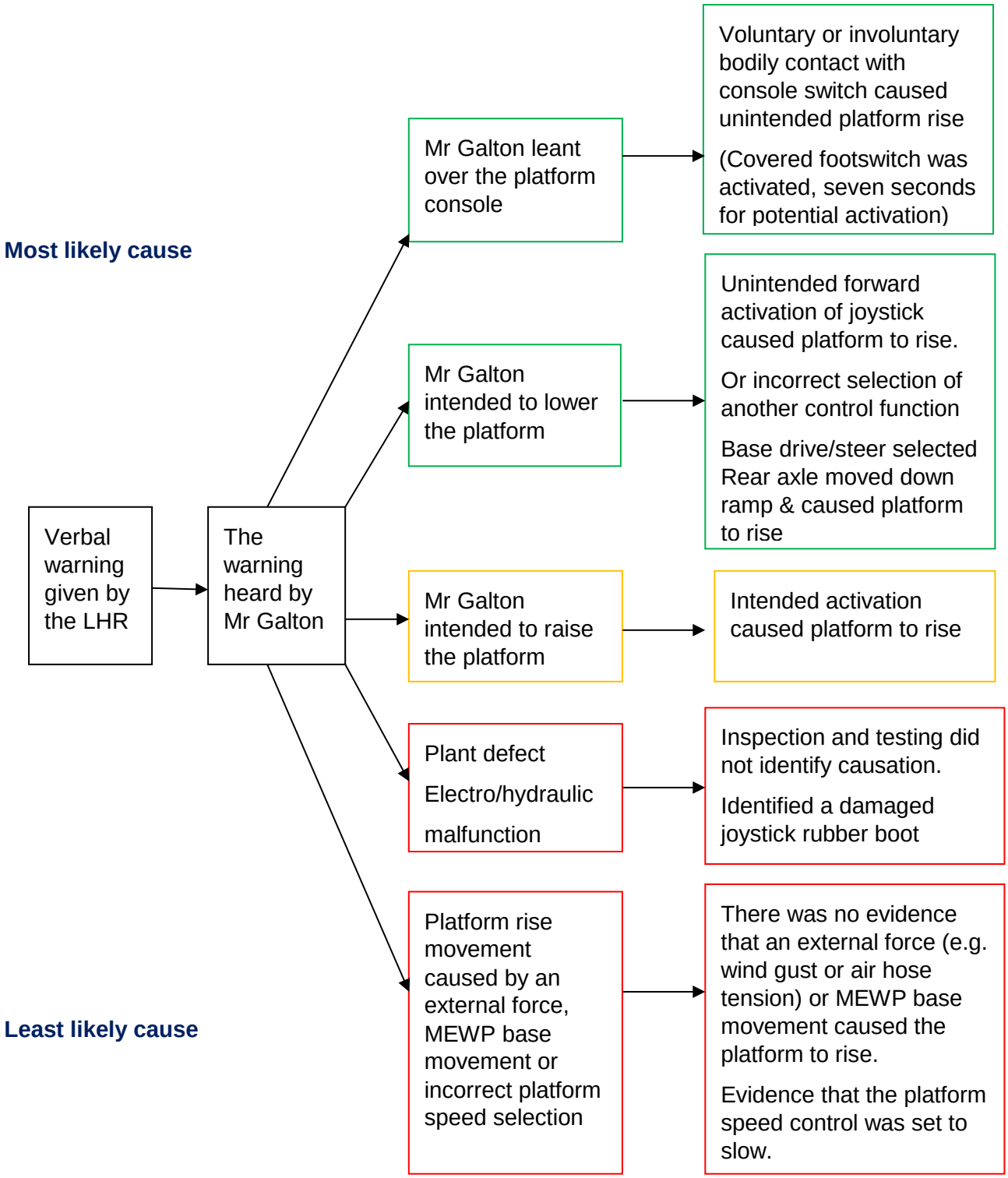
The control function ramp time settings for the incident MEWP were found to be within manufacturer specifications. Ramp time settings allow for a specified time period for the hydraulic functions of the MEWP to completely stop to reduce equipment damage.

5. External force applied by the environment to the plant caused the platform to rise.

   There was no evidence of causation due to a wind gust, electrical interference source acting on the MEWP electrical system, movement of the base of the MEWP caused by a wheel sinking in soft ground, another person operating the base control or release of tension in the compressed air hose attached from the platform to the ground level.

   The operational speed of the platform was low as the control dial was set to ‘slow’ speed.

Incident causation ranking diagram



Note: Causation ranking from most likely to least likely based on the findings of the investigation.

15. Health and Safety Management Systems

Documentation from the Theiss Sedgman Health and Safety Management System (HSMS) was collected from the site during the investigation. TPL has identified how the HSMS operated as at 21 May 2014.

The HSMS is informed by:

1. The Thiess Health and Safety Policy
2. The Thiess Group Health and Safety Standard
3. Thiess Group level procedures
4. Thiess Construction Business Stream procedures

The Health and Safety management Plan (HSMP doc No 950324-1100-M0-0001 revision dated 27 March 2014) included a range of tools that address how risks on the project are managed including:

1. Work Area Plan (WAP) and Work Area Plan Risk Assessment (WAPRA)
2. Work Pack (WP)
3. JSEA and
4. Start Card

The systems of work documentation for MEWPs at ST202 at 21 May 2104 included:

1. CSC 2 Prevention of falls (TM-CSC-ST-200)
2. Prevention of falls - core procedure (TM-CSC-PR-200)
3. JSEA 0305-0 ST202 exiting EWP basket
4. JSEA 0266-0 EWP general ops use of EWP to access heights

The risk assessment for work at ST202 prior to 21 May 2014 included:

1. WAP 950324-WAP -03-00
2. Risk assessment incorporated in JSEA 02909-2 sizing station structural installation ST202 erection of structural steel
3. Risk assessments incorporated into JSEA 0258-0 180t Kobelco crawler crane, general lifts and operation

Safe Work Method Statements (SWMS) relating to the task at ST2020 on 21 may 2014 included:

1. JSEA 02909-2 sizing station structural installation ST202 erection of structural steel
2. JSEA 0258-0 180t Kobelco crawler crane, general lifts and operation
3. WP for ST202 sizing station structural installation (WP-03-03-10)
4. JSEA 0266-0 EWP general ops use of EWP to access heights

Tool box talks for tasks at ST202 prior to 21 May 2014 included pre-start meeting conducted at the start of shift each day.

Machine risk assessments introduction of JLG 600 AJ to site

Theiss Sedgman undertook a plant and hazard assessment for the JLG 600 AJ MEWP on 22 March 2014.

The assessment identified the potential hazard of being trapped between the plant and materials or fixed structures. The hazards identified 1) operator error and 2) working within close proximity to structures.

The controls were listed as requiring the operator to be ticketed and have VOC and for a spotter to be present in the basket to guide the operator.

However it was noted during the investigation by a supervisor and other operators of the MEWP that they had not seen the risk assessment document before the incident.

Thiess has indicated that the MEWP plant and hazard assessment document was prepared for the purpose of assessing the suitability of the plant for use at Theiss Sedgman. The document was not required to be circulated to other staff but the document was accessible to a majority of staff.

Thiess critical safety controls

Thiess critical safety control (CSC TP-CSC-FO-231) identified MEWP verification of competency and operational requirements for the MEWP. Mr Galton had undertaken MEWP VOC on 4 March 2014.

The requirement of the MEWP CSC was to plan elevation procedures in consultation with other relevant personnel including appropriate hazard control strategies and implement planned hazard control strategies. There was no evidence of MEWP hazard control strategy planning taking place by the operators on the day of the incident. Individual operators had to determine the best path to get the platform in and out of a tight area.

There was evidence of documented lift plans created for lifting items by crane that identified the direction the lift was to follow into structures.

On 24 March 2014, Mr Galton signed onto the CSC prevention of falls – core procedure.

Work packs

There were two work packs for ST202.

Structural installation work pack (WP-03-03-10 rev 0 signed 29 January 2014) had been signed onto twice by Mr Galton.

Mechanical work pack for ST202 (WP-03-03-20 rev 0 signed on 29 January 2014) had not been signed by Mr Galton.

The work packs included a range of reference procedures, JSEA, permits and construction documentation. The work packs identified risks identified in WAPRA control measures including use of MEWPs.

Job Safety Environment Assessment

There was a significant number of Job Safety Environment Assessment (JSEA) documents that identified the risks associated with use of MEWPs.

Mr Galton had signed multiple JSEA documents related to use of MEWPs at the Theiss Sedgman site.

The JSEA referred to on the Start Card dated 21 May 2014 was JSEA 0258-0 was not applicable to the task Mr Galton was undertaking on 21 May 2014.

JSEA 0209-1 revised on 18 March 2014, for ST2020 structural installation identified use of MEWP during erection of steel work. Mr Galton signed onto JSEA 0209-1 on 23 March 2014 and 5 April 2014.

JSEA 0321-1 revised on 12 May 2014 for ST202 installation of mechanical components identified MEWP interaction with structures. Mr Galton had not signed onto JSEA 0321-1.

Working at Heights Permit

Mr Galton did not sign a Working at Heights permit (WAH permit) for work conducted at ST202 on 21 May 2014. Mr Galton had signed a WAH permit on 20 May 2014 for ST801. Two other workers signed the WAH permit for ST202 dated 20 May 2014.

Mr Galton signed two earlier WAH permits for ST801 on 22 and 23 April 2014.

Operators pre-start inspection and defect report

The original white copy MEWP operator's pre-start inspection and defect sheet No. 75239 undated and marked Wednesday day shift (assumed to be 21 May 2014) and signed by Mr Galton was found in the pocket of a work jacket identified with 'Mark' hand written on the jacket label.

All of the inspection checks boxes for the MEWP were ticked 'OK yes' and no further defects or comments were recorded on the report.

Safety observations at site

Thiess HSE observation sheet records identified that Thiess HSE staff and engineering and supervisory staff were conducting task observations at the site on a regular basis.

Comments were made in relation to MEWP usage on numerous HSE observation reports and feedback comments reported being given to operators.

Records of safety leadership audits were also made available conducted by senior staff at the site.

SAI Global external audit

An external audit inspection was conducted at the site from 28 April 2014 to 1 May 2014 by SAI Global Services.

The external assessor noted that a pre-assembly area was visited and observations made of workers using a MEWP. While the assessor did not comment on the MEWP use he identified strong supervisor oversight and effective communication between workers before conducting lifts. There were no areas of concern raised in the audit report concerning use of MEWPs at the site.

Controls to prevent the risk from occurring

The risk of a crush injury while operating a MEWP platform under a fixed structure was foreseen in documents created by the manufacturer, importer, supplier and the end users of the JLG MEWPs.

There were guidelines and information published by Australian regulatory agencies including NSW WorkCover and the Australian EWP industry association (EWPAA Inc) concerning the risk of crush injuries under fixed structures before the incident.

There was significant amount of published information available before the incident, published by overseas regulatory agencies (UK HSE) and end user groups (IPAF) concerning the risks and control measures to prevent crush injury under fixed structures.

The Australian construction industry placed significant reliance on lower order hierarchy of risk controls to reduce the risk of crush injury when using MEWPs.

The risk controls included:

1. Operator training and national 'High Risk Licence' accreditation to operate EWP.
2. Registered Training Organisation (RTO) competency training and certification of competency to operate the specific JLG MEWP.
3. Verification of competency (VOC) to operate the specific JLG MEWP at the work site by the end user.
4. Risk assessment documents created by the manufacturer and plant owner.
5. Plant registration to operate the JLG MEWP within Australia.
6. Plant periodic inspection, maintenance and reporting systems by the plant owner.
7. Plant site introduction assessment, operator pre-start inspection and site reporting systems by the end user.
8. Work area plans (WAP), Work Area Plan Risk Assessment (WAPRA), Critical Safety Controls (CSC).
9. Safe Work Method Statements (SWMS) and Job Safety Environment Analysis (JSEA) for the use of MEWP's.
10. Task JSEA documents created by the end user and review by MEWP operators.
11. Working at height permit (WAH permit) (noting that Mr Galton had not signed onto a WAH permit for MEWP tasks at ST202).
12. Shift tool box talks.
13. 'Start Card' created by operators at the start of the work task.
14. Spotter being present during the work task.
15. Inspection and auditing of EWP activity by the end user.

Ultimately, the controls put in place to reduce the potential of realising the risk of crush injury under a fixed structure in this circumstance were not sufficient to prevent the incident from occurring.

The risk controls did not address the specific risks when operating MEWPs under fixed structures with regard to the application and use of higher order hierarchy controls such as secondary guarding for the MEWP.

Secondary guarding on MEWP

1. On 25 June 2007, the 600A model articulating boom lift was design registered in the Northern Territory to design code AS1418.10 (classification GP-B-SUB-GP3)
2. In July 2010, best practice guidance documents were published discussing how to avoid trapping and crushing injuries using platforms by the United Kingdom HSE regulator. The Australian hire and rental industry was informed of the guideline in February 2011.[20]
3. JLG Industries (United Kingdom) Ltd had representatives placed on the Construction Strategic Forum that had created the UK HSE MEWP best practice guidance material.

[20] Hire and Rental News published February 2011 page 22

4. In October 2011 a secondary guarding device registered as SkyGuard® was designed and manufactured by JLG (America). By late 2012, the device was made available to European MEWP user groups.
5. In May 2012, JLG informed the Australian hire and rental industry that SkyGuard® could be previewed at the 2012 hire and rental industry convention.[21]
6. On 1 September 2012 the operator of Heathrow T2 terminal construction project mandated for all contractor MEWPs to be fitted with anti-entrapment devices from 1 January 2013.[22]
7. In February 2013, JLG informed the Australian hire and rental industry that SkyGuard® was available as an aftermarket kit on all JLG booms manufactured from 2004.[23] Australian Design Registration (ADR) had not been obtained for SkyGuard® at that date.
8. In May 2013, a United Kingdom equipment hire registry web page published information to MEWP user groups related to SkyGuard®.

   An extract of the publication stated:

   '*JLG SkyGuard® provides operators with enhanced control panel protection. When activated by approximately 23kg of force, SkyGuard® stops all functions in use at the time. The reverse functionality momentarily "undoes" most functions that were in use at the time of activation for less than a second's worth of time*.'

Figure 48: JLG SkyGuard® secondary protection device[24]

9. On 14 May 2014, JLG Industries Inc made an application for design registration for the SkyGuard® secondary protection device to WorkSafe Western Australia.
10. Before 14 May 2014, JLG had not received any purchase orders from Australian JLG MEWP users to fit the SkyGuard® secondary guarding device.

[21] Hire and Rental News published May 2012 front cover and page 3

[22] Vetikal.net/en/news/story/16102/ HETCO Health and Safety Information Bulletin Heathrow T2A – Anti Entrapment Devices

[23] Hire and Rental News published February 2013 page 34

[24] http://rermag.com/aerial-work-platforms/skyguard-aftermarket-accessory-jlg-boomlifts publication date 1 May 2013

11. On 30 May 2014, ADR for SkyGuard® was awarded by Worksafe Western Australia and received by JLG for the 600 AJ model on 10 June 2014.
12. It was clearly identified in the machine operation manuals created by JLG and CHOPL that crush injuries using MEWP underneath fixed structures was a foreseeable risk.
13. Apart from the raised bar protecting the platform control console, which was directly involved in the crush injury, there were no other secondary protection devices on the platform of the MEWP to prevent Mr Galton from being crushed during operation of the MEWP.
14. The risk of crush injuries from interaction of MEWP with fixed structures was a recognised risk in documented risk assessment and work procedures of TSJV. The identified controls to reduce the known risk were by reliance on the use of a 'spotter', operator competency training and VOC of operators at the site. Ultimately the selected control measures did not prevent the incident from occurring.
15. In November 2014, Safe Work Australia (SWA) identified seven fatal incidents involving the users of elevating work platforms being crushed against roofing beams between 2006 and 2011. SWA stated some manufacturers were responding to the risk with caged platforms with anti-entrapment devices such as a frame fitted to the basket that provides a 'safezone' within the platform and sensor bars or pads that stop the movement of the platform should the operator be pushed onto them.[25]

16. Australian Standards and State regulatory guidelines

The *Work Health and Safety Act 2011* (the Act) and the *Work Health and Safety Regulation 2011* (the Regulation) places obligations on designers, manufacturers and suppliers of plant, and any people responsible for its use, to ensure that it is safe and does not present a risk to people using it or who may otherwise be exposed to its use. Chapter 5 of the Regulation specified the provisions that apply for types of plant considered to be high risk, with most types of cranes, hoists and winches included.

Boom type elevating work platforms require plant registration under the Regulation.[26]

Appendix A provides detail related to extracts taken from Australian Standards.

Australian Work Safety Regulators

The following information is provided by Australian federal, state-based and international work safety regulators:

NSW WorkCover

NSW WorkCover published guidance material for the provisions of cranes, hoists and winches under WHSA legislation.

On October 2011, NSW WorkCover published safety information relating to overturning an EWP.[27]

[25] Safe Work Australia report November 2014, Work related fatalities associated with unsafe design of machinery, plant and powered tools,2006-11

[26] NSW WorkCover guidance material Cranes, Hoist and Winches Appendix A

[27] NSW WorkCover WCO3042

On 26 March 2013, NSW WorkCover published safety information relating to EWP use following a fatality and serious injuries received during the previous twelve months.

The March 2013 information release stated *'Since July 2012 WorkCover Inspectors have conducted almost 200 inspections of EWP throughout NSW to help operators understand their responsibilities and improve safety'.*

During April 2013, NSW WorkCover published safety information relating to working with or around mobile plant including EWP. The safety alert identified NSW WorkCover had published a Code of Practice outlining the risk and hazards of mobile plant on construction site.[28]

Safe Work Australia published a Code of Practice '*Managing the Risks of Plant in the Workplace*' on 18 July 2014, which was adopted by state-based regulatory agencies.

Victorian WorkCover Authority

On 7 June 2012, the Victorian WorkCover Authority obtained a conviction relating to offences that occurred on 7 October 2009. The deceased was fatally crushed between an EWP and the ceiling of a shed. There was no overhead protection for the EWP and the deceased had not received adequate training on the use of the EWP. No SWMS or JSEA was performed and no operating manual was provided in that instance.[29]

NSW Department of Industry, Resources & Energy Mine Safety

NSW Department of Industry, Resources & Energy, Mine Safety published guidance notes for certification for high risk work and registration of plant designs including elevating work platforms.[30]

On 27 June 2006, the department published a safety alert relating to unplanned movement of a EWP platform and crush injuries suffered against a fixed structure (mining machine).[31]

On 31 August 2009, the department obtained a conviction in the Industrial Court of NSW related to a person being trapped between an EWP and a fixed steel bucket at an open cut coal mine on 21 March 2006. Particulars of the charges included issues related a faulty drive joystick on the platform control console and failure to ensure that safe systems of work were in place.[32]

Worksafe Queensland

On 24 April 2009, Workplace Health and Safety Queensland published a guideline 'Safe Operation of an Elevating Work Platform, Learning Guide for operators of EWP.[33]

The learning guide was published to help operators gain the knowledge and skills needed to operate EWPs.

Western Australia Government

On 12 February 2009, the Western Australia Department of Mines and Petroleum Resources Safety published a Significant Incident report (No.151) concerning a fatal incident involving a person crushed in a pinch point of a fixed EWP.

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[28] NSW WorkCover WC03987 and WC 01310

[29] Victorian WorkCover Authority prosecution summary - Court Number B12850145

[30] Department Guidance notes and GNO-001 GNC-005

[31] Mine Safety - Safety Alert SA06-15

[32] NSW IRC365 of 2008 and NSW IRC366 of 2008

[33] Workplace Health and Safety Queensland PN10042 version 1 updated 24 April 2009

On 16 March 2010, the Western Australia Department of Mines and Petroleum Resources Safety published a Significant Incident report (No.162) concerning a serious head injury sustained when dismantling a roller shutter door from a EWP platform.

In 2012, the Western Australia Department of Commerce WorkSafe published a Safety Alert (No. 14/2012) concerning a fatal incident when a person fell with the platform when the MEWP jib failed.

Elevating Work Platforms Association of Australia

The industry Elevating Work Platforms Association of Australia (EWPAA) has identified that it was not aware of any issues concerning:

- MEWP operators sourcing secondary guarding devices before 21 May 2014.
- MEWP suppliers and users obtaining design registration for secondary guarding devices before 21 May 2014.
- MEWP suppliers and users seeking design registration through the Northern Territory WorkSafe regulator before 21 May 2014.
- Adequate provision of MEWP safe use information provided by MEWP importers and suppliers before 21 May 2014.
- Development of Australian Standards for the application and use of MEWP fitted with secondary guarding devices before 21 May 2014.

EWPAA identified it did not make any recommendations to current Australian Standards, Codes of Practice or guidance material.

EWPAA identified it did not make written submissions to the relevant MEWP Australian Standards Committee or Australian regulatory agencies concerning the introduction and application of MEWPs fitted with secondary guarding devices.

EWPAA identified that there are no official guidelines in respect of verifying the competence of MEWP operators. EWPAA has published articles to industry concerning the Verification of Competency of MEWP operators.

United Kingdom Health & Safety Executive Safety Regulator

In July 2010, the United Kingdom Health and Safety Executive (UK HSE) in a partnership with the Strategic Forum for Construction published a best practice guideline for MEWP titled *'Avoiding trapping/crushing injuries to people in platforms'*.

The publication provided significant review of the risk and guidance controls associated with crush injuries against fixed objects whilst operating platform controls. The working group membership listed a UK JLG group member.

International Powered Access Federation and European MEWP Standards

The United Kingdom International Powered Access Federation (IPAFF) produced publication and guidance information related to options available to reduce the identified risk of entrapment whilst using MEWP and secondary guarding devices.[34]

Appendix B details IPAFF published information related to secondary guarding of MEWP.

[34] IPAFF MEWP guidance to reduce identified risk of entrapment UKT3 04/14-002

18. Post incident response

Post-incident actions by the department

On 21 May 2014, the department began an investigation into the cause and circumstance of the incident involving Mine Safety Inspectors and the Investigation Unit.

On 22 May 2014, NSW Mine Safety Inspectors issued a *WHSA section 195 Prohibition Notice* to BCPL prohibiting use of any boom type EWP at the BCPL site where there is risk of collision between the EWP and a fixed object.

Ongoing interaction took place between inspectors and site operators related to the actions taken related to the *WHSA section 195 Prohibition Notice.*

On 4 June 2014, the department published an information release to industry containing safety observations identified from the preliminary investigation concerning Mr Galton's incident.[35]

On 14 January 2015, the Investigation Unit notified the Chief Inspector of Mine Safety Operations under the *Coal Mine Health and Safety Act 2002 section 153 – Additional Functions* of interim recommendations as a result of findings from the investigation.

Post-incident actions by Theiss Sedgman

Theiss Sedgman undertook an assessment as required in part G of the *WHSA section 195 Prohibition Notice* from 26 May 2014 to 7 June 2014 to assess and control activities around use of MEWP and working at heights at the BCPL site.

The Theiss Sedgman review identified at ST202:

> *'Station 202 is substantially complete, except for construction of CV 201 which connects to the top of this structure. Tightening of bolts internal to the structure is still required, and will require the use of EWP. There are overhead obstructions, and access is restricted, therefore this work is considered complex and will require the operator protective structures (OPS) or pressure sensor EWP. As a final option, a scissor lift with a height limitation to avoid contacting the underside of the top floor could possibly be used or scaffolding can be constructed within the structure itself. Scaffolding will require more time to construct and remove than the actual activity of tightening bolts.'*

Theiss Sedgman identified to the investigation the following actions that have taken place after the incident involving Mr Galton:

- 28 May 2014
    - Commenced discussion with EWPAA and operators as to available design registered secondary guarding systems,
- 9 June 2014
    - Arranged for another brand of MEWP with secondary guarding system for two MEWPs to be sent to site,
- 29 May 2014 to 3 June 2104
    - Developed and implemented a JSEA for use of equipment to work at heights,
- 29 May 2014 to 19 August 2014

[35] NSW Trade and Investment Information release 'Worker crushed while using MEWP. IR14-04 dated 4 June 2014.

    - Developed and revised SOP 067 Use of elevated work platforms that included roll out of EWP permit and work at heights rescue plan.
- 9 June 2014 – ongoing
    - Maintained ongoing discussion with manufacturers of MEWPs concerning secondary guarding devices available in Australia,
- 18 June 2014
    - Site visit and inspection of two secondary guarding devices.
- 29 July 2014
    - Meeting with JLG and other MEWP manufacturer to retrofit secondary guarding systems to current Theiss Sedgman MEWP fleet.
    - Attended demonstration of secondary guarding devices by JLG and other MEWP manufacturer.
- 20 August 2014
    - Confirmed in writing with Coates Hire requirements for secondary guarding devices of TSJV MEWP fleet.
- 10 October 2014
    - A design registered secondary guarding device was operational on all Theiss Sedgman MEWP fleet operating in or under structures at Boggabri Coal Mine.

Theiss Sedgman also identified a range of continuous improvement programs including:

- Revised MEWP spotter training package was completed in July 2014.
- Supervisors MEWP presentation and Supervisors MEWP scenarios assessment program was developed and implemented in August 2014 to help supervisors and leading hands to better understand the specific controls that should be used in various circumstances.
- VOC authorisation assessment for Level 3 was developed and implemented in August 2014.
- The generic site induction assessment and the Boggabri Coal CHPP induction PowerPoint presentation was updated in July 2014 to incorporate information from the MEWP skills review (VOC) package.
- Other initiatives have progressed as part of Work Area Pack Risk Assessment (WAPRA) for working in MEWP (undertaken in August 2014), developing toolbox talks on MEWP selection (August 2014), revising and processing work packs to incorporate information identified in the WAPRA, referred to above and revising the WHS Area Inspection Form (August 2014) to incorporate a MEWP section based on the Critical Safety Control (CSC), Prevention of Falls.
- Theiss Sedgman is continuing to implement and monitor the effectiveness of the actions taken and have no additional actions which Theiss Sedgman proposes to undertake at Boggabri Coal Mine as at 5 December 2014.

Appendix A - Applicable reference extracts to Australian Standards

Relevant references extracted from applicable Australian Standards include:

1. For boom type elevating work platforms have a specific design standard:

   AS 1418.10:2011 Cranes, Hoists and Winches Part 10 Mobile Elevating Work Platforms

   Section 2.6.4 Work platform controls: Location, accessibility, protection states:

   All control devices shall be protected against activation other than initiated by the operator.

   For foot controlled MEWP's, where the risk of inadvertent operation is eliminated by the constant foot positioning of the operator standing on the controls, a separate continuously activated control is not required.

   A guard shall be provided and located at least 50mm above the highest point of the controls.

2. For boom type elevating work platforms have a specific safe use standard:

   AS2550.10-2006 Cranes, Hoists and Winches Part 10 Mobile Elevating Work Platforms

   Section 1.3.7 Mobile Elevating Work Platform definition:

   A mobile machine (device) that is intended to move persons, tools and material to working positions and consists of at least a work platform with controls, an extending structure and a chassis, but does not include mast climbing work platforms.

   Section 1.6 Risk Assessment

   A risk assessment shall be undertaken by a competent person before carrying out operations involving the use of a MEWP. The assessment shall be in writing and shall take into account the following:

   a) The task to be carried out

   b) The range of methods by which the task can be carried out

   c) The type of MEWP that will be required

   d) The hazards involved and the associated risks

   e) The actual method and other requisite plant and material

   f) Emergency and rescue procedures

   Section 2 Planning

   m) Where a MEWP is required to operate in or near buildings or structures, that there are sufficient clearances between the operational path of the MEWP and the building or structure.

   Section 4.12 Proximity hazards requires consideration of proximity hazards including:

   d) fixed hazards including the risk of elevating or travelling into overhead structures

Other sections in the standard provide guidance detail including:

Section 5: Operation

Section 6: Maintenance, Inspection and Repair.

3. A standard that provides general safety of machinery guidance on control action and effect is provided in:

   AS 4024.1906:2014 Safety of Machinery : Part 1906 Displays, controls, actuators and signals – indication marking and actuation- requirements for the location and operation of actuators

   Table 1 Classification of final effects

   Group 1 Upwards motion of the object

   Table 2 Classification of actions

   Group 1 Away from the operator direction of action

4. A standard which provides alternate guidance on control action and effect is:

   AS 4240.1:2009 Remote control systems for mining equipment

   Part 1 Design, construction, testing, installation and commissioning

   Section 2.3.10.4 Direction of control movements:

   Table 1 which specifies directions of control movements that shall be adopted for various control functions unless machine operations dictate otherwise.

   Control function: Up or raise: Direction of control action: Up or rearward

   Control function: Down or lower: Direction of control action: Down, forward

Appendix B - International Powered Access Federation information

IPAFF identified:

> *'The European Union MEWP design standard EN280:2001 Mobile Elevating Work Platforms paragraph 5.7.1'*
>
> *'All controls particularly foot operated controls, shall be constructed to prevent inadvertent operation'. This resulted in 'built in' features such as foot pedals, shrouds, stand-off bars, guards and sunken controls being fitted as standard by MEWP manufacturers.*
>
> *The built in '**primary guarding'** systems are designed to prevent inadvertent operation. Despite these 'primary guarding' systems being present, accident data shows incidents still occur where the operator becomes trapped between the MEWP and a structure.*
>
> *Following review of EN280:2001 , the revised EN280:2013 paragraph 5.616 states 'Operators on the platform shall be protected against being crushed over the control panel when the platform is moving. This requirement can be fulfilled e.g. by controls according to 5.7.1'.*
>
> *EN280:2013 paragraph 5.7.1 states 'All controls shall be constructed to prevent inadvertent operation. Hand controls in the platform shall be protected against sustained involuntary operation. This protection should either prevent further movement of the machine in the direction of trapping or allow the operator to reverse or stop the trapping movement'*

IPAFF identified the two main secondary guarding devices available as being:

- Physical barriers
- Pressure sensing devices

IPAFF have published a range of design options as secondary guarding devices:

Figure 49: IPAFF published range of secondary guarding options.

	**Physical barrier** **Fixed full cage structure**
	**Physical barrier** **Operator protective structure**
	**Physical barrier** **Side protection barriers**
	**Pressure sensing device** **Pressure sensing bar - when activated, it stops further movement and activates audible and visual warning devices**

	**Pressure sensing device** **Break-away or moveable pressure sensing stand-off bar - when activated, it stops immediate boom movement, activating audible and visual warning devices, and limits further platform movement**
	**Pressure sensing device** **Pressure sensing control panel - when activated, it stops further movement and activates audible and visual warning devices**

IPAFF stated:

> *'Once the most suitable type of MEWP has been selected for the work task to be undertaken, consideration to further reducing any remaining risk of entrapment may include the selection of an additional secondary device.*
>
> *There is no one particular secondary guarding device that will prevent entrapment in all known circumstances. Therefore the following five points should be considered as of the risk assessment process to assist the employer to select, where available within the industry, the most appropriate secondary guarding device.*
>
> 1. *Reasons for selecting the MEWP for the intended work task*
> 2. *Identification of foreseeable entrapment situations expected to be encountered whilst carrying out the work task*
> 3. *Identification of types of secondary guarding devices available, their suitability for the work task, and their compatibility with the selected MEWP.*
> 4. *Consideration of additional hazards compared with the potential benefits that may be gained with the introduction of a secondary guarding device.*
> 5. *Need for additional familiarisation of operators and emergency rescue personnel for the selected device.'*