Me-Mel (Goat Island) 1925 Electric Tower Crane

Assessment and Consideration of Structural Issues

Prepared for NSW National Parks and Wildlife Service / 21 October 2024

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1.0 Executive Summary

At the request of NSW National Parks and Wildlife Service, TTW (NSW) Pty Ltd was commissioned to undertake a review to advise on the structural condition of the tower crane and on its safe removal, and the responsibilities and liabilities if the crane was to be repaired and maintained into the future.

The crane was manufactured by Sir William Arrol & Co Ltd, Parkhead, Glasgow in 1924 and commissioned in 1926 at Mort's Dock, Balmain. The crane was relocated to Goat Island and erected at its present site in 1963 by the NSW Maritime Services Board. The crane's serial number is 2184 and its original rated capacity was 4 tons at 140 feet radius (4.063 tonnes at 42.67m radius) or 10 tons at 60 feet radius (10.159 tonnes at 18.28m radius). The crane's construction is of riveted steel lattice members, mostly angle sections. Minor modifications made to relocate the crane to Goat Island in 1963 introduced some welded and bolted splice plate connections.

The crane structure is heavily corroded, with structurally significant and in some cases severe loss of thickness to some members. There is crevice corrosion at joints and between plates, where rainwater collects, and the integrity of rivets between members has not been assessed. In recent years elements that were dangerously loose and at risk of falling – such as the control cabin, motor room and winch room windows – have been removed so that they do not detach in high winds. Additionally, catch netting has been installed beneath the control cabin and across the central motor room, as a precaution against floor elements or severely corroded roof plates detaching.

A structural safety inspection by Arcadis in 2021 advised that some handrails and catwalks/floors are now in such an advanced state of corrosion that additional safety latch lines are required to access the crane safely, using fall arrest systems. Nevertheless, the floor to the counter jib winch room is considered too corroded to enter, as there is an absence of structural elements to safely attach a fall arrest harness to. In its current condition, an elevated work platform (EWP) or crane with man-box is required to physically inspect the crane jib, control room, motor room and winch room components.

A Hazardous Materials Register has been prepared for the crane and is appended in Appendix B. There are asbestos containing materials (ACM), and the crane structure is painted with lead-based paint, the remains of which are friable and flaking.

Following a WorkCover NSW inspection of the premises in November 2010 the shipyard lessee commissioned a crane engineer's inspection which concluded that the crane was damaged beyond repair and unsafe to operate. On 9 December 2010 WorkCover NSW issued Prohibition Notice No.153358 prohibiting the use of the crane and the crane was taken out of service.

Since the crane was taken out of service, safety inspections have been conducted approximately biennially by Hyder Consulting and by Arcadis, until 2021. The past inspection reports have been reviewed for this assessment. The author of this report, Paul Connett, is familiar with the condition of the crane structure, having overseen Hyder Consulting's inspections from 2011 to 2016. The author reinspected the crane from ground level in June 2022, and from drone photographs taken in August 2024 for this report.

The assessment concludes that the crane is at the end of its service life and there is no possibility that the crane could be repaired and returned to service. NSW Work Health and Safety Regulation 2017 registration requirements require that the design, location and ownership of cranes be registered. On structural and electrical safety grounds, under this Regulation, there is no possibility that the crane could be repaired and returned to service.

The crane structure could be retained and repaired as a non-operating crane, , however only at considerable expense and ongoing cost. Alternatively, the crane tower only could be retained, up to

slew ring level. A description of the works that would be required to retain the crane is provided. A fund would also be required for regular maintenance of the non-operating crane into the future. In conclusion, if the crane was to be repaired and maintained, it would be as a non-operating structure. Nonetheless the crane would require considerable immediate and ongoing resources, expertise, work and financing to keep it safe and to prevent any future risk to life and property.

If not repaired and regularly maintained, the crane structure is at the end of its life and is a hazard to persons and other heritage buildings on the island and it is recommended that it should be dismantled.

2.0 Introduction

At the request of NSW National Parks and Wildlife Service, TTW (NSW) Pty Ltd was commissioned to undertake a review to advise on the structural condition of the tower crane and on its safe removal, and the responsibilities and liabilities if the crane was to be repaired and maintained into the future.

The crane is the property of the NSW Department of Planning and Environment; however, operation and maintenance of the crane are the responsibility of the shipyard lessee, Sydney Ship Repair & Engineering Pty Ltd.[1]

Following a WorkCover NSW inspection of the premises in November 2010 the shipyard lessee commissioned a crane engineer's inspection which concluded that the crane was damaged beyond repair and unsafe to operate. On 9 December 2010 WorkCover NSW issued Prohibition Notice No.153358 prohibiting the use of the crane and the crane was taken out of service.

2.1 Authorship

The author of this report, Paul Connett, first inspected the crane in January 2011 and is familiar with its condition. Following the December 2010 prohibition notice the Department of Environment, Climate Change & Water instructed Hyder Consulting to undertake a structural assessment to help inform the decision-making process on the crane's future and to ensure public safety. Paul Connett undertook the structural assessment and authored Hyder's 23 February 2011 report.

On instruction from the Office of Environment and Heritage [OEH], and following crane baseplate weld repairs, the author reinspected the crane in October 2012. The author conducted Hyder's follow-up biennial structural inspection in November 2014, and hazard identification and risk assessment for OEH in 2015.

The author reinspected the crane from ground level in June 2022, and form drone photographs taken in August 2024 for this report.

2.2 Report Disclaimer

The particulars set out in this report are for the exclusive use of NSW National Parks and Wildlife Service. No responsibility or liability will be accepted for the use of this report by any other party. All descriptions, references to conditions and other details are for general guidance only and are given as our opinion, however interested parties should not rely on them as statements or representations of fact and must satisfy themselves as to the correctness, quantity, costs, etc of each of them.

3.0 Inspection

TTW's 2022 inspection was undertaken on the morning of 27 June, by Heritage Structural Engineer Olivia Britt and Technical Director Paul Connett. The weather was sunny, with low wind speeds. A further biennial inspection was conducted by Paul Connett 5 August 2024, accompanied by drone operator Veris, who took high resolution photographs. Again, the weather was fine for this inspection.

Arcadis' June 2021 structural inspection report advises that some handrails and catwalks/floors are now in such an advanced state of corrosion that additional safety latch lines are required to access the crane using fall arrest systems. Therefore, our 2022 inspection was visual only and was conducted from ground level, at the base of the crane and from a nearby slope rising to about half the crane height, and using high resolution photography. Our 2024 inspection was carried out by drone survey, such that high-resolution photography of higher crane elements could be captured than were

[1] Under Clause 6.2 of the Shipyard lease, the Lessee is responsible to maintain, repair, replace, rebuild, paint and keep the whole of the premises in good and substantial repair order and condition.

accessible by ground level inspection, as the crane is considered unsafe to climb.

The assessments of this report have been prepared from the findings of our June 2022 and August 2024 inspections, from past inspection reports and photographic recordings, and from the author's knowledge of the crane condition. No opening up work, structural testing or non-destructive examination of welds etc. was carried out as part of these inspections.

This report should be read in conjunction with Arcadis' June 2021 structural inspection report, which reports the most recent close-to inspection obtained by climbing the crane.

4.0 Standards and Codes Considered for this Assessment

The following Australian Standards, SafeWork codes of practice and industry codes have been considered for this assessment:

- Work Health and Safety Regulation 2017 (current version 14 October 2022)

  Under WHS Regulation 2017 Schedule 5, Registration of plant and plant design, Part 1, it is a legislative requirement that the design of tower cranes is registered; and

  Under Part 2, it is a legislative requirement that the item of plant (tower crane) is registered.

- AS1170.0 Structural design actions
- AS4100 Steel Structures
- AS2550.1 Cranes, hoists and winches – Safe use – General requirements
- AS2550.4 Cranes, hoists and winches – Safe use – Tower cranes'
- AS2312 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings
- ISO 8501 Corrosion Protection of Steel Structures by Painting
- Crane Industry Council of Australia (CICA) – Guide to 10-year major inspections (Revision 2, 24 July 2017)
- WorkCover NSW Industry Plant Consultative Committee – Safety Alert 2010 – 10-year crane inspection
- SafeWork NSW Code of Practice – Managing the Risks of Plant in the Workplace.

5.0 Previous Reports

The following previous structural inspection reports and related documents have been reviewed or considered for this assessment and in the preparation of this report.

- Crane Engineer's Inspection Report, by R K Findley Pty Ltd, dated 25 November 2010 (R K Findley report No. RN 111006).

  For ease of refence the crane engineer's report stating that the crane is not safe to operate is appended.

- WorkCover NSW Prohibition Notice No.153358, dated 9 December 2010, prohibiting the use of the crane. To the best of our knowledge this prohibition order remains in place.[2] The crane has

[2] TTW has not seen a copy of this Prohibition Notice.

been taken out of service.

- Goat Island Hammerhead Crane Structural Report, by Hyder Consulting, dated 23 February 2011.
- Goat Island Hammerhead Crane Structural Inspection October 2012, by Hyder Consulting, dated 12 November 2012.
- Goat Island Hammerhead Crane Structural Inspection November 2014, Revision R0, by Hyder Consulting, dated 7 January 2015.
- Hazardous Materials Register for Goat Island Crane, prepared by Safe Environments for Hyder Consulting, dated 23 April 2015 (Safe Environments report No. R8453).

  For ease of reference the 2015 hazardous materials register report is appended.
- Goat Island Hammerhead Crane Hazard Identification and Risk Assessment, Revision R0, by Hyder Consulting, dated 3 September 2015.
- Goat Island Hammerhead Crane Structural Inspection Report June 2016, Revision C, by Arcadis,[3] dated 2 September 2016
- Goat Island Hammerhead Crane Structural Inspection Report June 2021, by Arcadis, dated 8 July 2021.
- Goat Island Tower Crane Assessment and Consideration of Structural Issues Dec 2022, Revision R1, by TTW, dated 21 December 2022

In addition to the above listed inspections, Arcadis undertook safety inspections in 2017 and 2018 (Arcadis reports dated 15 November 2017 and 9 July 2018). TTW has not received copies of these reports.

6.0 Description of Crane

Constructed in 1924, the crane structure is 100 years old and the crane has stood at its present site for 61 years.

The crane was manufactured by Sir William Arrol & Co Ltd, Parkhead, Glasgow in 1924 and commissioned in 1926 at Mort's Dock, Balmain. The crane was relocated to Goat Island and erected at its present site in 1963 by the NSW Maritime Services Board. The crane's serial number is 2184 and its original rated capacity was 4 tons at 140 feet radius (4.063 tonnes at 42.67m radius) or 10 tons at 60 feet radius (10.159 tonnes at 18.28m radius).

The crane's original construction is of riveted steel lattice members. Later modifications for relocation of the crane in 1963 introduced some welded and bolted splice plate connections. It is assumed that this was done to allow the crane to be cut into sections, transported and re-erected at its present location.

In November 2010, following a visit by WorkCover NSW, the crane was inspected by crane engineers R K Findley Pty Ltd and determined unsafe to operate. The inspection report is appended in Appendix A. On 9 December 2010 WorkCover NSW issued a Prohibition Notice prohibiting the use of the crane. Accordingly, the crane's electric supply was disconnected and isolated.

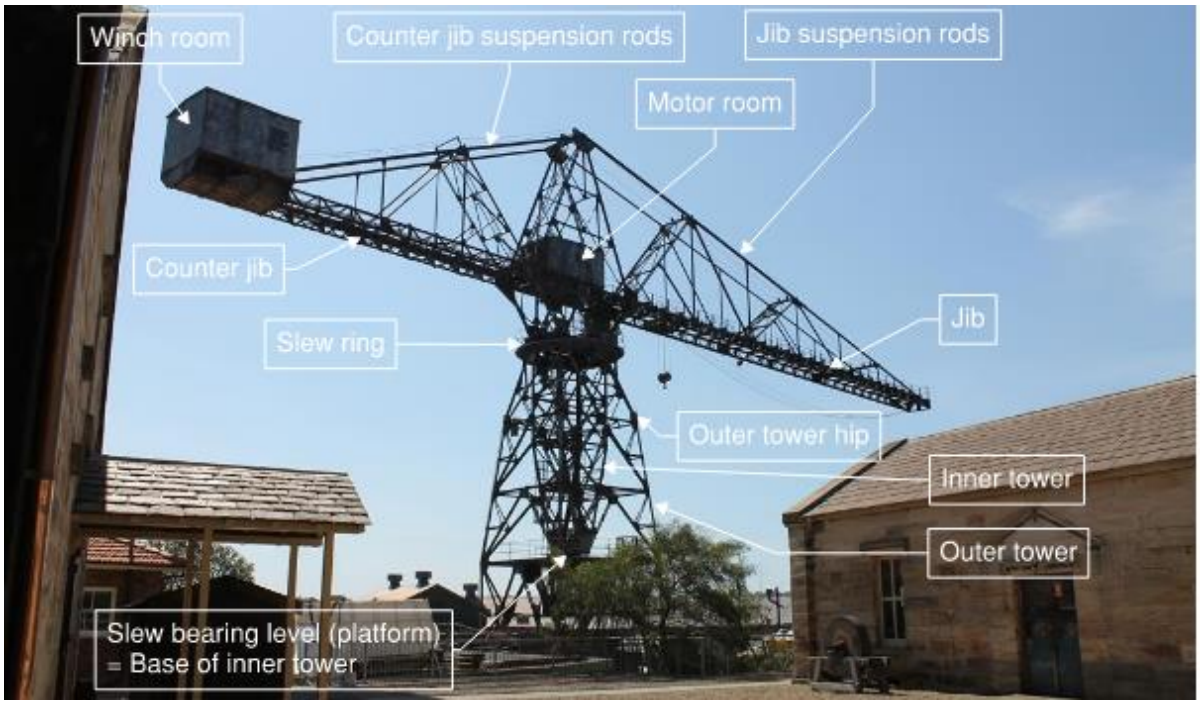
NSW National Parks and Wildlife Service have located some original drawings for the crane (amongst

[3] In September 2015 Hyder Consulting was incorporated into Arcadis and changed its name to Arcadis Australia Pacific. The personnel who conducted crane inspections and authored reports did not change.

old Maritime Services Board drawings in two rooms on the upper floor at Greycliffe House). Photographs of the drawings found are reproduced herein at Appendix D. The drawings are of electrical circuitry and conduits, the control cabin controls, rack and slew house motors (motor room), hoisting and racking gear brakes, collector gear, racking machinery (winch room) and overload device. Unfortunately, there are no drawings of the structure.

The main elements of the crane are described below and in the survey drawings at Appendix C. The safe out-of-service mode for the crane jib (left to weathervane) is described at Section 7.6.

A Hazardous Materials Register has been prepared for the crane and is appended in Appendix B. There are asbestos containing materials (ACM), and the crane structure is painted with lead-based paint.



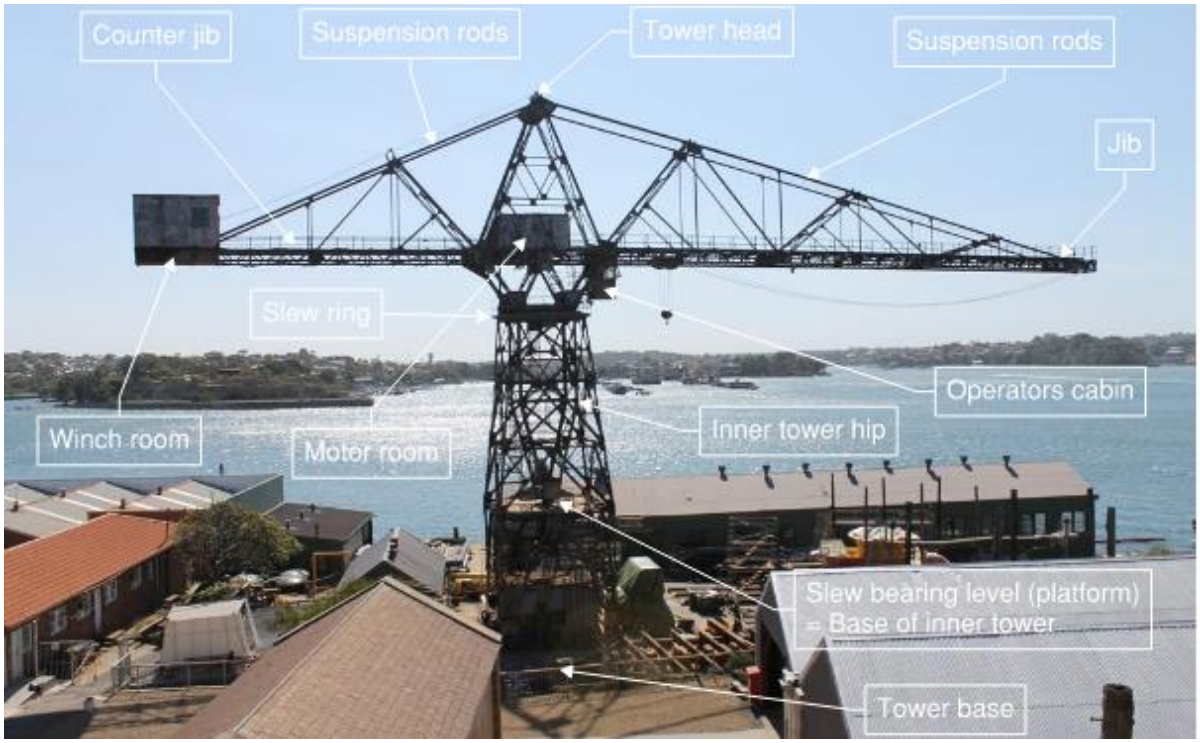


Figure 1 - Crane nomenclature used in this report

7.0 Crane Structural Elements and Function

The crane main structural elements have the following functions. Refer also to the survey drawings at Appendix C.

7.1 Tower footings and holding down bolts

The crane stands at the head of two slipways, above high-water level. The tower has a square base with four legs connected to concrete footings. The tower measures approximately 6.25m by 6.25m on plan. Each leg has two 63mm diameter holding down (HD) bolts, which provide resistance to overturning.

7.2 Static Outer Tower

The crane outer tower stands approximately 19m tall and is fabricated from steel angle and plate sections riveted together. The first platform level of the outer tower supports the bottom bearing and weight of the inner 'rotating' tower and jib on a substantial truss beneath the platform. The weight of the crane and vertical load is carried by this truss and by the bottom third of the outer tower.

The upper portion of the outer tower supports the slew ring and acts laterally to prevent the crane inner tower from overturning. The larger overturning forces are taken by the vertical and inclined members, which are larger in size and are in better condition typically than the horizontal members. The horizontal bracing members are smaller in section and serve to limit the effective lengths of the vertical members against buckling under compression and although also important structurally the horizontal members tend to be more lightly loaded.

Figure 2 - View on the outer tower (green shape) and the inner tower and slew mechanism (red shape)

7.3 Rotating Inner Tower and Slew Mechanism

The inner rotating tower bearing is supported by the outer tower, approximately 7.6m above ground level. Above this level it is the inner tower that supports the gravitational weight of the crane. The inner tower lattice frame also acts laterally – equally and opposite to the outer tower – to resist overturning forces due to such factors as wind forces and out of balance forces from the weight of the jib, motor and winch rooms etc.

The top of the inner tower, beneath the crane jib, is restrained in position and rotates within the slew ring, which is supported by the outer tower. Atop the slew ring is an external walkway (considerably corroded to the southern side, where water ponds). This walkway also acts as a horizontal ring beam, stiffening the slew ring.

The inner tower contacts the slew ring via four rollers. The slew rollers are connected to the inner tower by double channel sections. The skyward-facing surfaces of the channels have no protective paint remaining and have corroded significantly. Each slew roller bracket has eight bolts connecting it to the structure. Two of these bolts sit within skyward-facing pockets, which collect water, and the bolt heads have completely corroded away. However, this is not considered to be of major structural concern with the crane no longer operating, as each slew roller continues to be held in alignment and position by six bolts (75% of the original number of bolts provided) and the slew loads in operation would have been far greater than the reduced loads now likely in the crane's non-operational state.

7.4 Upper Tower and Crane Jib

Atop the slew mechanism sits the remaining height of the tower and the crane jib. The crane jib is

approximately 67m long overall. It extends approximately 44m to the front of the tower and has a 'counter jib' span of approximately 23m, supporting the counterweight load of the winch room. The longer front jib has rails mounted on the underside, on which runs a travelling carriage supporting the crane hook. The shorter rear counter jib carries a steel-clad motor room, containing a pair of electric motors and winches which control the radial position of the carriage and hook. These motors and winches also act as a fixed counterweight to the front section of the jib and hook load.

A second motor room sits centrally above the tower, containing an electric motor and winch that raises and lowers the hook. There is a second motor and shaft that drives the slewing pinion, which rotates the crane. The slew brake is within this motor room. The driver's cabin sits below and to one side of the jib.

The jib is essentially two lattice girders of angle sections held approximately 2.13m (7ft) apart by plan bracing. The hook carriage travels between the two front girders and the bottom chords of the girders are restrained laterally against buckling by gusset plates, extending down from the top chord. The front and rear jibs are 'suspended' from the top of the tower by angle ties (suspension rods) and a framework of struts, hangers and brace members. In this way, the ties (suspension rods) are in tension and the jib lattice girders are primarily in compression. If the hook carriage were to travel to the front of the jib the jib members would also undergo some bending, however the resultant bending stresses would be relatively small. Currently the hook carriage is parked closest to the tower, in accordance with its non-operational mode.

7.5 Suspension Rods (Angle Sections)

The suspension tie members carry most of the load of the jib and counterweight and are of primary importance to the structural integrity of the crane jib. For example, a failure of the upper suspension rods or their connection to the lattice jib would result in a catastrophic failure and collapse of the jib.

For the 1963 crane relocation several suspension rod and jib connections were re-made with bolted or welded connections. It is recommended that all suspension members be structurally inspected on a regular basis, annually or biennially. Arcadis has been visually inspecting these suspension elements since 2011 and did so again in 2021.

7.6 Safe out-of-service Mode for Crane Jib

The jib in out-of-service mode should be allowed to slew freely under prevailing winds. This is normal practice for most tower cranes (known as out-of-service weathervane mode). It is our firm opinion that this is the safest out-of-service mode for the Goat Island crane.

Inspection of the crane in August 2024 would suggest that the crane is being permitted to weathervane as the boom was not tied down. However, on the day of the July 2022 inspection the boom was tied in position with heavy fabric strops tying the rotating inner tower to the static outer tower. The boom direction was east-west, a non-prevailing wind direction. We were advised that this had been necessary to accommodate larger vessels on the slipways. As of August 2024 the shipyard is still in operation. We suspect that tying off the crane so that it cannot rotate freely, to permit vessels onto the slipways, is still carried out periodically.

8.0 Retention or Removal of the Crane

The purpose of this assessment and report is to advise on the structural condition of the tower crane and on its safe removal, and the responsibilities and liabilities if the crane was to be repaired and maintained into the future.

8.1 Current Condition of Crane

The crane members and joints exhibit severe corrosion, based on our visual inspections in 2022 and 2024.

Per AS2312.1:2014 *Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings*, the current location of the crane is considered to be Category C4 (High) corrosivity. The crane's earlier location at Mort's Dock, Balmain, is also considered to be within this category. As such, the crane has spent the 98 years since installation at Mort's Dock in 1926 and later relocation to Goat Island in a high corrosivity environment.

The typical first-year corrosion rate for steelwork within a category C4 environment is estimated to be 50 to 80 µm/year, per AS2312.1 (Table 2.1). Over the 100 year life to date of the structure, particularly as maintenance has been sporadic, this has led to appreciable section loss and subsequent reduction in member capacities. Additionally, crevices formed by lapped and riveted joints allow accentuated corrosion at these points, due to the retention of moisture and contaminants within crevices, particularly where retained moisture is saline due to harbour proximity.

Significant corrosion at all structural elements, including section loss and crevice corrosion at joints, has been observed at all inspections carried out by TTW. The observed corrosion is considered to have worsened between inspections conducted in July 2022 and in August 2024, particularly when viewing high resolution aerial photographs taken from the drone.

Descriptions of corrosion grades per ISO 8501 are given below:

- Grade A: Steel surface covered completely with adherent mill scale and with little if any rust.
- Grade B: Steel surface, which has begun to rust and from which the mill scale has begun to flake.
- Grade C: Steel surface on which the mill scale has rusted away or from which it can be scraped, but with little pitting visible to the naked eye.
- Grade D: Steel surface on which the mill scale has rusted away and on which considerable pitting is visible to the naked eye.

The crane structure is heavily corroded, with considerable loss of structural thickness on some members. Corrosion observed on the crane as of the August 2024 inspection is considered to fall within grades C and D described above; i.e., 'severe' corrosion. There is crevice corrosion at joints and between plates, where rainwater collects. The integrity of rivets between members has not been assessed.

8.2 No Option to Return the Crane to Operation

The crane structure is 100 years old and in poor condition overall. There is no option to return the crane to service. In recent years, dangerously loose items such as the control cabin, motor room and winch room windows have been removed so that they do not detach in high winds. Additionally, catch netting has been installed beneath the control cabin and across the central motor room, as a precaution against floor elements or severely corroded roof plates detaching. To our knowledge the crane has only had basic maintenance (occasional greasing of bearings and removal of items at risk of falling) over the last 14 years.

The electrical equipment on the crane matches that show on record drawings and may be the original installation. Dating from 1924, the electrical safety of the equipment to modern standards and requirements should therefore be questioned.

There is a SafeWork Prohibition Notice prohibiting the use of the crane. In November 2010, R K Findley's crane engineer inspection of the crane concluded that 'the crane was damaged beyond repair and not in a safe state of operation'. On 9 December 2010 WorkCover NSW issued Prohibition Notice No.153358 prohibiting the use of the crane. Subsequently, in accordance with AS2550.1, clause 6.6, out of service, the crane electric supply was disconnected and isolated.

Under Work Health and Safety Regulation 2017 Schedule 5, Registration of plant and plant design, Part 1, it is a legislative requirement that the design of tower cranes is registered. Under Schedule 5 Part 2, it is a legislative requirement that the item of plant (tower crane) is registered. There is no possibility that the crane could ever be registered in the future and the crane must remain out of service.

8.3 Responsibilities and Liabilities if the Crane is Retained

Arcadis' 2021 hand-on inspection and report advises that the crane structure, and safety for personnel accessing the crane, has deteriorated since they first inspected in January 2011. In Arcadis' February 2011 report they estimated a period of 10 to 15 years without structural repair, after which the crane would require to be dismantled. The crane is now coming to the end of this period, with no structural repairs undertaken.

We note that aerial photographs taken from the drone show greater degrees of corrosion to skyward facing surfaces, such as motor room roofs etc., not previously viable to persons climbing the crane. The crane's observed condition is therefore considered poorer in August 2024 than was observed in July 2022, with more elements corroded.

Where necessary, loose elements such as windows have been removed. Where accessible, the central motor room roofs, at risk of being lifted by wind, has been tied over with netting, and the control cabin floor has been netted under, to protect against items falling.

Drone photographs show severe corrosion and separation of roof plates to the rear winch room; not previously observed. If not removed, we would recommend that this roof too should be netted over to protect against roof plates falling. This roof can only be reached safely from an EWP or from a crane man-box.

In 2021, Arcadis raise their concern that the crane platforms, walkways and winch room floor are unsafe to walk on, and that additional fall-arrest latch lines are now required to access the crane. The winch room has been unsafe to enter for some years because of corroded floor plates and no structural points to secure fall-arrest lanyards to. The crane has reached a condition where safe access for inspections or maintenance has become difficult. In the crane's current condition, we expect that physical access to crane components will need to be via EWP or crane with man-box.

The safe mode for the crane jib in high winds and when out of service is to have it weathervane (rotate) freely. We noted that on the day of our 2022 inspection, the jib was restrained in an east-west position with heavy fabric straps tying the rotating inner tower to the static outer tower. This was done accommodate a tall vessel on the slipway. While the jib did not appear to be restrained at the time of our 2024 inspection, we understand that the shipyard remains operational and hence the jib may be being restrained periodically to allow vessels with tall superstructures to enter the shipyard.

The risk to this practice when high winds may occur is that wind force on the large winch house structure could twist and damage the rotating inner tower or buckle the outer tower members to which it is tied. The resulting damage could be severe and irreparable and could potentially seize the crane at that position. Not regularly inspecting and maintaining the slew mechanism may also cause the jib

rotation to seize[4]. This could put at risk persons and buildings within the crane's radius and make the jib difficult to dismantle.

Figure 3 -- Buildings oversailed by the crane and close to crane radius

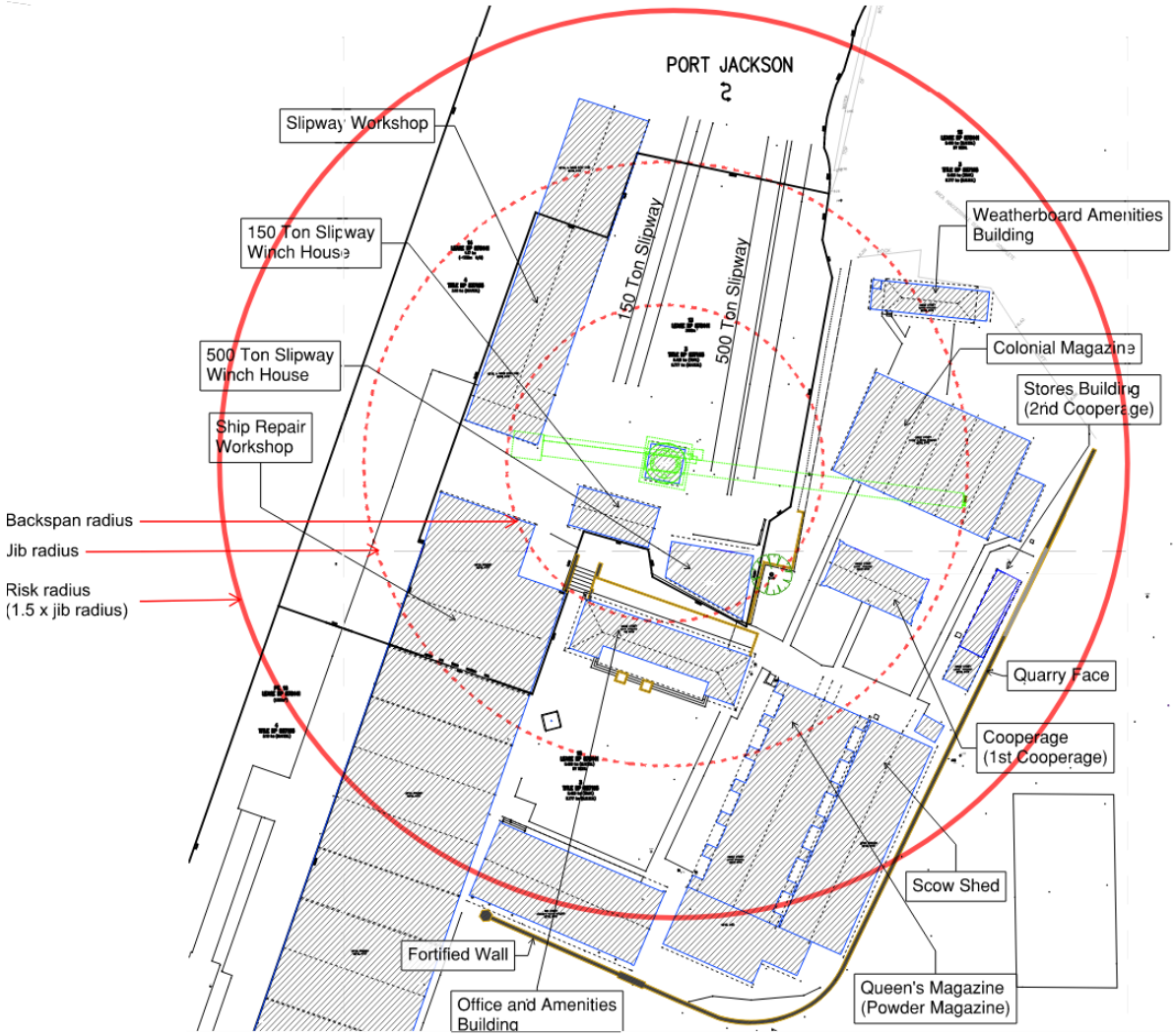


Figure 4 - 'Risk area radius', should crane jib collapse. A 1.5 times jib radius is recommended.[5] [6]

[4] Note that informal inspections were done by the crane operator of the slew mechanism each time the crane was used. This would not happen with a redundant, unused crane.
[5] A 1.5x radius exclusion zone is recommended. Where this zone extends over the harbour it is recommended that the Maritime Authority place exclusion buoys.
[6] So that buildings on the island may be accessed when the jib is orientated away from them an elliptical zone, based on the jib orientation, could be adopted. However, this would need to be managed on a jib orientation basis by persons controlling access to the island, and this may prove difficult to manage.

8.3.1 Option to Retain Crane

Repairing and maintaining the crane structure as an in-situ, redundant, non-operating object would require substantial resources, expertise, work and immediate and ongoing costs. In addition to structural repair and refurbishment (as summarised at Section 8.2.1), regular annual inspections and maintenance of the crane cantilever jib suspension system (jib and suspension rods) and slew mechanism – ensuring that the jib to rotate freely (requiring annual inspection and maintenance) are essential to the safe retention of the crane.

The following works would be required as a minimum to retain and manage the crane safely:

(a) Scaffold tower and jibs to safely access all parts of the crane

(b) A thorough structural inspection and analysis

(c) Engage crane maintenance engineer to inspect and service slew bearing and slew ring, to ensure crane can weathervane

(d) Crane maintenance engineer also to remove cables, hook, and anything that could fall from the crane, or install catch-nets where items cannot be removed. Install restraint netting over the corroded rear winch room roof and tie down.

> Loose window frames and glass have already been removed and the central motor room roof (which is very corroded and doily-thin) has been tied down with netting. A catch net has been installed beneath the control cabin.

(e) Remove asbestos containing material (ACM), by specialist contractor. Allow to encapsulate areas to remove asbestos.

> Refer to hazardous materials register at Appendix B – hazardous materials register is to be updated whenever ACM is removed (and if any ACM has been removed since the current register was prepared).

(f) Abrasive blast cleaning steel structure to remove all lead paint, back to bright metal.

> As structure is within National Park assume full encapsulation of structure will be required to abrasive clean.

(g) NDT weld inspection (base plates and boom and suspension rod splices) and ultrasonic testing of rivets and bolts

(h) Replace or augment structural members where required (cutting and splicing) and repairing/augmenting connections where required (plating/welding/bolting)

(i) Replace corroded handrails, walkways, platforms and floors by welding in new tube and plate

(j) Re-plate heavily corroded slew ring external walkway (considerably corroded to the southern side, where water ponds), which acts as a horizontal ring beam, stiffening the slew ring.

(k) Replace corroded motor, winch room and control cabin roofs and floors with new welded steel angle joists and plate (nominally 6mm thick steel plate)

(l) Patch motor and winch room walls needing patching with steel plate (nominally 6mm thick)

(m) Install anchor points for rope access maintenance

(n) Whip abrasive blasting to remove flash corrosion, and priming within 2 hours

(o) Protective coat all steelwork for 25 year design life to repainting

(p) Re-engage crane maintenance engineer to re-service slew mechanism on a biannual or annual basis.

(q) Repeat NDT weld inspection and ultrasonic testing of rivets and bolts every 10 years and repair/replace/augment as required. Re-protective coat all repairs.

(r) Repeat stages (a) to (o) at 25 years or at shorter interval as required.

8.3.2 Option to Dismantle the Crane

If the works described in Section 8.3.1 are not done, the crane structure is at the end of its life, and a hazard to persons accessing the ship yard area of the island, and to other buildings. If full repair cannot be committed to it is recommended that the crane be dismantled, for reasons of safety of persons and other buildings.

The following works would be required to dismantle the crane:

(a) Secure footprint of crane and establish safe site zone (e.g. fencing, hoarding)

(b) Archival recording (if applicable) and preparation of a Salvage and Re-Use plan to identify high-value heritage items is required to be carried out prior to commencement of dismantlement works.

(c) Perimeter scaffold and catch decks to be installed

Access to tower crane to be facilitated from EWP and mobile cranes standing on slipway.

(d) Encapsulate flaking coatings (paint over)

(e) Asbestos encapsulation and removal to be undertaken by licensed contractor. Air monitor for free asbestos fibres, if required.

(f) Localised coating removal to be undertaken at proposed cut locations, via chemical methods along cut lines

(g) Grind / oxy-cut members for removal in the following sequence:

a. Removal of rear winch room

b. Removal of jib outer 50% length, including hook

c. Removal of backspan

d. Removal of remainder of jib

e. Dismantle tower top down to slew ring, including operator cabin and motor room

f. Dismantle remainder of tower in sections from top down.

(h) Progressively relocate dismantled sections into a nominated safe area on site.

(i) Carry out final cutting on ground or off site, for removal and recycling of material.

Provide protection to nearby drainage such that contaminants are directed away from drains

(j) Removed sections are to be loaded to barge for recycling of steel.

Barges to be fitted with covers to minimise loss of contaminants during transport.

(k) Dispose of all materials per NPWS and EPBC Act requirements. Salvage items where required for heritage purposes.

8.3.3 Option to Dismantle Jib and Retain Crane Tower

NPWS have identified potential for partial retention the crane (tower only) and dismantlement of the jib and backspan.

As for full retention of the crane, we note that substantial resources, expertise, work and immediate and ongoing costs would be required for retention of the crane tower . However, regular annual inspections and maintenance of the crane cantilever jib suspension system (jib and suspension rods) and slew mechanism (allowing jib to freely rotate) would not be required.

The following works at a minimum would be required to dismantle the crane jib and backspan, and retain the crane tower:

Dismantle jib and backspan

(a) Secure footprint of crane and establish buffer zone (e.g. fencing, hoarding)

(b) Archival recording (if applicable) and preparation of a Salvage and Re-Use plan to identify high-value heritage items is required to be carried out prior to commencement of dismantlement works.

(c) Perimeter scaffold and catch decks to be installed

Access to tower crane to be facilitated from barge crane or EWP and mobile cranes standing on slipway.

(d) Encapsulate flaking coatings (paint over)

(e) Asbestos encapsulation and removal to be undertaken by licensed contractor. Air monitor for free asbestos fibres, if required.

(f) Localised coating removal to be undertaken at proposed cut locations, via chemical methods along cut lines

(g) Grind / oxy-cut members for removal in the following sequence:

a. Removal of rear winch room

b. Removal of jib outer 50% length, including hook

c. Removal of backspan

d. Removal of remainder of jib

e. Remove motor room and operator cabin

Tower from slew ring and below is to remain in place.

(h) Progressively relocate dismantled sections into a nominated safe area on site.

(i) The following items are to be retained from dismantled material, to be conserved for interpretation:

a. Crane hook and hook carriage

b. Operator cabin

c. Winches

(j) Carry out final cutting on ground or off site, for removal and recycling of material.

Provide protection to nearby drainage such that contaminants are directed away from drains.

(k) Removed sections are to be loaded to barge for recycling of steel.

Barges to be fitted with covers to minimise loss of contaminants during transport.

(l) Dispose of all materials per NPWS and EPBC Act requirements.

Retain crane tower

(a) Scaffold tower and jibs to safely access all parts of the tower

(b) A thorough structural inspection and analysis

(c) Abrasive blast cleaning steel structure to remove all lead paint, back to bright metal.

As structure is within National Park assume full encapsulation of structure will be required to abrasive clean.

(d) NDT weld inspection (base plates and boom and suspension rod splices) and ultrasonic testing of rivets and bolts

(e) Replacing structural members where required (cutting and splicing) and repairing/augmenting connections where required (plating/welding/bolting)

(f) Replace corroded handrails, walkways, platforms and floors by welding in new tube and plate

(g) Re-plate heavily corroded slew ring external walkway (considerably corroded to the southern side, where water ponds), which acts as a horizontal ring beam, stiffening the slew ring.

(h) Install anchor points for rope access maintenance

(i) Whip abrasive blasting to remove flash corrosion, and priming within 2 hours

(j) Protective coat all steelwork for 25 year design life to repainting

(k) Repeat NDT weld inspection and ultrasonic testing of rivets and bolts every 10 years and repair/replace/augment as required. Re-protective coat all repairs.

(l) Repeat stages (a) to (o) at 25 years or at shorter interval if required.

9.0 Conclusion

The crane is at the end of its service life and there is no possibility that the crane could be repaired and returned to service. NSW Work Health and Safety Regulation 2017 registration requirements require that the design, location and ownership of cranes be registered. On structural and electrical safety grounds, under this Regulation, there is no possibility that the crane could be repaired and returned to service.

The crane could be repaired and retained as a non-operating crane, or partially retained (tower only), however only at considerable expense. A description of the works that would be required to repair the crane is provided above. A fund would also be required for regular maintenance of the non-operating crane into the future. In conclusion, if the crane was to be repaired and maintained, it would be as a non-operating structure but nonetheless the crane would require considerable immediate and ongoing resources, expertise, work and financing to keep it safe and to prevent any future risk to life and property.

If not repaired and regularly maintained, the crane structure is at the end of its life and is a hazard to persons and other heritage buildings on the island and it is recommended that it should be dismantled.

This concludes our report. If you require further information, please contact the undersigned.

Prepared and authorised by
TTW (NSW) PTY LTD

PAUL CONNETT
Technical Director

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Appendix A

Crane Engineer's Inspection Report

25 November 2010 report by R K Findley Pty Ltd

R. K. FINDLAY PTY LTD

A.B.N. 74 003 142 854
CONSULTING ENGINEERS

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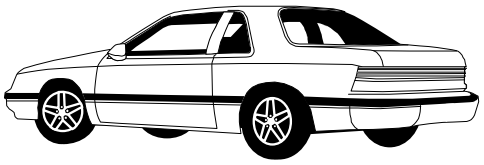

CONSULTANT TO THE TRANSPORT INDUSTRY

25th November 2010 **RN: 111006**

Sydney Ship Repair & Engineering Pty Ltd.
G.P.O. Box 1731
Neutral bay
N.S.W
2089

Attention: The Directors - Mr Colin McPherson.

Subject: Inspection of the Hammer Head Crane Located at Goat Island

Dear Sir,

Following receipt of your request to inspect the Hammer head crane located at your Goat Island Facility, I wish to confirm the following.

1.0 Background

Sydney Ship Repair & Engineering Pty Ltd lease from the NSW Parks and Wildlife Service the ship servicing facilities located on Goat Island which is located on Sydney harbour west of the Sydney Harbour Bridge.

The Island includes several heritage buildings as well as a large ship slipway and crane which are used to service various ships, barges etc.

The large Hammer head crane which is the subject of this report has been located on the Island for many years and was transferred from Mort Dock to Goat Island many years ago. The precise date of this relocation is not known to the writer of this report.

The cranes operation is fundamental to the operation of the facility as it is located in such a position that the crane can service an extensive area with in the slip yard.

2.0 Crane Details

Make:	Sir William Arrol & CO
Model:	N.A
Serial #:	2184
Build date:	1924
Commissioned:	1926
Crane Rated Capacity:	4 ton at 140 feet, 10 ton at 60 feet.
Last serviced:	N.A

3.0 Inspection of Cranes

In 2006 Workcover NSW in conjunction with the Crane Industry Council of Australia introduced an Inspection Scheme that was designed to ensure all cranes regardless of type were maintained and serviced in accordance with accepted procedures.

This inspection requires cranes to undergo a detail condition inspection and reporting procedure and an overload test known as the 10 year inspection. The requirements for this inspection are detailed in section 7 of AS2550.1 - Cranes, hoists and winches—Safe use Part 1: General requirements.

If the crane was less than 10 years old then the operator was required to ensure his log book and service records were readily available for inspection.

When a machine had been in service for 10 years or more the crane was required to be inspected and assessed in accordance with AS2550.1 clause 7.3.5 which states the following;

> *In carrying out a major inspection, attention shall be given to the following:*
> *(i) Structural, mechanical, electrical, instrumentation, control and operational anomalies.*
> *(ii) Non-destructive examination to an appropriate Standard*
> *(iii) Controls and emergency stop.*
> *(iv) Braking systems*
> *(v) Manufacturer's safety upgrades.*
> *(vi)Adequacy of safety instructions and manual*
> *(vii) The capacity and viability of upgrading the crane to the requirements of the latest Standard.*
> *The crane shall undergo further major inspections when deemed necessary by a competent person.*

Once the above inspections have been completed and any defects rectified the crane is subject to a full operational test in accordance with AS2250.4 – Section 11.3. This testing is to include a full operational dynamic test with a load equal to 110% of the rated capacity winch brake test with a load equal to 125% of the rated capacity.

4.0 Inspection results and findings

The structure for the crane base, tower and boom assembly is fabricated from standard structural steel sections which were available at the time of design and manufacture. That is 1924 / 1926

The structure is riveted together using techniques typical of the era of construction and painted in a grey paint to provide corrosion protection.

The operational environment is not ideal for the crane especially when the components such as the main structure are not galvanized to assist in protection against corrosion, using mild steel sections protected with an appropriate paint was typical of techniques used in the era of construction however constant attention was required to prevent the onset of corrosion.

The inspection we have carried out included extensive visual inspection of the main tower, the slew ring structure and the main boom components. Were practical material joins and rivets have been visually assessed, areas of corrosion were removed using a welder's slag mallet.

As shown in the attached photographs, the structure is not in good condition at all, and at best can be stated as being in poor condition. During the inspection we made the following observations;

- Rivets corroded to the point of the head being totally removed
- Areas of the main structure corroded over 50% of the material thickness
- Buckling of main tower members(localised only)
- Corrosion of electrical conduits
- Bolt heads/nuts on slew rollers corroded
- Extensive corrosion on racking winch mount
- Signs of contact between crane and slew ring
- Signs of excessive wear in the keyway of the main slewing gear mechanism
- Glass broken and difficult to see through in the operator's cabin.
- Extensive Flaking Paint

The above list is not considered exhaustive.

There is no maintenance or operational records for the machine prior to Sydney Ship Repair & Engineering occupying the site.

The extent of the damage to the machine is consistent with poor maintenance whilst under the control of the previous occupants of the site and it would be fair to say that the crane would have at best been in a marginal condition when Sydney Ship Repair and Engineering took up the lease.

5.0 Conclusion

The crane as inspected is not considered in a safe state to operate and it is recommended that the machine be removed from service immediately. In our opinion the machine is damaged beyond repair and it would be a costly and time consuming process to properly assess the machine and configure it to the current standards.

Special attention needs to be placed on the corrosion damage to the structure, in a number of areas we have witnessed structural elements that are have been reduced to less than 50% of the original material thickness which raises significant concern about the structures stability in the medium term.

If you have any questions regarding this report please do not hesitate to contact RK Findlay PTY LTD

Regards,

Craig Findlay
Mechanical Engineer

Figure 1 Identification Plate

Figure 2 Typical Severe Corrosion - Rivet heads completely corroded away

Figure 3 Typical severe corrosion

Figure 4 Main structural members reduced in thickness by over 50% by corrosion damage

Figure 5 Excessive corrosion on racking winch mount

Figure 6 Excessive Corrosion on racking winch mount

Figure 7 Damaged window in main control cabin

Figure 8 Worn Keyway on main slewing gear

Figure 9 Bolt heads removed by corrosion damage on slew rollers

Figure 10 Evidence of impact between frame and slew ring

Figure 11 Main Winch Brake - Brake pad material requires replacement

Figure 12 Typical Flaking Paint

Figure 13 Corrosion between plates

Figure 14 Severely corroded electrical conduit

Figure 15 Severe corrosion in main frame plates

Figure 16 Corrosion in main boom structure

Appendix B

Hazardous Materials Register

23 April 2015, prepared by Safe Environments

Hazardous Materials Register
Goat Island
Sydney NSW 2090

Site Reference: Hammerhead Crane

Report Number: R8453

Date: 23 April 2015

Total Number of Pages 44

Issued by Safe Environments Pty Ltd

NATA Accreditation Number 17139

Accredited for compliance with ISO/IEC 17020

NATA is a signatory to the APLAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports

Prepared for

Hyder Consulting Pty Ltd
Level 5, 141 Walker Street
North Sydney NSW 2060

Report Title	**:**	**Hazardous Materials Register**
Site Reference	**:**	**Hammerhead Crane**
Address:	**:**	**Goat Island** **Sydney NSW 2090**
Job No.	**:**	**R8453**
Date of issue	**:**	**23 April 2015**
Checked & Approved by:		 **Carl Strautins** **(Occupational Hygienist)**

Goat Island, Sydney NSW 2090

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Appendix

Report Disclaimers

This report has been prepared by Safe Environments Pty Ltd and its contents are provided exclusively for the use of Hyder Consulting Pty Ltd. Every care has been taken in the preparation of this report and its contents are believed to be accurate and current as at the date of the report.

However, neither Safe Environments nor its officers, employees or contractors (**personnel**) give any representation or warranty as to the reliability, accuracy or completeness of the report. Neither Safe Environments nor its personnel will be liable in any way for any loss or damage, (whether direct or indirect), howsoever arising (whether in negligence or otherwise), out of or in connection with this report, except where such liability is made non-excludable by legislation.

In the case of goods or services supplied by Safe Environments, liability for breach of any implied warranty or condition which cannot be excluded (**non-excludable conditions**) is limited at Safe Environment's option to either:

(a) the supply of the goods (or equivalent goods) or services again; or
(b) the payment of the cost of having the goods (or equivalent goods) or services supplied again.

Except in the case of non-excludable conditions, the total liability of Safe Environments to the client or any third party will not exceed in aggregate the total amount of the fees payable by the client

1 Executive Summary

A survey for Hazardous materials was carried out at Goat Island on the 15 April 2015. The site consists of a steel construction hammerhead crane built in 1924. Within the crane, there are three rooms with walls, ceiling, roof and floors constructed of metal

Safe Environments is NATA accredited (accreditation NO: 17139) and complies with the requirements of AS/NZS ISO.IEC 17020 (2000) for the inspection of asbestos and hazardous materials. This report has been produced in accordance with the Code of Practice How to Manage and Control Asbestos in the Work Place, December 2011, Code of Practice for Management and Control of Asbestos in Workplace NOHSC: 2018 (2005) and in-house documents for conducting hazardous materials inspections. This document is issued in accordance with NATA Accreditation requirements for ISO17020.

The survey undertaken is considered to be in line with the Health and Safety Executive (HSE) document The Survey Guide (HSG 264); Management Survey, identification and assessment survey (presumptive and sampling survey). This type of survey is fundamentally intrusive but not destructive and entails the collection of representative samples where possible or required for subsequent laboratory analysis.

For material risk and priority assessment score system see Appendix B.

Sampling may not be carried out during this kind of survey where doing so would put the surveyor at unreasonable health risk or when "The Controller" has specifically requested samples not to be taken. Materials that can be reasonably expected to contain asbestos are **presumed** as such. Furthermore a material is **strongly presumed** to contain asbestos when it appears highly likely to contain asbestos or where it has previously been identified as asbestos containing.

Table 1: Summary of Findings

Location	Material	Risk Level	Recommendation and Action	Time Table
Refer to Table 3	High content lead grey paint to external and walls to rooms steel frames/structures, grey paint to walls and roof and green paint to roof and door, Medium content lead green and yellow paint to motors	Minor	Monitor condition, do not use abrasive methods to remove paint, wear PPE and RPE when working with paint, dispose of contamination in accordance with EPA. All work should be conducted by experienced contractors. Visual and atmospheric monitoring during removal works is recommended	Annual
Refer to Table 3	Presumed asbestos resin electrical mounting board in cabinet on wall, and presumed asbestos paper internal to fuses	Minor	Minor risk of exposure under current condition and use. Recommended to label as asbestos containing and reinspect condition on annual basis	Annual
Refer to Table 3	Asbestos putty to windows	Minor	Minor risk of exposure under current condition and use. Recommended to label as asbestos containing and reinspect condition on annual basis	Annual

All Hazardous Materials remaining within the building/structure should be monitored for any deterioration in their condition by a competent person. This should form an integral part of the client's hazardous management plan.

Inaccessible areas are listed below. Please note that any areas which were not accessed during the survey should be presumed to contain hazardous materials until otherwise tested or inspected by a competent person.

Table 2: Inaccessible	
Inaccessible Area	**Reason**
Above 3 meters in height	Not fully accessed in line with company OHS policies
Within confined spaces	Not fully accessed in line with company OHS policies

Hyder Consulting Pty Ltd should understand the limitations of a survey being conducted in a non-destructive manner which are explained further in Sections 3, 5 and 9

Please read ALL of the report document

2 Scope

Safe Environments has been commissioned by Hyder Consulting Pty Ltd to undertake a hazardous materials survey of Goat Island. The aim of this survey is to identify hazardous materials to normally occupied and accessible areas within the selected building/structure as far as reasonably practicable. The survey is conducted to allow the client to manage their risk of hazardous materials within their premise. The risk assessment was conducted on the basis of the condition and activities at the time of the inspection.

The survey extent was agreed with the Hyder Consulting Pty Ltd prior to commencement of survey. Any areas not identified within the register and plans are considered outside the remit of this survey.

3 Introduction

Experienced surveyor from Safe Environments undertook the survey on the 15 April 2015. The survey undertaken was in line with the Health and Safety Executive (HSE) document. The Survey Guide (HSG 264); Management Survey, identification and assessment survey (presumptive and sampling survey). This type of survey is fundamentally intrusive but not destructive and entails the collection of representative samples where possible or required for subsequent laboratory analysis.

The survey undertaken was in line with the Health and Safety Executive (HSE) document "The Survey Guide (HSG 264)". This type of survey involves the collection of representative samples for subsequent laboratory analysis.

The survey describes the results of sample analysis and locations of hazardous materials presents, which are represented within sketch/plans of site (Section 7). A Hazardous materials register (Section 6) has been compiled for each structure which is within the survey scope and a risk assessment presented for the materials found. Please note that the register lists all samples and referenced samples, all identified and presumed and any inaccessible areas.

A Demolition and Refurbishment survey is recommended prior to any refurbishment / demolition work or any alterations which may affect the fabric of the building/structure. This type of asbestos survey allows identification of Asbestos Containing Material (ACM) which may otherwise be hidden within the fabric of the building/structure, as far as reasonably practicable. All identified materials must be removed prior to these works taking place.

It should be noted that a Refurbishment, Demolition Full access sampling and identification survey of the property has **not** been undertaken as part of this asbestos survey.

4 Definitions

Airborne asbestos means any fibres of asbestos small enough to be made airborne. For the purposes of monitoring airborne asbestos fibres, only respirable fibres are counted.

Asbestos means the asbestiform varieties of mineral silicates belonging to the serpentine or amphibole groups of rock-forming minerals, including actinolite asbestos, grunerite (or amosite) asbestos (brown), anthophyllite asbestos, chrysotile asbestos (white), crocidolite asbestos (blue) and tremolite asbestos.

Asbestos containing material (ACM) means any material or thing that, as part of its design, contains asbestos.

Asbestos-contaminated dust or debris (ACD) means dust or debris that has settled within a workplace and is (or assumed to be) contaminated with asbestos.

Asbestos-related work means work involving asbestos that is permitted under the exceptions set out in state specific regulations.

Asbestos removalist means a person conducting a business or undertaking who carries out asbestos removal work.

Asbestos removal work means:

- work involving the removal of asbestos or ACM
- Class A asbestos removal work or Class B asbestos removal work.

Competent person means a person who has acquired, through training, qualification or experience, the knowledge and skills to carry out the task.

Exposure standard for asbestos is a respirable fibre level of 0.1 fibres/ml of air measured in a person's breathing zone and expressed as a time weighted average fibre concentration calculated over an eight-hour working day and measured over a minimum period of four hours in accordance with:

- the Membrane Filter Method
- a method determined by the relevant regulator.

Friable asbestos means material that is in a powder form or that can be crumbled, pulverised or reduced to a powder by hand pressure when dry, and contains asbestos.

GHS means *Globally Harmonised System of Classification and Labelling of Chemicals.*

Hazmat means Hazardous Materials in the scope of this report

NATA-accredited laboratory means a testing laboratory accredited by the National Association of Testing Authorities (NATA), Australia, or recognised by NATA either solely or with someone else.

Naturally occurring asbestos (NOA) means the natural geological occurrence of asbestos minerals found in association with geological deposits including rock, sediment or soil.

Non-friable asbestos means material containing asbestos that is not friable asbestos, including material containing asbestos fibres reinforced with a bonding compound.

Ozone depleting substances (ODS) are those substances which deplete the ozone layer and are widely used in refrigerators, air-conditioners, fire extinguishers, in dry cleaning, as solvents for cleaning, electronic equipment and as agricultural fumigants.

Person Conducting a Business or Undertaking (PCBU) means persons responsible for ensuring, so far as is reasonably practicable, that workers and other persons are not put at risk from work carried out as part of the business or undertaking.

Polychlorinated Biphenyls (PCBs) PCBs are chlorine containing compounds and were used extensively as fluids in electrical equipment such as transformers and capacitors. They were also used in pesticides, carbonless copier paper, fluorescent light ballast and other products up to 1996.

Respirable asbestos means an asbestos fibre that:

- is less than 3 microns (µm) wide
- is more than 5 microns (µm) long
- has a length to width ratio of more than 3:1.

Synthetic Mineral Fibre (SMF) Man made mineral fibre have been used as asbestos replacement and used in cement as re-enforcement additive, and other insulating materials. This material poses health risks if disturbed and personal protective measures are required when working with it.

Lead Containing Materials (LCM) paint, dust and soil which may contain various levels of lead in its content as per Appendix C of this document

5 Procedures

Asbestos Identification

Safe Environments have taken all reasonable effort to identify any Asbestos Containing Material (ACM) in those areas detailed within the "Introduction" to this Report. The survey methodology is considered to be in accordance with the HSG 264 as identified within in-house procedure SOP Hazardous Materials Inspections.

Suspected ACMs were sampled in accordance with the required number detailed in HSG 264 and the Safe Environments' in-house methods. Most materials only require one or two samples of each type, while others may require a far greater number. These are considered to be heterogeneous in nature such as textured paint coating, dusts and soils. This is particularly the case for materials that may give rise to 'false negative'. Some homogeneous ACMs such as cement, fibre boar, thermoplastic tiles and vinyl covering materials may be cross-referenced against an original sample where excess samples of known content would otherwise be collected.

Bulk samples have not been taken where the act of sampling would endanger the surveyor or affect the functional integrity of the item concerned. Sampling may not be carried out during this kind of survey where doing so would put the surveyor at unreasonable health risk or when the person with management or control of the premises has specifically requested samples not to be taken. Materials that can be reasonably anticipated to contain asbestos are **presumed** as such. Furthermore a material is **strongly presumed** to contain asbestos when it appears highly likely to contain asbestos or where it has previously been identified as asbestos containing.

Analysis of asbestos bulk samples were carried out by Asbestos Check laboratory, accredited by the National Association of Testing Authorities (NATA) Accredited for compliance with ISO/IEC 17025 for the determination of asbestos in materials. Please note that asbestos identification is restricted to Chrysotile, Amosite and Crocidolite. Other types of asbestos are not identified under current approved NATA requirements for asbestos bulk analysis. The samples were examined under a Stereo Microscope and selected fibres were analysed by Polarized Light Microscopy (PLM) in conjunction with dispersion Staining method (Safer Environment Method 1.). All other types of asbestos forms are identified as Unknown Mineral Fibres (UMF) and are treated as ACMs unless otherwise tested by other methods, such as Scanning Electron Microscopy.

Only safely accessible areas were surveyed. We have not inspected any part requiring specialist access equipment such as cherry pickers or scaffoldings. The survey height will not exceed more than 3 metres above ground level, accessed using stepladders. Areas at height greater than 3 metres (such as roofs) have not been surveyed unless otherwise stated.

The following items which are not safely and readily accessible are considered outside the scope of a Management Survey. These include:

- Within support columns, enclosed within cladding or concealed within the fabric of the building/structure; sealed voids (under floor, wall or ceiling);
- Areas such as the internal of partition walls or above fixed and/or plasterboard ceilings;
- Areas below fitted floorings, such as non-asbestos tiling, fitted vinyl or carpet where access would usually cause excess decorative and structural / functional damage;
- Under ceramic wall and floor tiles in wet areas and lining under properties with confined spaces;
- Under suspected hazardous material, i.e. nothing that would disturb possible hazardous materials and give rise to airborne fibre or lead;
- Within live electrical fuse or switch boxes; conduits and all other live plant items at the time of the survey;
- Lift shafts or machinery, unless the client arranged the safe access with a qualified engineer;
- Within any fire doors. Any access within fire doors can cause functional damage.

Density checks on materials have not been carried out by the laboratory. Materials referred to Asbestos Fibre Board (Fibro-Plaster) or Asbestos Cement (AC) is done so purely on their content and appearance.

For each asbestos containing material and all references, a material assessment score has been assigned, identifying:

- product type
- extent of damage
- surface treatment
- asbestos type.

A total material assessment score of up to 12 may be attributed to material by the methodology adopted for this survey.

Synthetic Mineral Fibre

This report identifies as far as reasonably practicable the general condition and location of suspected SMF material found throughout the building/structure through visual identification.

Polychlorinated Biphenyls (PCBs)

Representative light fittings containing capacitors were dismantled and inspected on site. The presence of PCB in electrical capacitors was checked by the serial number, against the Australian and New Zealand Environment and Conservation Council (ANZECC) information booklet for electricians and electrical contractors (1997). Some light fittings were not dismantled on site due to their age and the likelihood of PCBs being present within capacitors.

Lead containing paint

Lead analysis are carried out by an independent laboratory, accredited by the National Association of Testing Australia (NATA) for determination of Lead content as recommended by Australian Standard (AS) 4361.2 Guide to Lead Paint Management; Part 2 Residential and Commercial Building, published in May 1998.

The sample programme is representative of paint types found within the site, concentrations within the areas and of different structures, e.g. exterior paint, walls, windows, skirting boards, etc. The objective of lead paint identification in this survey is to highlight the presence of lead based paint within the building/structure as far as reasonably practicable.

Ozone Depleting Substances (ODS)

A visual inspection of any refrigerant gas labels on the representative refrigeration units and plants were documented. In the absence of labels the assessment of ODS is based on the age and condition of the plant and comments are made based on the equipment and the likelihood of ODS presence.

No Sampling of ODS has taken place as part of this audit and only structural items are recorded, such as AC units.

A priority assessment has also been carried out which categorises Hazardous materials into risk priority groups. This is used as guidance into managing asbestos materials in building/structures. If a hazardous material is found and likely to be disturbed as part of planned works, the only management recommendation is to remove it prior to commencement of work. However, if there is a gap between the time the survey is conducted and removal time and the building/structure remains to be used as normal, then the priority assessment should be used for as a guide for management of Hazmat.

The score is created from taking into account the likelihood of disturbance of the Hazmat, involving factors such as occupant and maintenance activity and likelihood of disturbance. The combined algorithms of the material and priority assessments can generate a risk score to a maximum of 24, which is the worst-case and would normally require urgent attention.

The final score for each Hazmat acts as a comparative quantitative measure, which can be used to aid the prioritisation of action for their management, where the materials are to remain within the building/structure. A copy of the material assessment algorithm and priority assessment categorisation is contained in Appendix B.

The priority assessment is the responsibility of the person with management, control of the premises, or one who conducts a business or undertaking (PCBU). Safe Environments has completed it taking into account the current apparent use and occupancy of the area. The person with management or control of the premises should consider if this requires revision if the use etc. changes in the future.

6 Hazardous Materials Register

Site: Goat Island Sydney NSW 2090			**Table 3: Hazmat Register**						**Surveyors:** Stuart Lumsden
Date: 15 April 2015	**Building/structure Reference:** Hammerhead Crane		**Client:** Hyder Consulting Pty Ltd						**Laboratory:** Asbestos Check / Sydney Analytical Laboratories
Location	**Building/structure Component**	**Hazmat Detected** CHR, AMO, CRC, UMF, NAD, NHD, NHI, SMF, PCB, ODS, LEAD	**Sample Number**	**Extent (Units)**	**Photo**	**Risk Assessment**			**Comments & Recommendations**
						Friable or Non-Friable	**Final Risk Rating**	**Action Level**	
Externals	High content lead grey paint to external steel frames and walls to rooms	**High Lead (10.0%)**	Pb2627	>100LM	3356	-	7	**D**	**Contains high lead content (10.0%). Monitor condition, do not use abrasive methods to remove paint, wear PPE and RPE when working with paint, dispose of contamination in accordance with EPA. All work should be conducted by experienced contractors. Visual and atmospheric monitoring during removal works is recommended**
Rear motor room	Presumed asbestos resin electrical mounting board in cabinet on wall	**Presumed Asbestos**	ACM1	< 1	3305	NF	4	**D**	**Minor risk of exposure under current condition and use. Recommended to label as asbestos containing and reinspect condition on annual basis.**
Rear motor room	Medium content lead green paint to motor	**Medium Lead (0.42%)**	Pb2622	1	3309	-	6	**D**	**Contains medium lead content (0.42%). Monitor condition, do not use abrasive methods to remove paint, wear PPE and RPE when working with paint, dispose of contamination in accordance with EPA. All work should be conducted by experienced contractors. Visual and atmospheric monitoring during removal works is recommended**
Rear motor room	Medium content lead yellow paint to motor	**Medium Lead (0.95%)**	Pb2623	1	3309	-	6	**D**	**Contains medium lead content (0.95%). Monitor condition, do not use abrasive methods to remove paint, wear PPE and RPE when working with paint, dispose of contamination in accordance with EPA. All work should be conducted by experienced contractors. Visual and atmospheric monitoring during removal works is recommended**

Sample Numbers: AB123, R1, 2, 3… – R denotes sample has been referenced. P denotes material visually identified only (no sample was taken), SP denotes Strongly Presumed materials, CHR=Chrysotile, AMO=Amosite, CRC=Crocidolite, UMF=Unknown mineral fibre. SMF=Synthetic Mineral Fibres, ODS=Ozone Depleting Substance, PCB= Polychlorinated Biphenyl, NHI=No Hazmat Identified, NHD=No Hazmat Detected, NAD=No Asbestos Detected, F=Friable Asbestos within soft matrix, NF=Non-Friable Asbestos (i.e. Bonded) Asbestos within solid matrix Risk Score: A – High risk, B –Medium risk, C – Low risk, D – Minor risk, E – No further action required

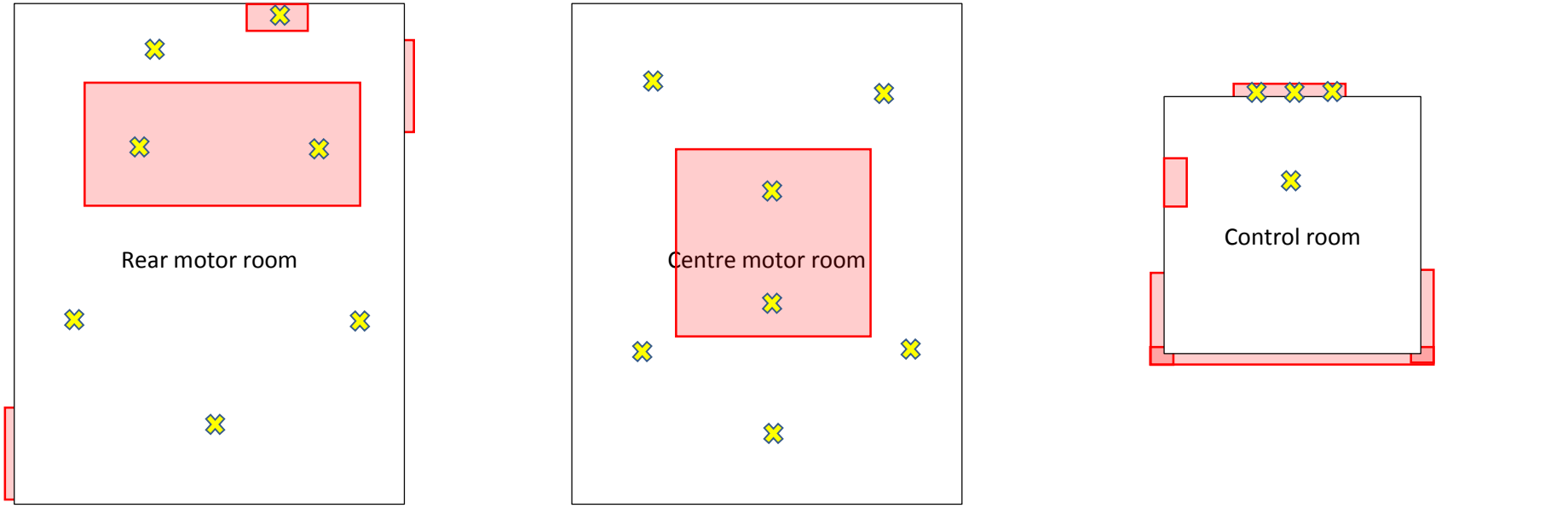
Site: Goat Island Sydney NSW 2090			**Table 3: Hazmat Register**						**Surveyors:** Stuart Lumsden
Date: 15 April 2015	**Building/structure Reference:** Hammerhead Crane		**Client:** Hyder Consulting Pty Ltd						**Laboratory:** Asbestos Check / Sydney Analytical Laboratories
Location	**Building/structure Component**	**Hazmat Detected** CHR, AMO, CRC, UMF, NAD, NHD, NHI, SMF, PCB, ODS, LEAD	**Sample Number**	**Extent (Units)**	**Photo**	**Risk Assessment**			**Comments & Recommendations**
						Friable or Non-Friable	**Final Risk Rating**	**Action Level**	
Rear motor room	High content lead red paint to electrical pipes	**High Lead (48.8%)**	Pb2624	<1	3313	-	7	**D**	**Contains high lead content (48.8%). Monitor condition, do not use abrasive methods to remove paint, wear PPE and RPE when working with paint, dispose of contamination in accordance with EPA. All work should be conducted by experienced contractors. Visual and atmospheric monitoring during removal works is recommended**
Rear motor room	High content lead grey paint to walls and roof	**High Lead (15.4%)**	Pb2625	25	3314	-	7	**D**	**Contains high lead content (15.4%). Monitor condition, do not use abrasive methods to remove paint, wear PPE and RPE when working with paint, dispose of contamination in accordance with EPA. All work should be conducted by experienced contractors. Visual and atmospheric monitoring during removal works is recommended**
Rear motor room	Asbestos putty to windows	**CHR**	AP002	<1	3317	NF	3	**D**	**Minor risk of exposure under current condition and use. Recommended to label as asbestos containing and reinspect condition on annual basis**
Rear motor room	Presumed asbestos paper internal to fuses	**Presumed Asbestos**	ACM2	<1	3307	F	7	**D**	**Minor risk of exposure under current condition and use. Recommended to label as asbestos containing and reinspect condition on annual basis**
Rear motor room	Presumed asbestos resin brake linings internal to motor	**Presumed Asbestos**	ACM4	< 1	3308	NF	4	**D**	**Minor risk of exposure under current condition and use. Recommended to label as asbestos containing and reinspect condition on annual basis**

Site: Goat Island Sydney NSW 2090			**Table 3: Hazmat Register**						**Surveyors:** Stuart Lumsden
Date: 15 April 2015	**Building/structure Reference:** Hammerhead Crane		**Client:** Hyder Consulting Pty Ltd						**Laboratory:** Asbestos Check / Sydney Analytical Laboratories
Location	**Building/structure Component**	**Hazmat Detected** CHR, AMO, CRC, UMF, NAD, NHD, NHI, SMF, PCB, ODS, LEAD	**Sample Number**	**Extent (Units)**	**Photo**	**Risk Assessment**			**Comments & Recommendations**
						Friable or Non-Friable	**Final Risk Rating**	**Action Level**	
Centre motor room	Medium content lead green paint to motor	**Medium Lead (0.42%)**	Pb2622/R1	1	3326	-	6	**D**	**Contains medium lead content (0.42%). Monitor condition, do not use abrasive methods to remove paint, wear PPE and RPE when working with paint, dispose of contamination in accordance with EPA. All work should be conducted by experienced contractors. Visual and atmospheric monitoring during removal works is recommended**
Centre motor room	Medium content lead yellow paint to motor	**Medium Lead (0.95%)**	Pb2623/R2	1	3326	-	6	**D**	**Contains medium lead content (0.95%). Monitor condition, do not use abrasive methods to remove paint, wear PPE and RPE when working with paint, dispose of contamination in accordance with EPA. All work should be conducted by experienced contractors. Visual and atmospheric monitoring during removal works is recommended**
Centre motor room	Asbestos putty to window	**CHR**	AP002/R1	<1	3323	NF	3	**D**	**Minor risk of exposure under current condition and use. Recommended to label as asbestos containing and reinspect condition on annual basis**
Centre motor room	High content lead grey paint to walls and roof	**High Lead (15.4%)**	Pb2625/R1	25	3327	-	7	**D**	**Contains high lead content (15.4%). Monitor condition, do not use abrasive methods to remove paint, wear PPE and RPE when working with paint, dispose of contamination in accordance with EPA. All work should be conducted by experienced contractors. Visual and atmospheric monitoring during removal works is recommended**
Centre motor room	Presumed asbestos resin brake linings internal to motor	**Presumed Asbestos**	ACM5	< 1	3326	NF	4	**D**	**Minor risk of exposure under current condition and use. Recommended to label as asbestos containing and reinspect condition on annual basis**

Sample Numbers: AB123, R1, 2, 3… – R denotes sample has been referenced. P denotes material visually identified only (no sample was taken), SP denotes Strongly Presumed materials, CHR=Chrysotile, AMO=Amosite, CRC=Crocidolite, UMF=Unknown mineral fibre. SMF=Synthetic Mineral Fibres, ODS=Ozone Depleting Substance, PCB= Polychlorinated Biphenyl, NHI=No Hazmat Identified, NHD=No Hazmat Detected, NAD=No Asbestos Detected, F=Friable Asbestos within soft matrix, NF=Non-Friable Asbestos (i.e. Bonded) Asbestos within solid matrix Risk Score: A – High risk, B –Medium risk, C – Low risk, D – Minor risk, E – No further action required

Site: Goat Island Sydney NSW 2090			**Table 3: Hazmat Register**						**Surveyors:** Stuart Lumsden
Date: 15 April 2015	**Building/structure Reference:** Hammerhead Crane		**Client:** Hyder Consulting Pty Ltd						**Laboratory:** Asbestos Check / Sydney Analytical Laboratories
Location	**Building/structure Component**	**Hazmat Detected** CHR, AMO, CRC, UMF, NAD, NHD, NHI, SMF, PCB, ODS, LEAD	**Sample Number**	**Extent (Units)**	**Photo**	**Risk Assessment**			**Comments & Recommendations**
						Friable or Non-Friable	**Final Risk Rating**	**Action Level**	
Control room	High content lead green paint to roof and door	**High Lead (1.5%)**	Pb2626	5	3344, 3346	-	6	**D**	**Contains high lead content (1.5%). Monitor condition, do not use abrasive methods to remove paint, wear PPE and RPE when working with paint, dispose of contamination in accordance with EPA. All work should be conducted by experienced contractors. Visual and atmospheric monitoring during removal works is recommended**
Control room	Asbestos putty to window	**CHR**	AP002/R2	<1	3347	NF	3	**D**	**Minor risk of exposure under current condition and use. Recommended to label as asbestos containing and reinspect condition on annual basis**
Control room	High content lead grey paint to walls	**High lead (15.4%)**	Pb2625/R2	5	3342		7	**D**	**Contains high lead content (15.4%). Monitor condition, do not use abrasive methods to remove paint, wear PPE and RPE when working with paint, dispose of contamination in accordance with EPA. All work should be conducted by experienced contractors. Visual and atmospheric monitoring during removal works is recommended**
Control room	Presumed asbestos paper internal to fuses	**Presumed Asbestos**	ACM3	<1	3342	F	7	**D**	**Minor risk of exposure under current condition and use. Recommended to label as asbestos containing and reinspect condition on annual basis**

7 Site Sketch / Plan



Goat Island Sydney NSW 2090

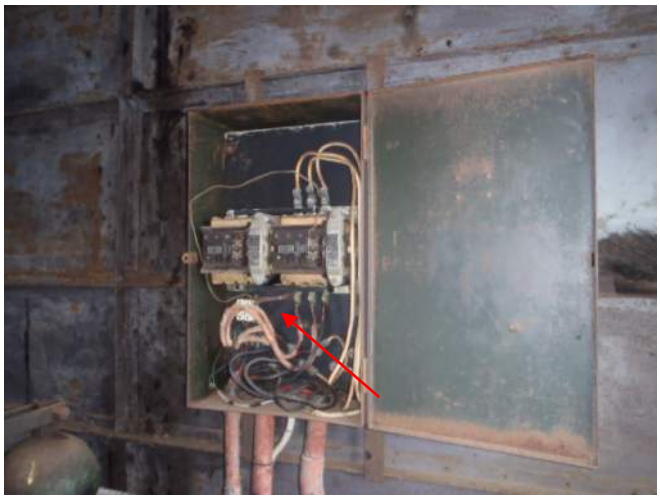
Goat Island Sydney NSW 2090

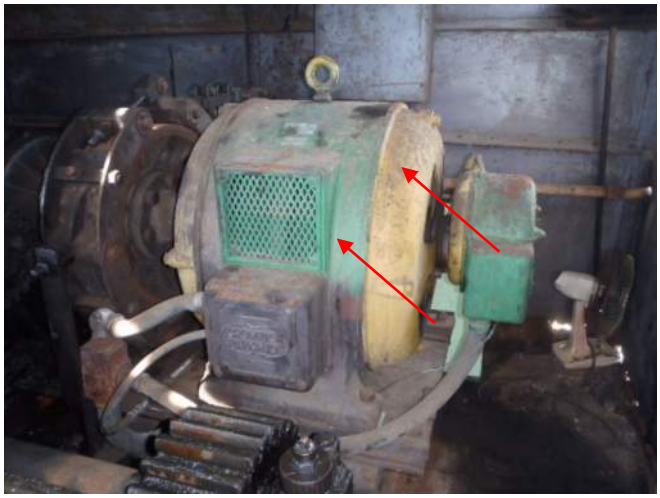
Key:
Inaccessible Area
Area Contains Asbestos
Area Contains SMF
Area Contains PCB
Area contains Ozone
Area Contains Lead

8 Representative Hazardous Materials Photographs

This section is provided as a visual aid to a selection of representative hazardous materials identified in Section 6. Where a material has been found in several locations a 'representative' photograph may have been included.

Goat Island Sydney NSW 2090

Photograph: 3356	**Photograph:** 3305
Description: High content lead grey paint to external steel frames and walls to rooms	**Description:** Presumed asbestos resin electrical mounting board to cabinet wall & asbestos paper internal to fuses
Locations Found: Externals	**Locations Found:** Rear motor room
	

Photograph: 3309	**Photograph:** 3313
Description: Medium content lead to yellow and green paint to motor	**Description:** High content lead red paint to electrical pipes
Locations Found: Rear motor room	**Locations Found:** Rear motor room
	

Photograph: 3315	**Photograph:** 3317
Description: High content lead grey paint to walls and roof	**Description:** Asbestos putty to windows
Locations Found: Rear motor room	**Locations Found:** Rear motor room
	

Photograph: 3346	**Photograph:** 3308
Description: High content lead green paint to roof and door	**Description**: Presumed asbestos resin brake lining internal to motor
Locations Found: Control room	**Locations Found:** Rear motor room
	

9 Limitations

The recommendations presented in this report are professional opinions based on the indicated data described within report. They are intended only for the purpose, the location, and the project described.

Please note that this survey is not a definitive study as it is not reasonably practicable to inspect every area. Due diligence and professional judgment has been used to attempt to identify and sample all suspect hazardous materials as far as reasonably practicable. Whether identified or otherwise, inaccessible hazardous materials may be present in areas where access or visual observation is not possible. If such features should become accessible as a result of future refurbishment or alterations, they should be surveyed for possible asbestos content.

Some ACMs are heterogeneous in nature; hence it is possible to get a false negative when sampling such materials as textured coating, dust and debris. Therefore, Safe Environments have taken multiple samples, where required to ensure ACMs are detected as far as reasonably practicable. Please also note that Polarised Light Microscopy (PLM) method may also yield false negative results at low concentrations of asbestos fibre.

More sensitive laboratory analyses such as scanning electron microscopy (SEM) and transmission electron microscopy (TEM) may result in the detection of asbestos and higher asbestos concentrations due to their increased resolution. Due to the additional time and expense involved these methods are not normally used unless agreed in advance with the client for a specific purpose.

Quantities of materials identified as part of the survey are estimates made by the surveyor and should not be used for the purpose of tendering for work. Contractors should make their own measurement.

Changes in standards may occur as a result of legislative amendments or the progress in understanding effects of asbestos. Accordingly, the findings of this report may be nullified, wholly or in part, by changes beyond our control. Opinions and judgments expressed herein, which are based on our current understanding and interpretation of current legal standards and guidelines, should not be interpreted as legal judgments.

Safe Environments are not responsible for application of a Management Plan. It is the responsibility of the site Person Conducting a Business or Undertaking to ensure that recommendations within this report are adhered to by relevant parties and that the Management plan is produced as required

Appendix A

Laboratory Analysis Certificate

Asbestos Identification to AS 4964 Method for the Qualitative Identification of Asbestos in Bulk Samples

R8453
Hyder Consulting Pty Ltd
-

Sampling location:
Goat Island
Sydney NSW 2477

NATA Accreditation Number 17139

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards

Accredited for compliance with ISO/IEC 17025

NATA is a signatory to the APLAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports

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Blacktown NSW 2148
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NATA
ACCREDITED FOR TECHNICAL COMPETENCE

22 April 2015

Test Report No. R8453

AS 4964 Method for the qualitative identification of asbestos in bulk analysis

Requested by:	Hyder Consulting Pty Ltd
Clients Address:	Level 5, 141 Walker Street North Sydney NSW 2060
Clients Ref/Job No:	Hammerhead Crane
Sampling Location:	Goat Island Sydney NSW 2090
Date(s) Sample(s) Received:	15 April 2015
Date(s) of Analysis:	17 April 2015

This report consists of 3 pages

This test method for the qualitative identification of asbestos in bulk analysis polarized light microscopy (PLM) as the primary technique for identification because of its simplicity, low cost, relevance and detection limits. The determination of principal refractive indices by dispersion staining (DS) on its own is not sufficient and needs to be used in conjunction with various other optical properties using PLM.

The Standard sets out relatively simple aspects of sample preparation and PLM that enable a large proportion of commercial samples containing chrysotile, amosite and crocidolite asbestos to be identified, even though some samples will be difficult or impossible to analyse. These samples may require the use of an independent confirming technique such as infrared spectroscopy, X-ray diffraction, scanning electron microscopy or transmission electron microscopy, if PLM fails to give an unequivocal identification, or they require more complex sample preparation.

The procedure has the following known limitations:

(a) PLM is a qualitative technique only.
(b) It does not cover the identification of airborne and water-borne asbestos.
(c) Most samples of tremolite, actinolite and anthophyllite asbestos show a wide range of optical properties and cannot be equivocally identified by PLM and dispersion staining. Materials identified as unknown mineral fibre may contain asbestos which requires further analysis.
(d) For valid asbestos identification there must be sufficient sample of the unknown fibres for them to exceed the practical detection limit of the technique used. To report ‘trace’ levels using confirming techniques the fibres must be observed at ‘trace’ levels by PLM, because of the difference in detection limits between the techniques.

AsbestosCheck
CREATING SAFE ENVIRONMENTS
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NATA
ACCREDITED FOR TECHNICAL COMPETENCE

Test Report No: R8453
Client Ref: Hammerhead Crane
Sampling Procedures: Safe Environments Hazardous Materials Procedure Complying with ISO 17020

Analytical method: Polarised light microscopy including dispersion staining to AS 4964
Sample Preparation: Safe Environments in-house SOP - Asbestos Identification
Approved Identifier: Stuart Lumsden

Sample Description & Results:

Sample Number	Sample Description	Weight[1] (g)	Analysis Result[2]
AP002	Sample containing putty material (homogenous) consisting of asbestos fibres.	1	Chrysotile Asbestos Detected

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

Carl Strautins
Occupational Hygienist

[1] Approximate sample weight only– not covered as part of the scope of accreditation
[2] detected by polarised light microscopy including dispersion staining

SYDNEY
ANALYTICAL
LABORATORIES

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PO BOX 48
ERMINGTON NSW 2115

Laboratory:
1/4 ABBOTT ROAD
SEVEN HILLS NSW 2147
Telephone: (02) 9838 8903
Fax: (02) 9838 8919
A.C.N. 003 614 695
A.B.N. 81 829 182 852
NATA No: 1884

ANALYTICAL REPORT for:

SAFE ENVIRONMENTS

UNIT 4/40 BESSEMER STREET
BLACKTOWN 2148

ATTN: MEGHAN McNAB

JOB NO:	SAL25467B
CLIENT ORDER:	R8453
DATE RECEIVED:	20/04/15
DATE COMPLETED:	21/04/15
TYPE OF SAMPLES:	PAINTS
NO OF SAMPLES:	6

NATA Accredited for compliance with ISO/IEC 17025

.....
Issued on 21/04/15
Lance Smith
(Chief Chemist)

SYDNEY ANALYTICAL LABORATORIES

ANALYTICAL REPORT

JOB NO: SAL25467B
CLIENT ORDER: R8453

	SAMPLES	Pb %
1	Pb2622	0.42
2	Pb2623	0.95
3	Pb2624	48.8
4	Pb2625	15.4
5	Pb2626	1.5
6	Pb2627	10.0
MDL		0.01
Method Code		A8
Preparation		P1

ANALYTICAL REPORT

JOB NO: SAL25467B
CLIENT ORDER: R8453

METHODS OF PREPARATION AND ANALYSIS

The tests contained in this report have been carried out on the samples as received by the laboratory.

P1	Analysis performed on sample as received
A8	Lead - Total in Paint/Dust (HNO3 Digest) Determined by APHA 3111B (Flame AAS)

Appendix B

Material Priority Assessment and Categorisation

Material Assessment Asbestos Only

Sample Variable	Examples	Score
Asbestos Type	Chrysotile	1
	Amosite	2
	Crocidolite, UMF	3
Product Type (Product Friability)	Asbestos reinforced composites (plastics, resins, mastics, vinyl floor tiles, semi rigid paints, decorative finishes and asbestos cement	1
	Fibre board, low density boards, fabrics (e.g. fire blanket), felt, and gasket	2
	Thermal Insulation, dust, mill board, sprayed coating, mattresses, paper, rope or any material that can be pulverised or crumbled between fingers	3
Surface Treatment	Composite materials. putty, resins, floor tiles etc.	0
	Enclosed sprays, lagging, sealed fibre board (exposed face painted) or Cement	1
	Non-encapsulated fibre boards and textiles, encapsulated thermal insulation.	2
	Unsealed thermal insulation. Unsealed lagging or sprays, dust, fire damaged cement, paper, etc.	3
Extent of Damage	Good condition, no visible damage	0
	Low damage, a few scratches	1
	Medium damage, significant breakages. Loose fibres visible	2
	High damage, visible asbestos debris	3

Material Assessment Other Hazardous Materials

Sample Variable	Examples	Score
Material Type	≥300mg Soil Lead, ≥1mg/m^2 Lead Dust, ≥0.1% Lead Paint, PCB ODS (HFC), SMF (Good damage)	1
	≥600mg Soil Lead, ≥4mg/m^2 Lead Dust, ≥0.25% Lead Paint, PCB ODS (HCFC), SMF(Medium Condition)	2
	≥1200mg Soil Lead, ≥8mg/m^2 Lead Dust, ≥1% Lead Paint, PCB ODS (CFC & BFC), SMF (High Damage)	3
Friability	Lead Paint and fixings in good condition , functioning ODS unit, In-situ SMF, Operation PCB	1
	Lead paint debris and soil, ODS stored and not functioning, SMF ceiling insulation, pipe and boiler insulation and non-functioning stored goods, non-functioning and stored PBCs	2
	Lead dust and highly damaged paint flacks, Highly damaged ODS, SMF debris, dust and loose insulation, Highly damaged PCBs with leak marks	3
Surface Treatment	Composite Materials – reinforced with plastic or cladded or enclosed etc.	0
	Encapsulated d in good condition	1
	Unsealed and early signs of damage	2
	Unsealed lagging, loose paints and dust or leak marks	3
Extend of Damage	Good Condition – no visible damage	0
	Low Damage – few scratches on surface, broken edges etc	1
	Medium Damage – significant breakage of material, fibrous	2
	High Damage – Damage/delaminating and/or visible debris	3

The material assessment has a maximum score of 12.

Non-Hazardous materials will have no score

Material Assessment Scoring

- **A. (<4) Very low potential for Hazmat exposures**
- **B. (5-6) Low potential for Hazmat exposure**
- **C. (7-9) Medium potential for Hazmat exposure**
- **D. (10-12) High potential for Hazmat exposure**

This scoring system should be used alongside a current risk assessment (the structure of which is found below) in providing accurate management of asbestos containing materials.

Priority Assessment

Normal Occupant Activity – Non Maintenance		Average of these two scores
Rare disturbance – little used store	0	
Low disturbance – office type	1	
Periodic disturbance – Industrial or vehicular activity	2	
High disturbance – e.g. fire door in constant use	3	
Other Occupant Activity – Non Maintenance		
Rare disturbance – little used store	0	
Low disturbance – office type	1	
Periodic disturbance – Industrial or vehicular activity	2	
High disturbance – e.g. fire door in constant use	3	
Likelihood of Disturbance – Location		Average of these three scores
Outdoors	0	
Large rooms > 100m^2	1	
Rooms up to 100m^2	2	
Confined Spaces	3	
Accessibility of Material		
Usually inaccessible	0	
Occasionally visited	1	
Easily visited	2	
Routinely visited	3	
Extent/Amount		
Small amounts (fuse boxes, single items, etc)	0	
<10m^2 OR <10m run	1	
>10m <50m^2 OR >10m <50m^2	2	
>50m^2 OR 50m run	3	
No. of Occupants		Average of these three scores
None	0	
1 to 4	1	
4 to 10	2	
>10	3	
Frequency of Use		
Infrequently	0	
Monthly	1	
Weekly	2	
Daily	3	
Average Time of Use		
<1 Hour per day	0	
>1 Hour and <3 Hours per day	1	
>3 Hours and <6 Hours per day	2	
>6 Hours per day	3	

Maintenance Activity		Average of these two scores
Minor disturbance possible	0	
Low disturbance possible	1	
Medium disturbance possible	2	
High disturbance possible	3	
Maintenance Frequency		
Material unlikely to be disturbed	0	
<1 activity per Year	1	
>1 activity per Year	2	
> 1 activity per Month	3	

The priority assessment should be formed from the total of the material assessment score and the 4 categories grouped above.

Risk Assessment Scoring and Action Level

A. **(18 +) High risk material**
B. **(14-17) Medium risk material**
C. **(9-13) Low risk material**
D. **(2-8) Minor risk material**
E. **No asbestos detected in sample**

Appendix C

Legislations and References

STATE Primary Asbestos Legislation	Asbestos Survey Requirements	Asbestos Documentation Review Requirements	Reporting Requirements	Labelling/Signage Requirements	Supporting Documentation
http://www.safeworkaustralia.gov.au/sites/swa/model-whs-laws/pages/jurisdictional-progress-whs-laws					
COMMONWEALTH Work Health & Safety Act 2011 Work Health & Safety Regulations 2011 *Chapter 8 - Asbestos*	Person who manages or controls a workplace must ensure, so far is reasonably practicable, that all asbestos present under their management or control is identified by a ***competent person***. If sampling is to be conducted must be NATA accredited laboratory. A written Asbestos Management Plan (AMP) is required if asbestos is identified at the workplace. An asbestos register is to be kept at the workplace.	Asbestos Management Plan (AMP) & Asbestos Register are to be kept current. Should be reviewed at least once every 5 years.	AMP must include information identification of asbestos, decisions on management of identified materials, as well as procedures for detailing incidents and emergencies with regard to asbestos and consolation, responsibility and training of persons who will be involved with asbestos works. Asbestos register is to contain details of the location, type and condition asbestos materials plus date asbestos was identified. An asbestos register is not required if building/structure was constructed after 31 December 2003.	The regulations require that the presence and location of asbestos is clearly identified, and that where practicable, the identification is by labelling.	Safe Work Australia Code of Practice - How to Manage and Control Asbestos in the Workplace 2011.

STATE Primary Asbestos Legislation	Asbestos Survey Requirements	Asbestos Documentation Review Requirements	Reporting Requirements	Labelling/Signage Requirements	Supporting Documentation
AUSTRALIAN CAPITAL TERRITORY Work Health & Safety Act 2011 Work Health & Safety Regulations 2011 *Chapter 8 - Asbestos*	Person who manages or controls a workplace must ensure, so far is reasonably practicable, that all asbestos present under their management or control is identified by a ***competent person***. If sampling is to be conducted must be NATA accredited laboratory. A written Asbestos Management Plan (AMP) is required if asbestos is identified at the workplace. An asbestos register is to be kept at the workplace.	Asbestos Management Plan (AMP) & Asbestos Register are to be kept current. Should be reviewed at least once every 5 years.	AMP must include information identification of asbestos, decisions on management of identified materials, as well as procedures for detailing incidents and emergencies with regard to asbestos and consolation, responsibility and training of persons who will be involved with asbestos works. Asbestos register is to contain details of the location, type and condition asbestos materials plus date asbestos was identified. An asbestos register is not required if building/structure was constructed after 31 December 2003.	The regulations require that the presence and location of asbestos is clearly identified, and that where practicable, the identification is by labelling.	Safe Work Australia Code of Practice - How to Manage and Control Asbestos in the Workplace 2011.
NEW SOUTH WALES Work Health & Safety Act 2011 Work Health & Safety Regulations 2011 *Chapter 8 - Asbestos*	Person who manages or controls a workplace must ensure, so far is reasonably practicable, that all asbestos present under their management or control is identified by a ***competent person***. If sampling is to be conducted must be NATA accredited laboratory. A written Asbestos Management Plan (AMP) is required if asbestos is identified at the workplace. An asbestos register is to be kept at the workplace.	Asbestos Management Plan (AMP) & Asbestos Register are to be kept current. Should be reviewed at least once every 5 years.	AMP must include information identification of asbestos, decisions on management of identified materials, as well as procedures for detailing incidents and emergencies with regard to asbestos and consolation, responsibility and training of persons who will be involved with asbestos works. Asbestos register is to contain details of the location, type and condition asbestos materials plus date asbestos was identified. An asbestos register is not required if building/structure was constructed after 31 December 2003.	The regulations require that the presence and location of asbestos is clearly identified, and that where practicable, the identification is by labelling.	Safe Work Australia Code of Practice - How to Manage and Control Asbestos in the Workplace 2011.

STATE Primary Asbestos Legislation	Asbestos Survey Requirements	Asbestos Documentation Review Requirements	Reporting Requirements	Labelling/Signage Requirements	Supporting Documentation
NORTHERN TERRITORY Work Health & Safety (National Uniform Legislation) Act 2011 Work Health & Safety (National Uniform Legislation) Regulations 2011 *Chapter 8 - Asbestos*	Person who manages or controls a workplace must ensure, so far is reasonably practicable, that all asbestos present under their management or control is identified by a ***competent person***. If sampling is to be conducted must be NATA accredited laboratory. A written Asbestos Management Plan (AMP) is required if asbestos is identified at the workplace. An asbestos register is to be kept at the workplace.	Asbestos Management Plan (AMP) & Asbestos Register are to be kept current. Should be reviewed at least once every 5 years.	AMP must include information identification of asbestos, decisions on management of identified materials, as well as procedures for detailing incidents and emergencies with regard to asbestos and consolation, responsibility and training of persons who will be involved with asbestos works. Asbestos register is to contain details of the location, type and condition asbestos materials plus date asbestos was identified. An asbestos register is not required if building/structure was constructed after 31 December 2003.	The regulations require that the presence and location of asbestos is clearly identified, and that where practicable, the identification is by labelling.	Safe Work Australia Code of Practice - How to Manage and Control Asbestos in the Workplace 2011.
QUEENSLAND Work Health & Safety Act 2011 Work Health & Safety Regulations 2011 *Chapter 8 - Asbestos*	Person who manages or controls a workplace must ensure, so far is reasonably practicable, that all asbestos present under their management or control is identified by a ***competent person***. If sampling is to be conducted must be NATA accredited laboratory. A written Asbestos Management Plan (AMP) is required if asbestos is identified at the workplace. An asbestos register is to be kept at the workplace.	Asbestos Management Plan (AMP) & Asbestos Register are to be kept current. Should be reviewed at least once every 5 years.	AMP must include information identification of asbestos, decisions on management of identified materials, as well as procedures for detailing incidents and emergencies with regard to asbestos and consolation, responsibility and training of persons who will be involved with asbestos works. Asbestos register is to contain details of the location, type and condition asbestos materials plus date asbestos was identified. An asbestos register is not required if building/structure was constructed after 31 December 2003.	The regulations require that the presence and location of asbestos is clearly identified, and that where practicable, the identification is by labelling.	Safe Work Australia Code of Practice - How to Manage and Control Asbestos in the Workplace 2011.

STATE Primary Asbestos Legislation	Asbestos Survey Requirements	Asbestos Documentation Review Requirements	Reporting Requirements	Labelling/Signage Requirements	Supporting Documentation
SOUTH AUSTRALIA Work Health & Safety Act 2012 Work Health & Safety Regulations 2012 *Chapter 8 - Asbestos*	Person who manages or controls a workplace must ensure, so far is reasonably practicable, that all asbestos present under their management or control is identified by a ***competent person***. If sampling is to be conducted must be NATA accredited laboratory. A written Asbestos Management Plan (AMP) is required if asbestos is identified at the workplace. An asbestos register is to be kept at the workplace.	Asbestos Management Plan (AMP) & Asbestos Register are to be kept current. Should be reviewed at least once every 5 years.	AMP must include information identification of asbestos, decisions on management of identified materials, as well as procedures for detailing incidents and emergencies with regard to asbestos and consolation, responsibility and training of persons who will be involved with asbestos works. Asbestos register is to contain details of the location, type and condition asbestos materials plus date asbestos was identified. An asbestos register is not required if building/structure was constructed after 31 December 2003.	The regulations require that the presence and location of asbestos is clearly identified, and that where practicable, the identification is by labelling.	Safe Work Australia Code of Practice - How to Manage and Control Asbestos in the Workplace 2011.
TASMANIA Work Health & Safety Act 2012 Work Health & Safety Regulations 2012 *Chapter 8 - Asbestos*	Person who manages or controls a workplace must ensure, so far is reasonably practicable, that all asbestos present under their management or control is identified by a ***competent person***. If sampling is to be conducted must be NATA accredited laboratory. A written Asbestos Management Plan (AMP) is required if asbestos is identified at the workplace. An asbestos register is to be kept at the workplace.	Asbestos Management Plan (AMP) & Asbestos Register are to be kept current. Should be reviewed at least once every 5 years.	AMP must include information identification of asbestos, decisions on management of identified materials, as well as procedures for detailing incidents and emergencies with regard to asbestos and consolation, responsibility and training of persons who will be involved with asbestos works. Asbestos register is to contain details of the location, type and condition asbestos materials plus date asbestos was identified. An asbestos register is not required if building/structure was constructed after 31 December 2003.	The regulations require that the presence and location of asbestos is clearly identified, and that where practicable, the identification is by labelling.	Safe Work Australia Code of Practice - How to Manage and Control Asbestos in the Workplace 2011.

STATE Primary Asbestos Legislation	Asbestos Survey Requirements	Asbestos Documentation Review Requirements	Reporting Requirements	Labelling/Signage Requirements	Supporting Documentation
VICTORIA Occupational Health & Safety Act 2004 Occupational Health and Safety Regulations 2007 – *Part 4.3 - Asbestos*	Person who manages or controls a workplace must ensure, so far is reasonably practicable, identify all asbestos present that is under their management or control. Must determine the location, type, friability condition and likelihood of ACM sustaining damage or deterioration. Division 6 requires that prior to any demolition or refurbishment works, the person who manages or controls the workplace must review the asbestos register and revise if it is inadequate in regard to the planned works.	Undertake review and revision of risk assessment when condition of asbestos changes, remedial work has been carried out or the assessment is no longer valid. At least once every 5 years.	Reports must include the type, location, friability & condition of asbestos, Identification of inaccessible areas and risk assessment including dates.	The regulations require that the presence and location of asbestos is clearly identified, and that where practicable, the identification is by labelling.	Work Safe Victoria Compliance Code – Managing Asbestos in Workplaces Work Safe Victoria Compliance Code – Removing Asbestos in Workplaces
http://www.austlii.edu.au/au/legis/vic/consol_reg/ohasr2007382/					
WESTERN AUSTRALIA Occupational Safety and Health Act 1984 Occupational Health and Safety Regulations 1996 *Division 4 - Further requirements in relation to certain hazardous substances. Subdivision 1 – Asbestos. Regulation 5.43*	Employer, main contractor, self-employed person or person having control of the workplace to ensure that presence and location of asbestos at the workplace is identified. The process of identification and assessment of risks arising from asbestos hazards are to be conducted in accordance with the Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC: 2018 (2005)].	Annual review of register and management plan under NOHSC: 2018(2005). A visual inspection of ACM should be undertaken as part of any review.	Under NOHSC:2018(2005): Maintain a register on the premises which includes date of assessment, location & types of asbestos, analysis, risk assessments, control measures, and details of competent person who undertook the assessment. Details of presumptions made and likely asbestos in inaccessible areas to be included	Warning signs & labels to be used in conjunction with the workplace register to warn people of the presence of ACM. Competent person to determine number and position of labels. Areas containing ACM to be signposted.	Health (Asbestos) Regulations 1992 Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC: 2002 (2005)] Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC:2018 (2005)]
http://www.commerce.wa.gov.au/worksafe/content/safety_topics/Asbestos/Asbestos_Management.html					

Historical Exposure Levels and Lead in Paint, Soil and Dust level

AS4361.1 – 1995, Guide to Lead Management, Part 1: Industrial Applications: Assessment of presence of Lead, page 10: For the purpose of this standard, a paint film is considered to be Lead containing if it has lead or lead components in excess of 1.0 precent (w/w) of dried film.

AS4361.2 – 1998, Guide to Lead Management Part 2: Residential and commercial building. 2.3.2 Lead in Paint during maintenance or Renovations: Even at levels of lead below 1% and as low as 0.25%, the dust generated by dry sanding or abrasive blast cleaning can have sufficient lead content to produce exposure levels exceeding those which define a "Lead Risk" in NOHSC 1012

The maximum level of lead in paint for domestic use was lowered to 0.25% in 1992.

Australian Government Department of the Environment, Water, Heritage and the Arts: The Six Step Guide to Painting your Home, Lead Alert, Third edition, page 3: As a rule of thumb, the lead content of paint was limited to 1% by 1970. In 1992, a 0.25% limit on the maximum allowable amount of lead in house paint was recommended. This has been reduced to 0.1% since December 1997.

AIOH POSITION PAPER, Inorganic Lead and Occupational Health Issues, MARCH 2009: The majority of Legislation in Australia for the control of lead exposure in the workplace is modelled on the National Standard Control of Inorganic Lead at Work (NOHSC: 1012) 1994. The AIOH believes that this standard is outdated and does not provide adequate protection to "nearly all workers" and especially females of reproductive capacity. Some multi-national companies have lowered their exposure limits in light of current research.

To reduce potential exposure to airborne lead, an exposure standard of 0.1 mg/m3 (TWA) is recommended. Where there is potential for lead in air to exceed 0.05 mg/m3, or where a risk assessment indicates a need, a blood lead monitoring programme is required.

Under WHS Regulation 2011 and National Standard for the Control of Inorganic Lead at Work [NOHSC:1012(1994)] sets out to minimise adverse health effects caused by lead exposure in the workplace, ensure that an employer controls lead exposure at the source in workplaces, prohibits certain activities at workplaces where lead processes are conducted such as uncontrolled removal and to ensure that all work is carried out in accordance to levels set by the national standard. An employer shall ensure that:

a) a register is kept and maintained for all lead-containing hazardous substances used in the workplace for as long as the lead processes are used;
b) the register contains, as a minimum, the Material Safety Data Sheet for all these hazardous substances, and
c) the register is accessible to all employees with the potential for exposure to lead.
d) An employer shall ensure that a suitable and sufficient assessment is made of the risks to health created by work involving potential exposure to lead.
e) the employer shall ensure that the exposure of employees to lead is either prevented or, where that is not practicable, adequately controlled so as to minimise risks to health.
f) the employer shall use the results of the assessment to develop an ongoing workplace improvement plan which shall be used to progressively reduce lead exposure and blood lead levels to convert existing lead-risk jobs to non-lead-risk jobs.

The employer has the responsibility to ensure that a suitable and sufficient assessment is made of any work involving potential exposure to any lead-containing hazardous substance. It is expected that the employer or manager of the workplace in consultation with employees and employee representatives will conduct the assessment. In each case the individual employer retains the responsibility to ensure the generic assessment is valid for that workplace.

The control of lead in the workplace should not be at the expense of the external environment (which is controlled by other legislation). Where emissions of lead dust or fumes to the general environment may occur, permissible emission levels of the appropriate jurisdiction regulations should not be exceeded.

Safe Environments has taken into account all above mentioned detection and exposure limits and in the absence of an overarching up-to-date detection limit have adopted the most conservative guidelines as recommendation as a guideline for compliance and limit of detection for various lead contaminates which are as follows:

Lead Source / Pathway	Lead Levels	Standard / Guideline Source
Air	**1.5 micrograms/m3 1.5 µg/m3** (90 days average) for ambient air By 2008, NSW is required to comply with the National Environment Protection Measure for Ambient Air Quality which limits lead in air to **0.5 micrograms/m3** **0.5 µg/m3**(annual average) **150 µg/m^3 TWA** for worker exposures. Allowable industry emissions to air vary according to company licence but rarely exceed **1.0 µg/m3**	NSW EPA using National Health and Medical Research Council (NHMRC) recommendation as a guideline for compliance National Environment Protection Council (Commonwealth) Act 1994 National Environment Protection Council (New South Wales) Act 1995 National Environment Protection Measure for Ambient Air Quality 1998 Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:1003(1995)]
Soil	General background concentration of total lead in soil is less than 50 mg/kg **300 mg/kg** Investigation level for residential yards, garden, day care centres, pre-schools and primary schools **600 mg/kg** Investigation level for recreational open space, playgrounds, parks and secondary schools **1200 mg/kg** Investigation level for multi-unit building/structures where residents have limited access to soil **1500 mg/kg** Investigation level for commercial and industrial areas	NSW EPA 1994 Australian and New Zealand Environment Conservation Council (ANZECC), National Health and Medical Research Council (NHMRC) and the National Environmental Health Forum recommendation for investigation threshold for lead in soil. These same values have been taken up into the *National Environment Protection (Assessment of Site Contamination) Measure 1999* which was endorsed under s. 105 of the NSW *Contaminated Land Management Act 1997*, as according to a requirement of the *National Environment Protection Council (New South Wales) Act 1995*.
Dust	Bare and carpeted floors and surfaces: **1 mg/m^2** Interior window sills: **5 mg/m^2** Exterior surfaces: **8 mg/m^2**	NSW EPA recommends the use of lead dust standards to determine the safety of the premises for re-occupancy after renovation and clean-up are completed. The lead dust loadings for various surfaces are from AS 4361.2-1998 *Guide to lead paint management Part 2: Residential and Commercial Building/structures*. They were originally based on 1995 US guidance for investigation of lead poisoning. In the US the "clearance" level for bare and carpeted floors was lowered in 2000 to **0.4 mg/m^2** but the Australian standard is yet to change to this more rigorous clearance level.
Paint	**0.1%** maximum lead content for domestic paint (since December 1997) – paint for bridges is now included in this category.	Uniform paint standard – Appendix I of Standard for the Uniform Scheduling of Drugs and Poisons

References

- Australian and New Zealand Environment Conservation Council (ANZECC), National Health and Medical Research Council (NHMRC) and the National Environmental Health Forum recommendation for investigation threshold for lead in soil.
- Australian Standard AS ISO/IEC 17020 *General criteria for the operation of various types of bodies performing inspection*;
- Australian Standard AS ISO/IEC 17025 *General requirements for the competence of testing and calibration laboratories*;
- AS4361.1 – 1995, Guide to Lead Management, Part 1: Industrial Applications: Assessment of presence of Lead
- AS4361.2 – 1998, Guide to Lead Management Part 2: Residential and commercial building/structures.
- Safe Environments Quality Manual;
- Health and Safety Executive (UK), HSG264, *Asbestos: The survey guide*; 2010;
- Health and Safety Executive (UK) HSG248, *Asbestos: The Analysts Guide for Sampling, Analysis and Clerance Procedures*
- Health and Safety Executive (UK), HSG227, *A comprehensive guide to Managing Asbestos in premises*, 2002;
- Code of Practice for the Management and Control of Asbestos in Work Place [NOHSC: 2018 (2005)];
- National Environment Protection Council (Commonwealth) Act 1994;
- National Environment Protection Council (New South Wales) Act 1995;
- National Environment Protection Measure for Ambient Air Quality 1998
- NSW EPA using National Health and Medical Research Council (NHMRC) recommendation as a guideline for compliance
- WA Environmental Health Directorate, *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*; 2009;
- ANZECC, *Identification of PCB-Containing Capacitors*; 1997;
- UNEP, Inventory of Trade Names of Chemical Products Containing Ozone Depleting Substances and their Alternatives; 2001;
- Australian Standard AS 4361.2 *Guide to Lead Paint Management Part 2*; 1998
- Code of Practice: *How to manage and Control Asbestos in the Workplace*; 2011

Appendix D

Hazardous Materials Management Plan

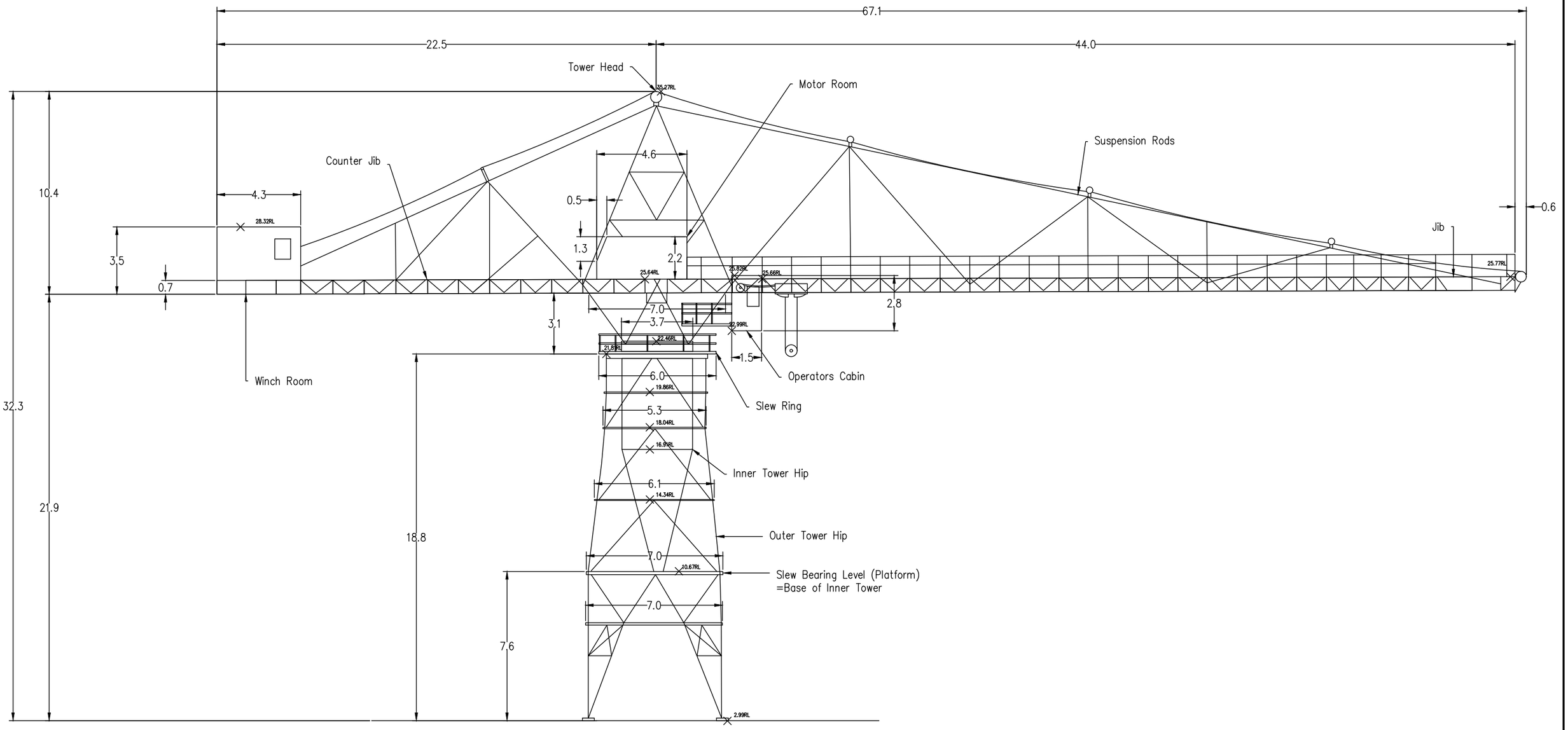
Not included as part of this inspection

Appendix C

Survey Drawings

27 June 2022, prepared by Total Surveying Solutions

ME-MEL GOAT ISLAND - HAMMER HEAD CRANE
ELEVATION VIEW



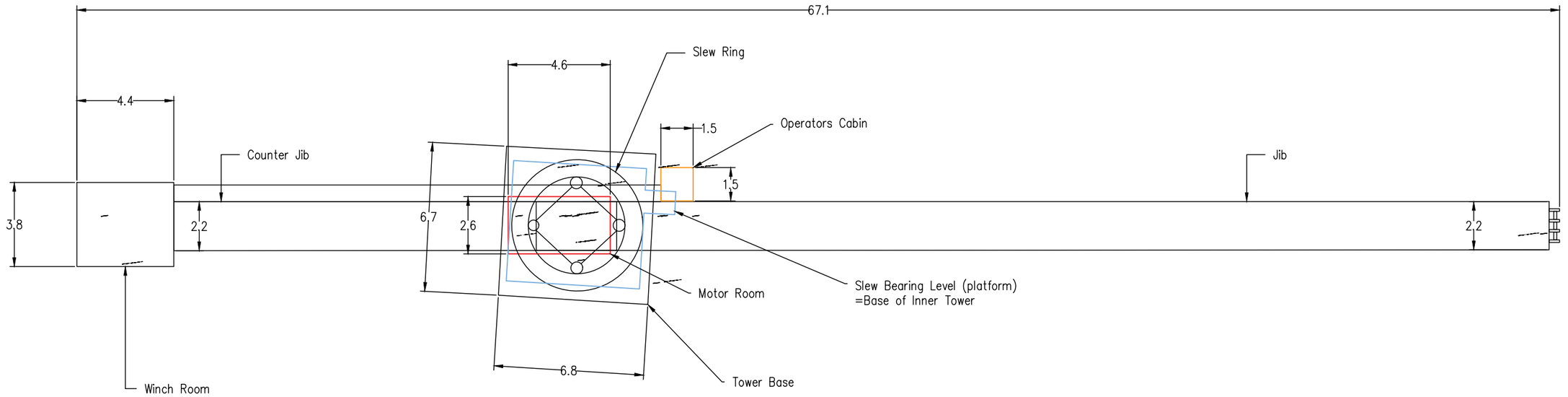
TSS TOTAL SURVEYING SOLUTIONS

LANE COVE | CAMDEN | MANLY VALE | CENTRAL COAST

ME-MEL GOAT ISLAND - HAMMER HEAD CRANE

CLIENT: TTW - TAYLOR THOMSON WHITTING	
PROJECT: HAMMER HEAD CRANE	
ADDRESS: ME-MEL GOAT ISLAND, SYDNEY HARBOUR	
JOB No.: 220577	LGA: UNINCORPORATED AREA
PLAN No.: 220577_A	DATUM: AHD
DATE: 27/06/2022	SCALE: 1:200@A3
DRAWN: EJ	CONT. INTERVAL: N/A
CHK: KF	SHEET 1 OF 2

ME-MEL GOAT ISLAND - HAMMER HEAD CRANE
PLAN VIEW



TSS TOTAL SURVEYING SOLUTIONS

LANE COVE | CAMDEN | MANLY VALE | CENTRAL COAST

ME-MEL GOAT ISLAND - HAMMER HEAD CRANE		
	JOB No.: 220577	LGA: UNINCORPORATED AREA
	PLAN No.: 220577_A	DATUM: AHD
CLIENT: TTW - TAYLOR THOMSON WHITTING	DATE: 27/06/2022	SCALE: 1:200@A3
PROJECT: HAMMER HEAD CRANE	DRAWN: EJ	CONT. INTERVAL: N/A
ADDRESS: ME-MEL GOAT ISLAND, SYDNEY HARBOUR	CHK: KF	SHEET 2 OF 2

NOTE:

THE BOUNDARY INFORMATION SHOWN ON THIS PLAN REGARDING THE LOCATION OF THE PROPERTY BOUNDARIES HAS BEEN TAKEN FROM THE TITLE DEPOSITED PLAN. IT HAS BEEN PLOTTED AS REQUIRED UNDER *DIVISION 1, SECTION 9 (1)* OF THE *"SURVEYING AND SPATIAL INFORMATION REGULATION 2017"* AND IS ACCURATE TO ABOUT ±0.05m. IT HAS NOT BEEN DETERMINED BY AN ACCURATE BOUNDARY SURVEY.

A DETAIL & LEVEL SURVEY IS NOT A "LAND SURVEY" AS DEFINED BY THE SURVEYING AND SPATIAL INFORMATION ACT, 2002. IF ANY CONSTRUCTION OR DESIGN WORK, WHICH RELIES ON CRITICAL SETBACKS FROM THE STREET OR BOUNDARIES IS PLANNED, IT WOULD BE IMPERATIVE TO CARRY OUT FURTHER SURVEY WORK TO DETERMINE THE BOUNDARY DIMENSIONS.

PRIOR TO ANY CONSTRUCTION WORK, SURVEY MARKS SHOULD BE PLACED TO DEFINE THE PROPERTY BOUNDARIES.

SERVICES SHOWN ARE INDICATIVE ONLY. POSITIONS ARE BASED ON SURFACE INDICATOR(S) LOCATED DURING FIELD SURVEY. CONFIRMATION OF THE EXACT POSITION SHOULD BE MADE PRIOR TO ANY EXCAVATION WORK. OTHER SERVICES MAY EXIST WHICH ARE NOT SHOWN.

LEVELS ARE BASED ON AUSTRALIAN HEIGHT DATUM (AHD) USING SSM 99523 WITH RL 7.911 (GNSS OBS) (AHD).

RIDGE & GUTTER HEIGHTS HAVE BEEN OBTAINED BY INDIRECT METHOD AND ARE ACCURATE TO ± 0.05m.

MEAN HIGH WATER MARK BOUNDARY LINE HAS BEEN SCALED IN FROM DP837195 & DP878441 FOR THE PURPOSE OF THIS VERIFICATION PLAN.THE MEAN HIGH WATER MARK HAS NOT BEEN SURVEYED AND SHOULD BE CONFIRMED BY FURTHER SURVEY. DO NOT SCALE OFF THIS PLAN.

AREAS OF LOTS SHOWN ARE TITLE AND LEASE AREAS TAKEN FROM DP837195 & DP878441.

O753519 - THE LAND DESCRIBED IS RESERVED UNDER THE NATIONAL PARKS AND WILDLIFE ACT 1974 AS A NATIONAL PARK KNOWN AS SYDNEY HARBOUR NATIONAL PARK AFFECTING PART OF THE LAND DESCRIBED SHOWN IN GAZ.24.11.1995 FOLIOS 8028-29.

DP878441 - PLAN FOR LEASE PURPOSES.

BOUNDARIES HAVE NOT BEEN LOCATED BY SURVEY. THE BOUNDARIES SHOWN ON THIS PLAN HAVE BEEN TAKEN FROM THE TITLE DEPOSITED PLAN AND ARE APPROXIMATE RELATIVE TO THE DETAIL SURVEY.

OVERALL SHEET

MGA

TN

APPROX. 1°

LEGEND

BENCH MARK	
TELSTRA PIT	TEL
ELECTRIC LIGHT POLE	LP
POWER POLE	PP
SIGN POST	SP
SEWER INSPECTION PIT	SIP
SEWER VENT	SEWER
MANHOLE	MH
SEWER MANHOLE	SMH
STOP VALVE	SV
WATER HYDRANT	HYD
WATER METER	WM
GAS METER	GM
STATE SURVEY MARK	SSM

TSS TOTAL SURVEYING SOLUTIONS

LANE COVE | CAMDEN | MANLY VALE | CENTRAL COAST

REVISION No.	REVISION DATE:	COMMENT:

LEGEND:

TG - TOP OF GUTTER
RR - ROOF RIDGE
FL - FLOOR LEVEL
PA - PARAPET LEVEL
TOW - TOP OF WALL
BOW - BOTTOM OF WALL
CHIM - CHIMNEY
BAL - BALCONY
DD - DISHDRAIN
0.4/10 - DIAMETER/SPREAD

N.T.S.

PLAN SHOWING DETAIL & LEVELS
OVER LOTS 3 & 4 IN DP837195 AND LOTS 13,14,15,16 IN DP878441

CLIENT:	TTW - TAYLOR THOMSON WHITTING	JOB No.: 220577	LGA: UNINCORPORATED AREA
PROJECT:	HAMMERHEAD CRANE, ME-MEL GOAT ISLAND	PLAN No.: 220577-1	DATUM: AHD
ADDRESS:	GOAT ISLAND, SYDNEY HARBOUR	DATE: 27/06/2022	SCALE: 1:600@A0
		DRAWN: AP	CONT. INTERVAL: N/A
		CHK: KF	SHEET 1 OF 3

NOTE:
INFORMATION CONTAINED IN THIS PLAN IS THE COPYRIGHT OF TOTAL SURVEYING SOLUTIONS. THE USE OR DUPLICATION WITHOUT THE WRITTEN CONSENT OF TOTAL SURVEYING SOLUTIONS CONSTITUTES AN INFRINGEMENT OF COPYRIGHT.

TSS TOTAL SURVEYING SOLUTIONS
LANE COVE | CAMDEN | MANLY VALE | CENTRAL COAST

REVISION No.	REVISION DATE:	COMMENT:

LEGEND:
- TG - TOP OF GUTTER
- RR - ROOF RIDGE
- FL - FLOOR LEVEL
- PA - PARAPET LEVEL
- TOW - TOP OF WALL
- BOW - BOTTOM OF WALL
- CHIM - CHIMNEY
- BAL - BALCONY
- DD - DISHDRAIN
- 0.4/10 - DIAMETER/SPREAD

BAR SCALE
PLOTTED SCALE 1:100 (A0 SIZE SHEET)

PLAN SHOWING DETAIL & LEVELS
OVER LOTS 3 & 4 IN DP837195 AND LOTS 13,14,15,16 IN DP878441

CLIENT:	TTW - TAYLOR THOMSON WHITTING
PROJECT:	HAMMERHEAD CRANE, ME-MEL GOAT ISLAND
ADDRESS:	GOAT ISLAND, SYDNEY HARBOUR

JOB No.:	220577	LGA:	UNINCORPORATED AREA
PLAN No.:	220577-1	DATUM:	AHD
DATE:	27/06/2022	SCALE:	1:100@A0
DRAWN:	AP	CONT. INTERVAL:	N/A
CHK:	KF	SHEET	2 OF 3

15
LEASE DP 878441
5.468 ha (M.H.W.M.)
BY DEDN.

3
TITLE DP 837195
5.423 ha (TRAV.)
5.777 ha (M.H.W.M.)

MGA
TN
APPROX.

TSS TOTAL SURVEYING SOLUTIONS
LANE COVE | CAMDEN | MANLY VALE | CENTRAL COAST

NOTE:
INFORMATION CONTAINED IN THIS PLAN IS THE COPYRIGHT OF TOTAL SURVEYING SOLUTIONS. THE USE OR DUPLICATION WITHOUT THE WRITTEN CONSENT OF TOTAL SURVEYING SOLUTIONS CONSTITUTES AN INFRINGEMENT OF COPYRIGHT.

REVISION No.	REVISION DATE:	COMMENT:

LEGEND:
TG - TOP OF GUTTER
RR - ROOF RIDGE
FL - FLOOR LEVEL
PA - PARAPET LEVEL
TOW - TOP OF WALL
BOW - BOTTOM OF WALL
CHIM - CHIMNEY
BAL - BALCONY
DD - DISHDRAIN
0.4/10 - DIAMETER/SPREAD

BAR SCALE
0 1 2 3 4 5 10m
PLOTTED SCALE 1:100 (A0 SIZE SHEET)

PLAN SHOWING DETAIL & LEVELS
OVER LOTS 3 & 4 IN DP837195 AND LOTS 13,14,15,16 IN DP878441

CLIENT:	TTW - TAYLOR THOMSON WHITTING	JOB No.: 220577	LGA: UNINCORPORATED AREA
PROJECT:	HAMMERHEAD CRANE, ME-MEL GOAT ISLAND	PLAN No.: 220577-1	DATUM: AHD
ADDRESS:	GOAT ISLAND, SYDNEY HARBOUR	DATE: 27/06/2022	SCALE: 1:100@A0
		DRAWN: AP	CONT. INTERVAL: N/A
		CHK: KF	SHEET 3 OF 3

Appendix D

Original Sir William Arrol & Co Ltd Drawings

Drawings showing electrical circuitry and conduits, the control cabin controls, rack and slew house motors (motor room), hoisting and racking gear brakes, collector gear, racking machinery (winch room) and overload device.

Found amongst old Maritime Services Board drawings in two rooms on the upper floor at Greycliffe House

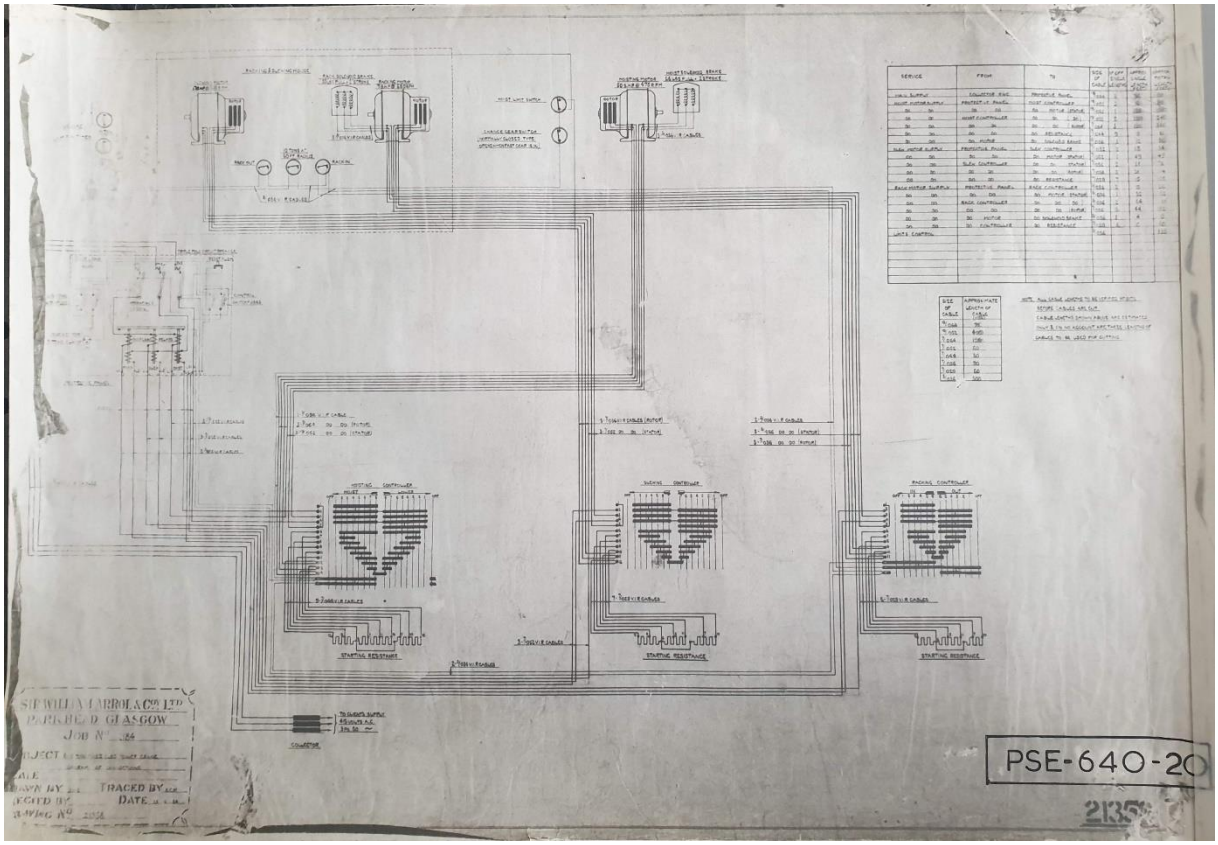


Figure 5 – Electrical circuits

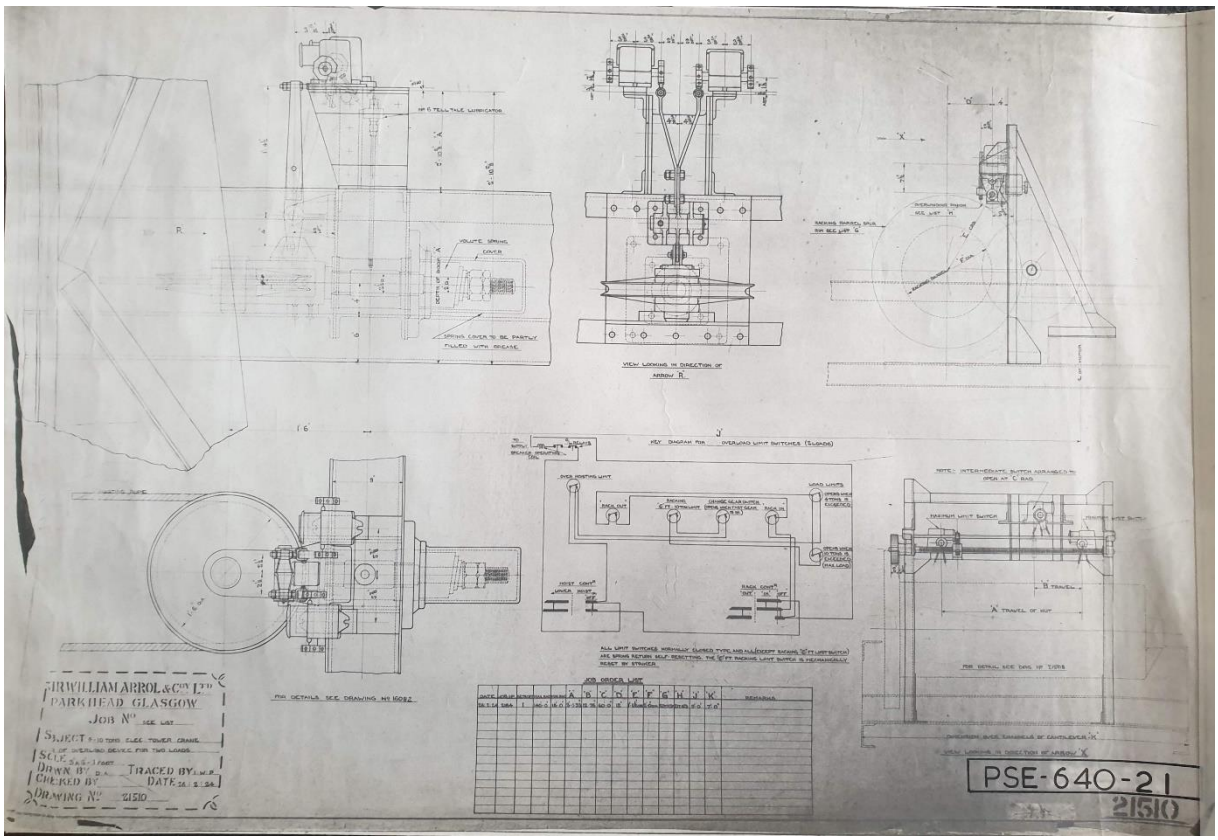


Figure 6 – Overload device

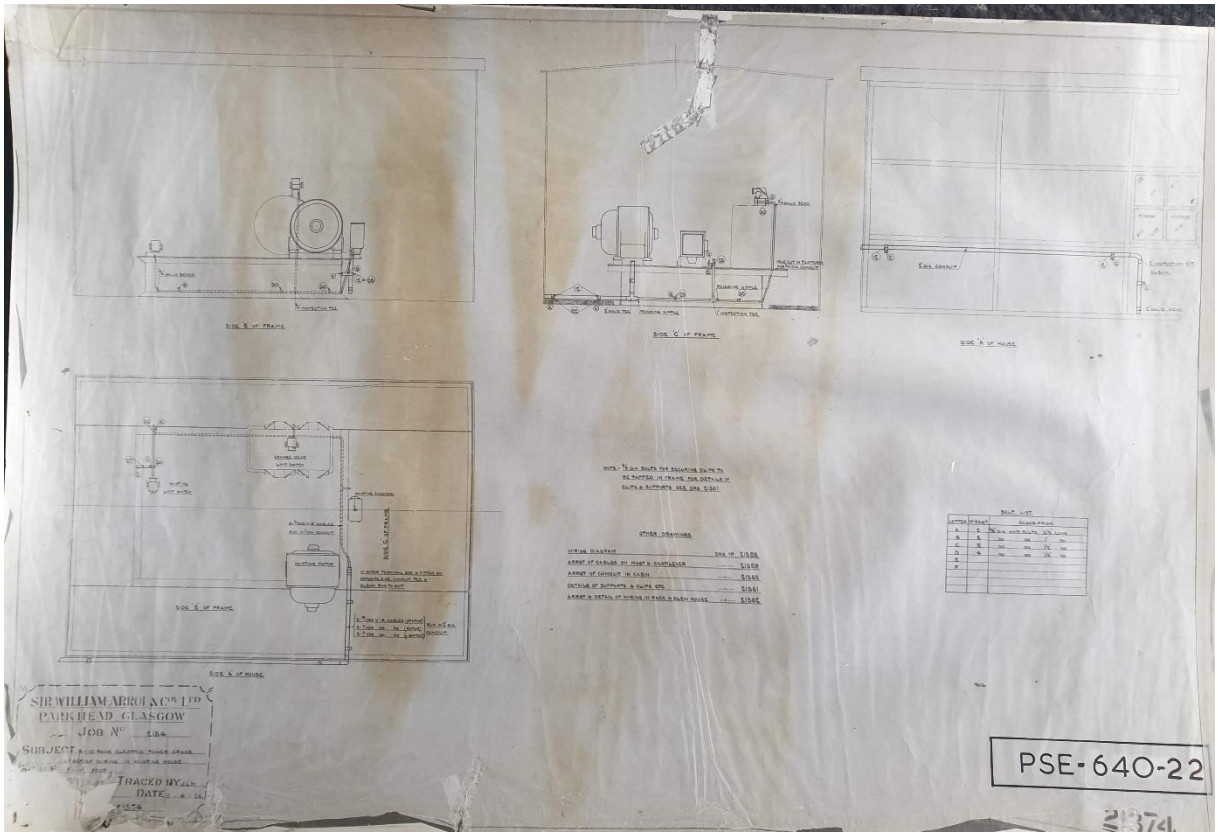


Figure 7 - Wiring in hoisting house (winch room)

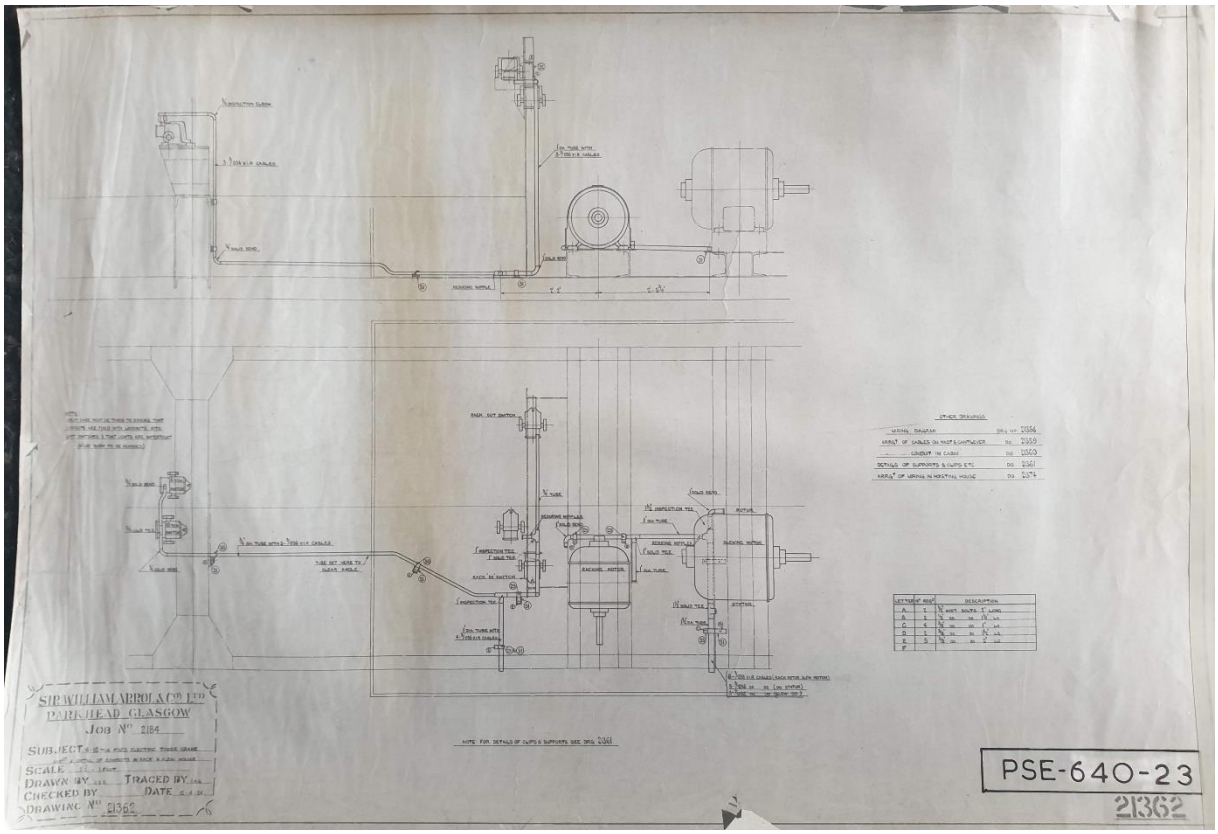


Figure 8 - Conduits in rack and slew house (motor room)

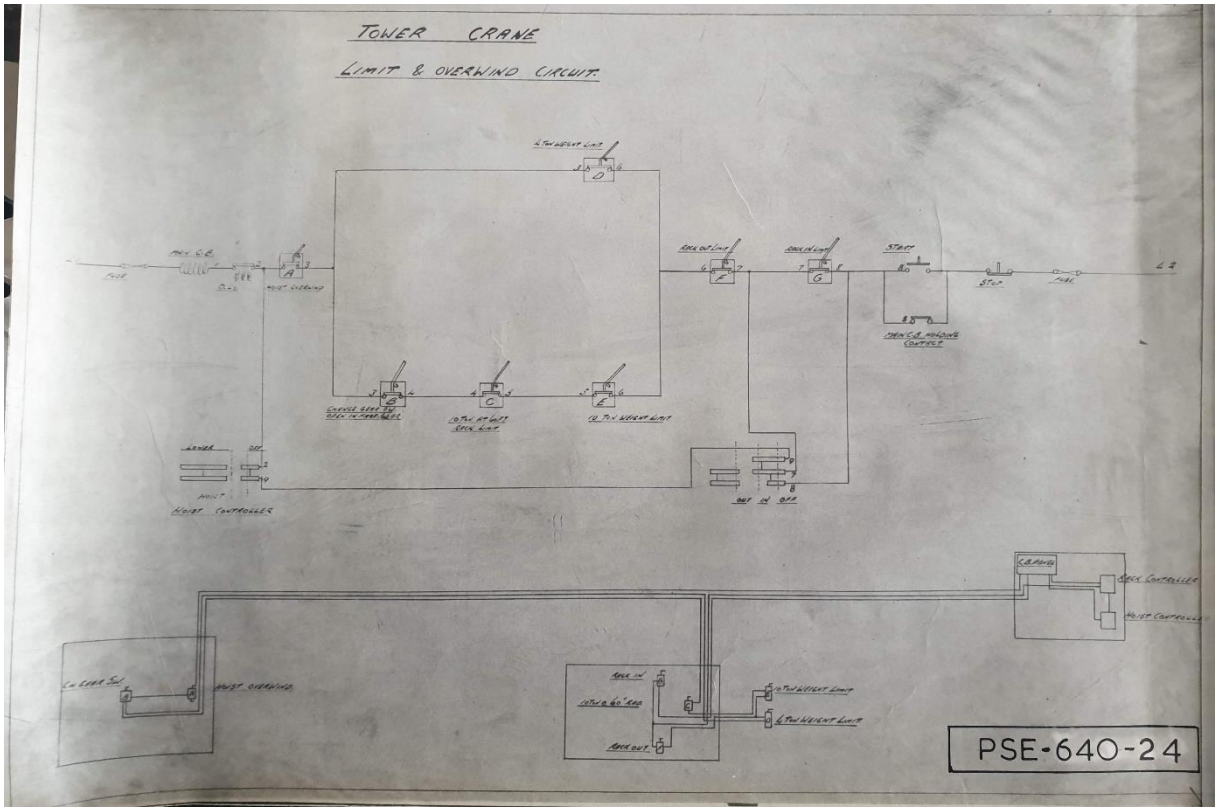


Figure 9 - Limit and overwind circuit

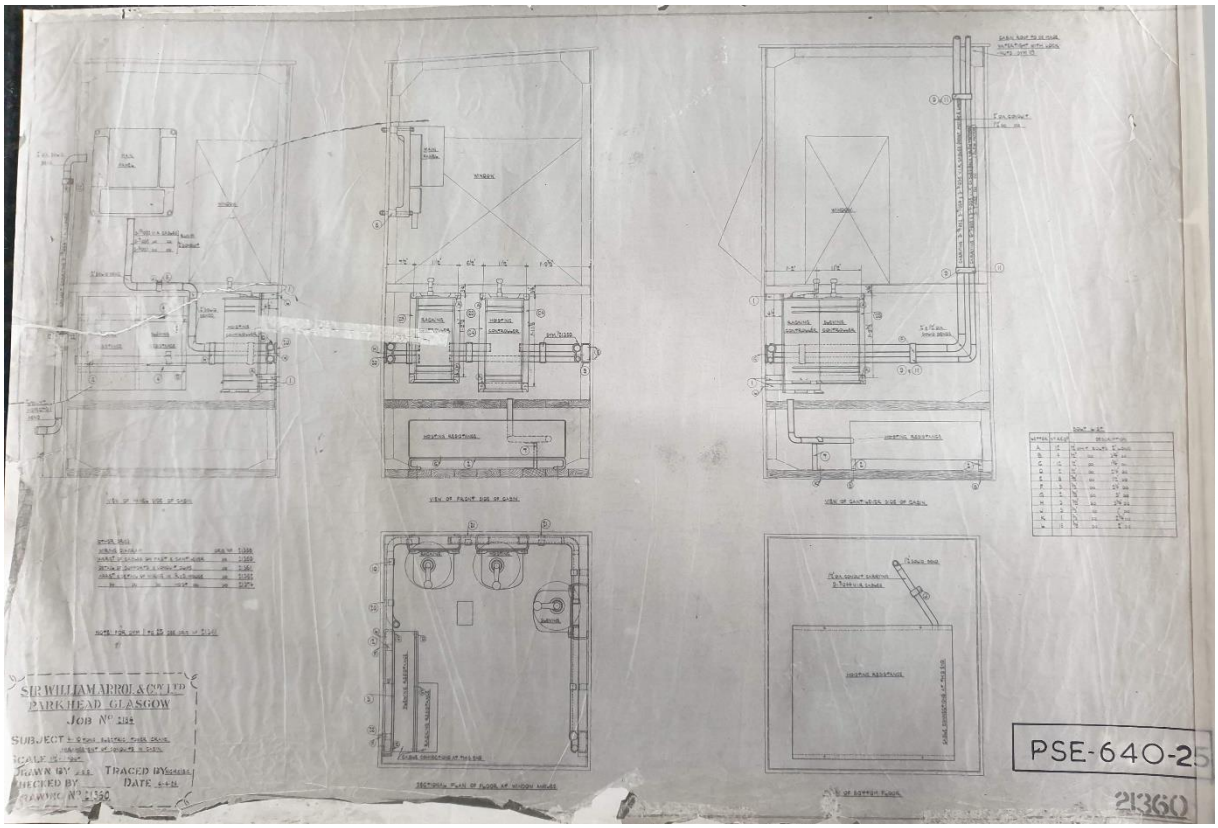


Figure 10 - Arrangement of conduits in control cabin

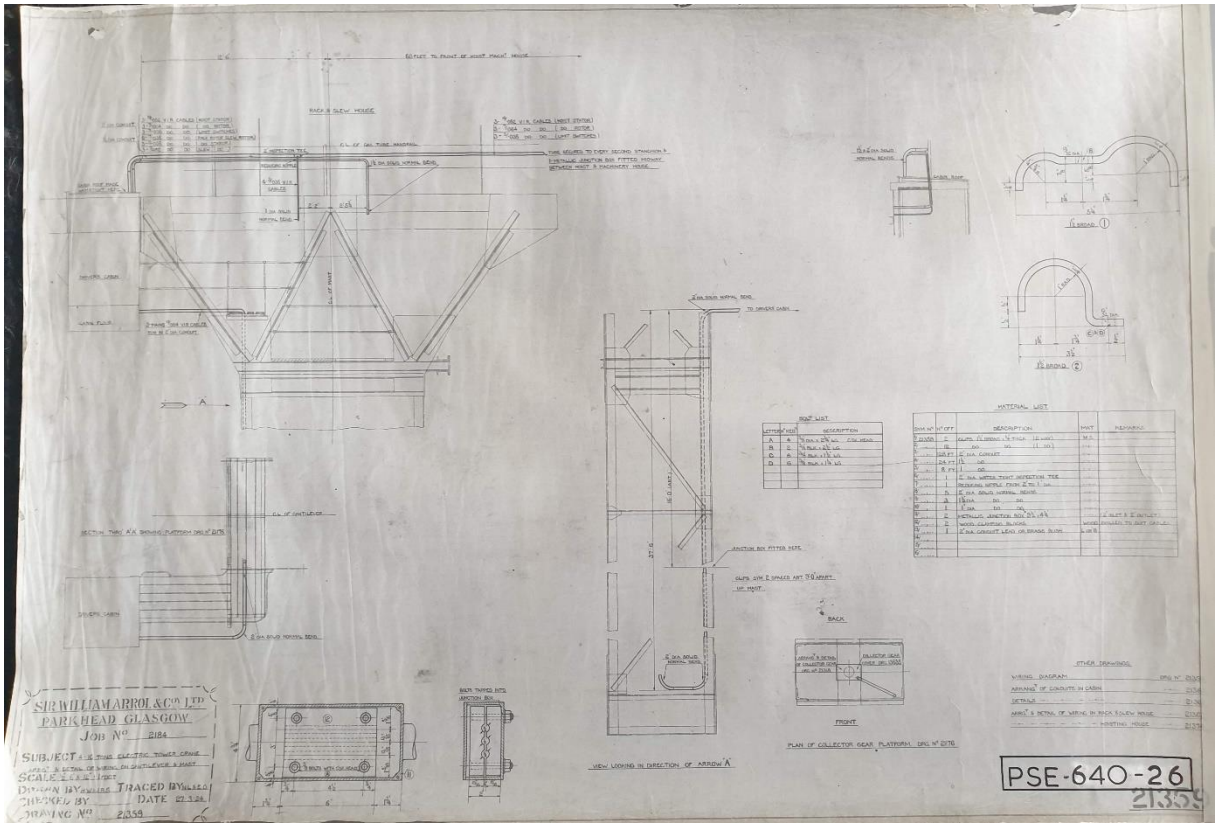


Figure 11 - Wiring on cantilever and mast

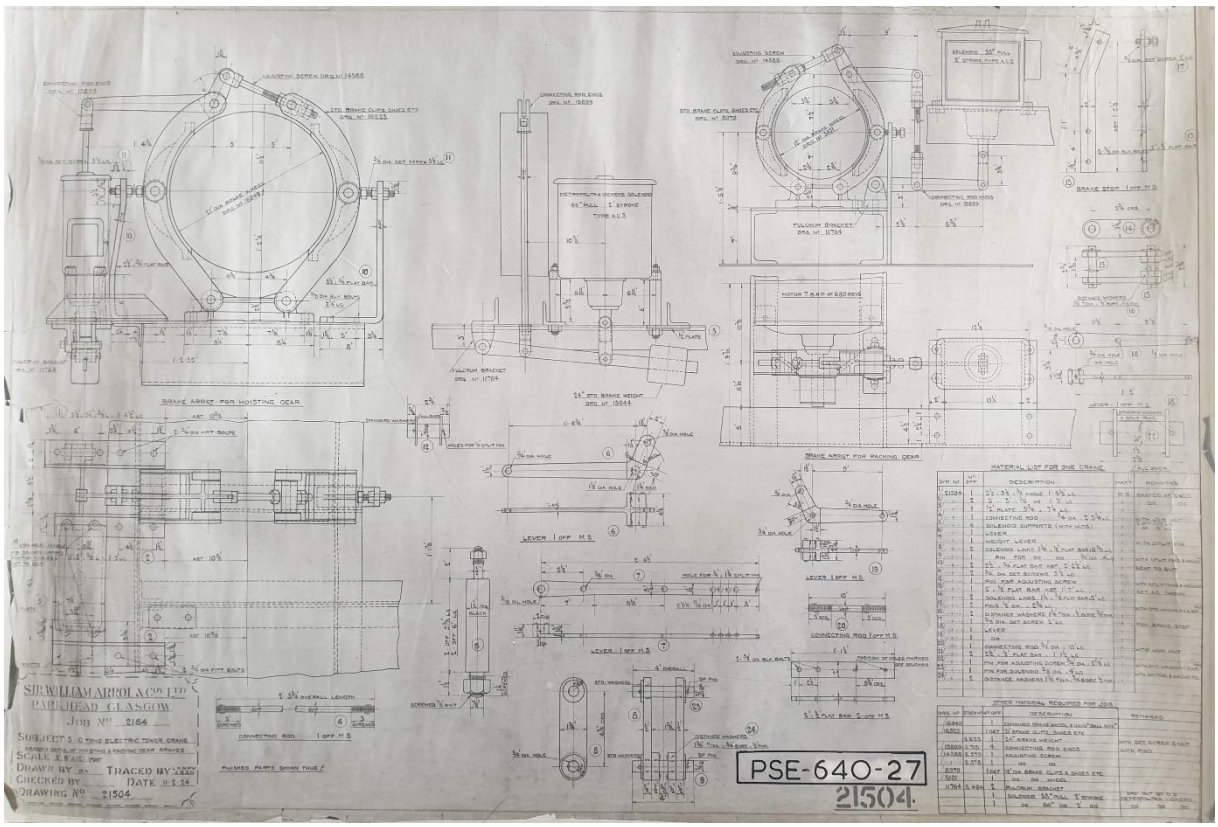


Figure 12 - Hoisting and racking gear brakes (motor room)

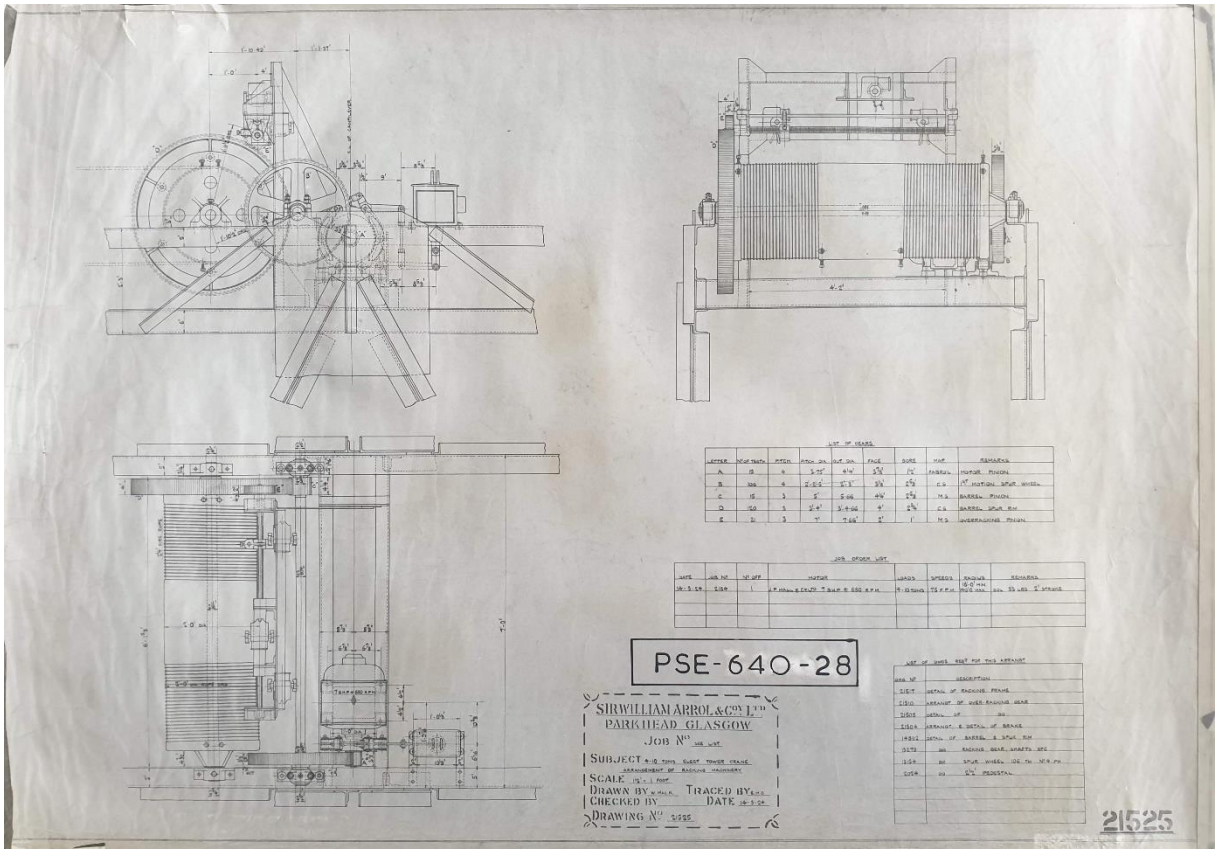


Figure 13 - Arrangement of racking machinery (winch room)

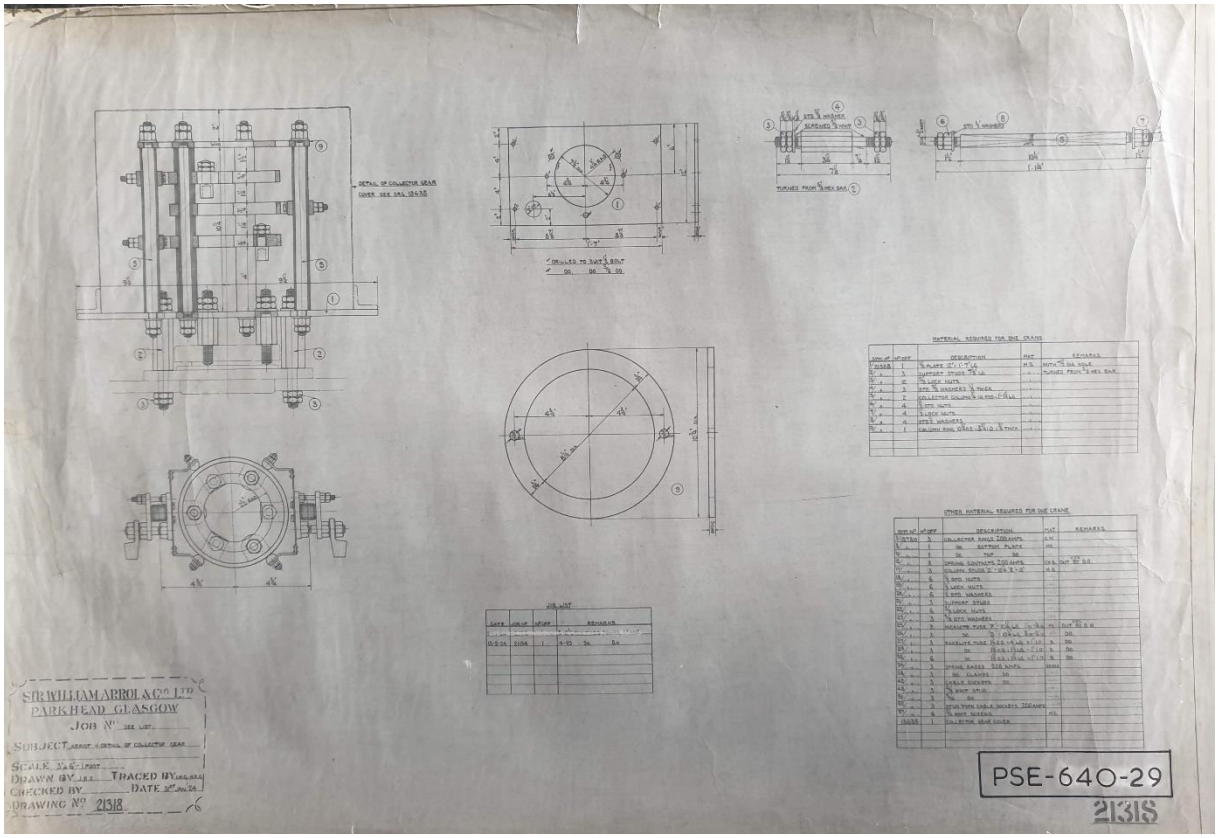


Figure 14 - Collector gear