Australian Government
Asbestos Safety and Eradication Agency

# ASEA REPORTS


# Case studies of significant asbestos removal projects

As prepared by rawtec reincarnate strategic environmental consultants prensa

Asbestos Safety and Eradication Agency Report – 12-2017

# Case studies of significant asbestos removal projects

*Final Report*

## Disclaimer

This report has been prepared for Asbestos Safety and Eradication Agency in accordance with the terms and conditions of appointment dated 15 December 2016. Rawtec has collected and collated information from public and confidential sources, most provided as secondary information and via stakeholder interviews. Whilst we are confident that this information reflects the projects outlined in this report, Rawtec Pty Ltd cannot accept any responsibility for use or reliance of this report or its contents by any third party.



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## List of acronyms

| | |
|---|---|
| **ACM** | Asbestos Containing Material |
| **ACT** | Australian Capital Territory |
| **ASEA** | Asbestos Safety and Eradication Agency |
| **NATA** | National Association of Testing Authorities |
| **NSW** | New South Wales |
| **NT** | Northern Territory |
| **OHS** | Occupational Health and Safety |
| **SA** | South Australia |
| **VIC** | Victoria |
| **WA** | Western Australia |
| **WHS** | Work Health and Safety |

# Executive Summary

*The Asbestos Safety and Eradication Agency (the Agency) has been established to facilitate a national approach to managing asbestos in Australia. Preventing the risk of asbestos exposure is the Agency's core purpose and this is delivered through the National Strategic Plan for Asbestos Management and Awareness. The plan provides a framework that supports each state and territory in working cooperatively and independently to achieve key objectives.*

*The sharing of knowledge and information on effective safe management and removal of asbestos is essential in building capacity within Australia to manage the legacy of ageing asbestos in the built environment. To facilitate this, the Agency has developed a series of case studies that demonstrate safe and effective options to remove asbestos from the built environment.*

The case studies aim to examine a variety of approaches to asbestos management including:

- Approaches to site assessment; sampling and testing
- Development of conceptual site models
- Use of asbestos registers and management plans to identify and prioritise removal in large property and infrastructure portfolios
- Identification of the investment/cost of removal, and how decisions to invest in removal are made
- Analysis of the cost and benefit of different approaches
- Identification of innovative removal practices
- Consideration for the social impact of asbestos and risks of exposure
- Removal, storage, transport and disposal practices
- Remediation

## Methodology

The case studies have been developed in collaboration with key government and industry stakeholders, including:

- Research and documenting asbestos removal projects across Australia in the build environment;
- Shortlisting these projects based on the relevance to the desired case studies, in particular looking for projects that have had a significant impact on good practice approaches;
- Collecting and collating information on each shortlisted project via detailed stakeholder consultation;
- Developing comprehensive case studies of shortlisted projects using the information collected.

## Key findings

This report presents eleven case studies of significant asbestos removal works in the built environment. Whilst these are designed to be stand-alone case studies, there are lessons and findings that are relevant to all asbestos removal projects. Some of the key findings from the project are summarised as follows:

### *Benefits of proactive asbestos removal*

There are several stages in the management of asbestos containing materials in the built environment. The decision to move from in-situ management of asbestos to full removal depends on many factors, including consideration of costs and benefits (see 'Business case for removal' below).

A number of projects presented in this report highlight organisations making informed, proactive decisions to remove asbestos completely in order to:

- Reduce the risk of exposure to asbestos by the community, employees and contractors
- Remove future costs from ongoing maintenance
- Increase opportunities for future land / building use and development.

The City of Adelaide for example removed significant volumes of asbestos from the former Balfours Building to protect the community and security staff accessing the site, providing safety benefits for a key area of the Adelaide CBD. Similarly, BOC Australia made the decision to strip some 6,500$m^2$ of asbestos roof and wall sheeting to reduce the risk from future storm damage.

Utilities, such as power and water infrastructure, require constant maintenance and management by staff and contractors. Ausgrid undertook a corrective maintenance program to remove asbestos from 13 of its two-pole substations across Sydney to ensure that risks to the community and maintenance and repair personnel was minimised.

***Key Finding: The most effective way to manage the long-term risks of exposure to asbestos is via its complete removal. Organisations opting to proactively remove asbestos reduce risk to employees and contractors, remove the need for ongoing maintenance and asbestos audits, and ultimately increase the value and potential reuse options for the site.***

### *Health and safety*

All stakeholders consulted during this project recognised that the health and safety of workers and the general public was the number one priority. Leading asbestos removal contractors have detailed training and induction programs and well as developed procedures to ensuring workplace health and safety is demonstrated.

A number of projects in this report have required asbestos removal at heights. Working at heights is a challenge on its own, however coupled with the need to removal asbestos in bubble enclosures this challenge is amplified.

Demolition of the old Amcor paper mill in Botany required removal of some 4,000$m^2$ of asbestos cement roof and wall sheeting. A purpose build aerial work platform was constructed and glove bags were used to remove friable pipe insulation. Similarly, the removal of asbestos paint from two-pole electrical substations in Sydney required full scaffolds, work permits and a number of iterations to the removal methodology to find the most effective solution.

***Key Finding: Removal of asbestos at height remains a key challenge for the industry. It is essential to plan early and work with relevant regulators and site personnel to develop a safe and effective solution for both removal works and the movement of bagged asbestos waste. Developing sound***

***approaches to removing asbestos at height reduces the risk of falls and avoids potential delays to the asbestos removal program.***

### *Effective communication and consultation*

Successful asbestos removal projects require planned and effective communication and consultation. Many of the case studies presented in this report highlight areas where communication between key internal and external stakeholders has been essential in project delivery.

In the case of the old Balfours site in Adelaide (Case Study 1), communication between the client, hygienist, superintendent and asbestos removal contractor was essential such that the community and client could be kept informed on project progress.

Other projects have adopted innovative approaches to communications, such as project specific newsletters that are provided regularly (weekly or fortnightly) to project stakeholders.

***Key Finding: Those projects that have demonstrated effective communications have invested time in detailed communications planning to identify stakeholders, their needs and concerns, and to tailor engagement approaches that are fit for purpose. Effective communication and engagement can improve project delivery time, generate strong community support for asbestos removal and reduce the risk of project delays. In addition, projects that are delivered with the support of key stakeholders can add reputational benefits to all involved.***

### *Project planning*

The importance of early planning for asbestos removal works is critical in successful asbestos removal projects.

One of the most important elements of this is ensuring fully intrusive site auditing and sampling can be done prior to tendering for asbestos removal works. A large number of projects suffered from time delays and cost overruns where additional asbestos was found once demolition works had commenced.

A fully compliant pre-demolition asbestos survey should be undertaken to identify, as far as is practicable, all areas where asbestos is present. This may require additional costs upfront, particularly if the site is still occupied as areas inspected will need to be made safe again, however these costs are offset by lower risk of delays and variations.

***Key Finding: Fully intrusive site audits should be undertaken, as far as is practicable, prior to the development and release of tender documentation to ensure time delays and cost overruns can be avoided. Asbestos surveys undertaken for general site compliance (i.e. non-intrusive) should not be relied upon for demolition or refurbishment works.***

### *Responding to challenges*

The case studies presented aim to highlight how different problems and challenges can be solved. In some cases, innovation was demonstrated through the removal program, usually to deal with complex challenges that arose during removal stages.

For instance, to remove sections of asbestos pipe lagging and poles coated in asbestos paint, glove bags were used in several projects. These are purpose made bags that can be wrapped around the pipe so that it can be cut and removed in parts, each being sealed and disposed of as asbestos waste.

At the BOC facility in Rocklea, asbestos contamination in the storm water system, arising from the impacts of a ‘super storm’, was managed using a filter system that allowed for wash water to be cleaned out and asbestos fibres removed. This methodology was developed working closely with Workplace Health and Safety Queensland to ensure compliance requirements were met.

During the removal of asbestos limpet at 199 William Street, Melbourne, an innovative procedure was developed to remove whole façade panels using lifting chains inside a bubble enclosure which extended over the scaffolding on the outside of the building. Due to the lack of ground space in the busy CBD, the roof was used as an exclusion zone to ensure the panels were asbestos free prior to disposal.

***Key Finding: Innovation during asbestos removal is often required where complex situations exist. New approaches can be designed and tested, working closely with the relevant regulators, to ensure that risks are minimised and high quality outcomes are maintained. The benefits of innovation can be significant including reduction in overall costs and time and improved outcomes for stakeholders.***

### *Business case for removal*

There are a number of internal and external factors that need to be considered when assessing the business case for asbestos removal. In many cases, existing regulations will dictate the asbestos be removed as part of demolition or refurbishment works.

However, in other cases it is a business decision that is made based on company drivers, such as the long term health and safety of workers and neighbours. For instance, storm damage at the BOC Rocklea site led to significant asbestos contamination from damaged roof sheeting. After making the site safe, BOC assessed the costs and benefits of removing the asbestos completely rather than patching damaged areas. The lack of certainty around how the material could be safely managed in-situ ultimately led to its complete removal at significant cost to the business.

Governments can also see the long-term business case for asbestos removal. The SA Government absorbed an additional $3 million in development costs for asbestos removal at the Port Lincoln Hospital. It was decided that the benefits, via increased safety and minimisation of risk to hospital staff and patients, outweighed the additional costs.

Innovation can also improve the business case for asbestos removal works. When removing two-pole substations in Sydney, Ausgrid worked with its asbestos removal contractor to wrap and remove asbestos painted poles in large sections, employing a 'glove bag' method. In addition, substations were taken off the network to avoid electrical safety issues and these measures combined saved more than $120,000 from the overall cost.

Stakeholders also noted that real estate values in Australia have been a positive driver for site improvements and developments. In major cities, the increase in land values has encouraged redevelopment of sites with the sale price outweighing the additional costs of asbestos removal. For example, the redevelopment of the Dallas Brooks Hall site in Melbourne was able to proceed despite costs of $9 million for asbestos removal based on prices for inner city apartments.

***Key Finding: Stakeholders assessing the long-term costs and benefits of asbestos removal should consider the impact of ongoing maintenance and repair, risks to employees and the community, and future land value when making decisions on asbestos removal.***

## List of case studies within the report

The following projects are profiled as case studies within the report:

| No | Project Name | Location | Overview |
|---|---|---|---|
| 1 | **Former Balfours Building** | Adelaide CBD, SA | Vacant building in the Adelaide CBD, deemed unsafe. Highly consultative approach to planning and ultimate asbestos removal and building demolition. |
| 2 | **Amcor Paper Mill** | Botany, NSW | Demolition of old Botany paper mill and construction of new B9 Mill. Significant asbestos removal program including challenging conditions working at heights. |
| 3 | **BOC Facility** | Rocklea, QLD | Remediation of BOC's Rocklea gas packaging and distribution site after significant storm damage to asbestos roof sheeting. Removal of some 6,500$m^2$ of asbestos roof and wall panels, decontamination of consumable stock and storm water drains. |
| 4 | **Dallas Brooks Hall** | East Melbourne, VIC | Demolition and redevelopment of Dallas Brooks Hall. One of the largest asbestos removal projects in Victoria with more than 1,500 tonnes of asbestos removed at a cost of around $9 million. |
| 5 | **Port Lincoln Hospital** | Port Lincoln, SA | Removal of asbestos managed through the redevelopment of the Port Lincoln Hospital. Both friable and bonded asbestos removed at a cost of around $3 million. |
| 6 | **199 William Street** | Melbourne CBD, VIC | Long-term empty building site in Melbourne CBD, comprised of two towers. Challenging removal of asbestos limpet applied to the concrete infill in between the slab edge and the façade panels. |
| 7 | **University of Melbourne, Laboratory Upgrades** | Melbourne CBD, VIC | Staged asbestos removal and refurbishment of the East Wing laboratories in the School of Chemistry. Careful planning and communications employed to minimise disruption. |
| 8 | **AusGrid** | Sydney CBD, NSW | A national program of proactive asbestos removal and management across a national network of utilities infrastructure. Included complex removal of asbestos paint from power poles. |
| 9 | **Tas Paper (PaperlinX)** | Wesley Vale & Burnie, TAS | Decontamination and demolition of the Burnie and Wesley Vale paper mills in Tasmania. Contractors demolished more than 50 buildings and removed 47,000 m2 of bonded asbestos roofing and other hazardous materials. |
| 10 | **Rural Community Asbestos Remediation Program** | Rural Communities across the Northern Territory, NT | A government-driven initiative that started as an asbestos remediation program aimed at lowering health risk and grew into increased employment opportunities and provision of community skills and knowledge. |
| 11 | **CSBP** | Kwinana, WA | A program of asbestos removal and remediation at a large chemical and fertiliser facility in WA. Significant volumes of asbestos roof and wall sheeting removed over a 15-year period. |

These 11 case studies highlight several benefits to removing asbestos in a planned, systematic, safe and thorough manner. These benefits include lowering the risk of harm to site users and the community, avoiding higher costs and logistical issues that would occur if the asbestos was left in situ, and the potential to increase building and land value. As demonstrated in the case studies, proper removal of asbestos can be viewed as a financially sound investment, rather than just a cost.

The following pages include detailed summaries of each case study. These case studies demonstrate the significant and positive work undertaken by government and industry in relation to asbestos identification, management and removal across Australia in the past five years. These case studies will help share knowledge and demonstrate better practices with the broader industry and regulators to promote and encourage effective asbestos management across Australia and reduce the risk of asbestos-related illness.

# Former Balfours Building, Adelaide CBD

## Case Study 1 – Former Balfours Building, Adelaide CBD

### Project overview

The former Balfours Bakery site in Adelaide presented a unique opportunity for development when the factory was closed in 2003. However, poor building conditions and the presence of friable asbestos spread throughout the site presented key barriers, and the site soon became an abandoned building. Regular break-ins and council safety concerns led the site to be deemed unsafe and earmarked for potential demolition. The City of Adelaide arranged a site clean-up and asbestos removal in 2014.

The project management team took a planned, low risk and highly consultative approach to ensure a successful outcome was achieved for the client (the City of Adelaide). A significant volume of asbestos was removed and safely transported to an asbestos licenced landfill, and the site is now being transformed into apartments. See Table 1.1 for an overview of the project.

**Table 1.1: Key information from the asbestos removal case study**

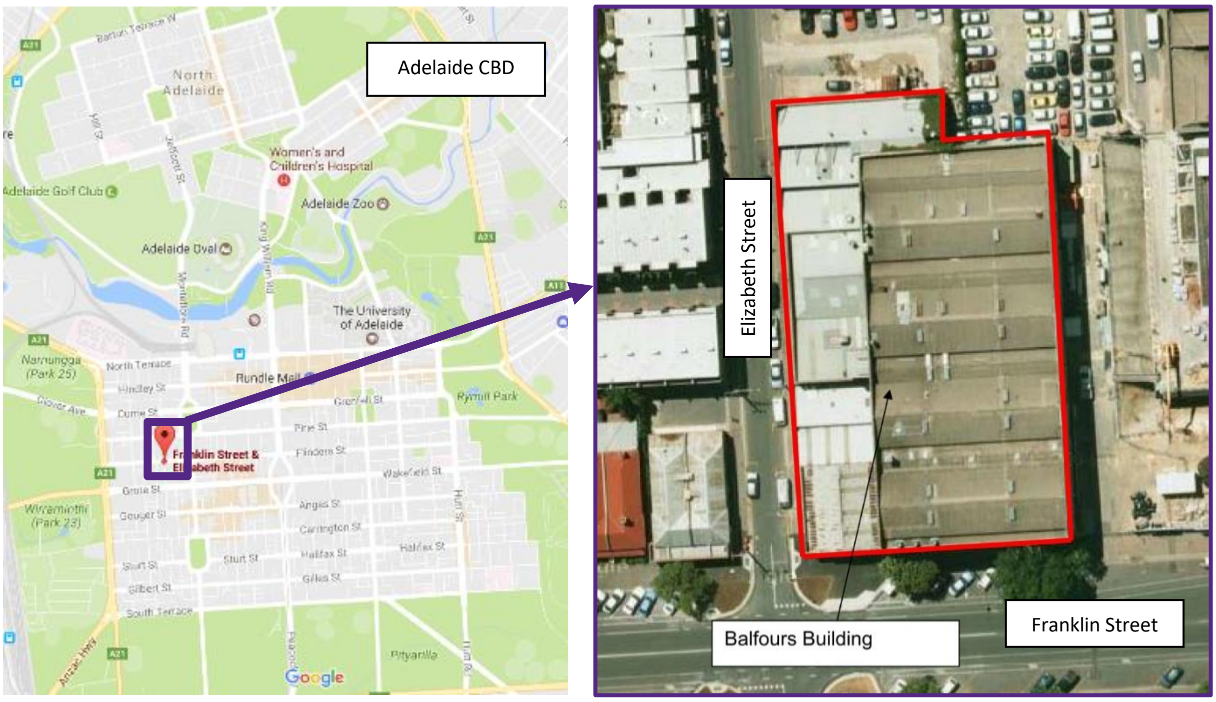
| Key information | Finding |
|---|---|
| **Location** | Corner of Franklin Street and Elizabeth Street, Adelaide, South Australia |
| **Removal period** | February 2014 – June 2014 |
| **Type of asbestos** | Amosite (brown) friable asbestos found throughout the building, including on the ground, in the ceiling cavity and roof, vinyl tiles, doors and on two large ovens. Sprayed asbestos found on steel beams and pipework. |
| **Volume** | • 1,500 LM sprayed asbestos insulation pipework and steel beams;<br>• 5,800 $m^2$ floor area, doors, vinyl floor tiles, ceiling tiles, roof cladding and cement sheets, cavity walls;<br>• 1,300 $m^3$ contaminated items (ovens, cardboard, plastic etc), refrigerated wall panels. |
| **Cost to remove** | Approx. $800,000, government funded. |

| | |
|---|---|
| **Key considerations for the asbestos clean-up** | • Strict safety precautions put in place as the site was in poor condition;<br>• Thorough early planning, including an initial site assessment provided a scope of work for tender documentation;<br>• Regular communication maintained between project managers, the asbestos removal company and hygienist throughout the project;<br>• The site is now being developed into apartments following successful demolition. |

## Background

Balfours is a South Australian family-owned bakery. For a century (1903 until 2003), Balfours manufactured baked goods in a plant on Franklin Street in the Adelaide CBD[1] (see Figure 1.1).

**Figure 1.1: Location in Adelaide CBD and Site Plan[2]**



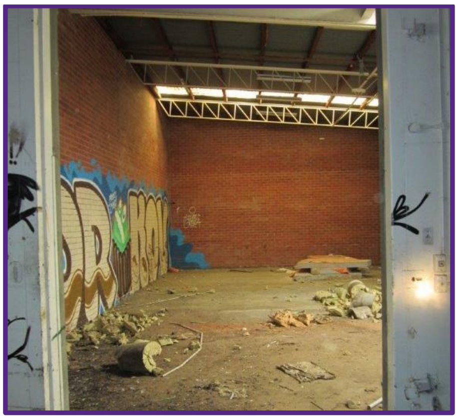

The building was left vacant when Balfours moved to a new facility in Dudley Park, which subsequently led to break-ins and vandalism at the empty site. City of Adelaide staff were often required enter after a break-in to secure the building, and concerns about asbestos and other hazards such as needles were raised at that time. Given the poor and unsafe state of the site (see Figure 1.2 overleaf) as well as the asbestos concerns, the City of Adelaide engaged Carters Asbestos Managers to conduct a site inspection in 2013.

The site inspection revealed the presence of a significant amount of friable asbestos, with contamination obvious in several areas. It was thus decided that asbestos removal and a site clean-up was needed to ensure council staff and public safety.

[1] http://www.samemory.sa.gov.au/site/page.cfm?u=370&c=1832

[2] Map data: Google.

**Figure 1.2: Abandoned site prior to clean up and asbestos removal**



## Site sampling, assessment and project planning

Prior to tendering for the asbestos removal, further site investigations were undertaken by Carters Asbestos Managers to estimate the volume of asbestos and the extent of contamination. This was used to inform early planning and to develop a scope of work for the asbestos removal tender.

Significant time was invested developing the scope of works to ensure prospective tenderers had suitable information against which to develop an approach and methodology. Key information included:

- A **project overview** of the works to be undertaken for the asbestos removal;
- The **scope of works**, including the type of asbestos, removal of equipment such as old ovens, pipework, sliding doors, structural beams, the roof;
- **Responsibilities** for relevant stakeholders, including the asbestos removal contractor, asbestos consultant and independent air monitoring consultant;
- Other requirements such as clearance inspection, air monitoring and inspections;
- Requirements for the **asbestos removal control plan** (ARCP);
- **Negative air pressure** requirements and **smoke testing**;
- **Air monitoring control limits**, including number of fibres per millilitre and subsequent control measures and actions;
- **Decontamination requirements**, including the unit with shower requirements and drainage;
- **Bag lock and waste removal**, to guide how asbestos waste can be properly managed and disposed of;
- **Methodology for removal**;
- **Photos were also included for tenderers** (see Figure 1.3)**.**

**Figure 1.3: Pre-removal photos included in the scope of works for asbestos removal tenderers, showing visual asbestos in the building**

Prior to providing a tender response, tenderers were invited to visit the site to better understand the logistics and implications behind the asbestos removal project.

| Key consideration for future projects |
| --- |
| ***The scoping study and invitation for tenderers to visit the site was key in ensuring the successful removal of asbestos throughout the building at a later stage.*** |

## Asbestos removal program

### Overview of removal program

The City of Adelaide engaged Carters Asbestos Management as the Project Manager / Superintendent, who engaged McMahon Services to conduct the asbestos removal and another company as the Independent Hygienist. Table 1.2 outlines the extent of the asbestos removed during the project.

**Table 1.2: Asbestos removed and quantity**

| Asbestos Type | Quantity (approx.) | Locations |
| --- | --- | --- |
| Sprayed steel beams and asbestos sealant | 1,500 LM | Ground floor |
| Friable asbestos on floor fallen from sprayed beams | 2,000 $m^2$ | Ground floor surface area |
| Asbestos in roof cladding, pitched corrugated asbestos cement sheet and cavity walls | 2,900 $m^2$ | All areas including roof |
| Vinyl floor tiles, ceiling tiles, sliding doors | 900 $m^2$ | Ground floor and first floor |
| Contaminated items (oven, refrigerated wall panels) | 1,300 $m^3$ | Ground floor and first floor |

The project involved 2 distinct stages: *Pre-removal works* and *removal works*.

### Pre-removal works

Key actions undertaken in the pre-removal works included:

1. Independent air monitoring of airborne asbestos fibres monitored during set up;
2. Client review of the safe work method statement (SWMS) and asbestos removal control plan (ARCP) provided by the asbestos removal company;
3. Establishing temporary power to the site for the use of negative air units and other equipment;
4. Installing asbestos removal warning signs and barricades;
5. Setting up the decontamination unit;
6. Ensuring PPE was ready (type 5 disposal coveralls and gloves);
7. Sealing off all areas, including temporary repairs over loose bricks;
8. Smoke testing to check for any leaks/holes in the building and work areas;
9. Communication with neighbouring residents via letter with contact details for further questions;
10. SafeWork SA were also notified of the project and given the opportunity to provide feedback prior to commencement.

### Removal works

Key actions undertaken for the removal included:

1. Setting up air monitoring along the boundary of work area at all times;
2. Removal methods that aligned with *How to Safely Remove Asbestos* codes of practice[3], for example having a Class A removal licence and appropriate PPE requirements;
3. Set up of equipment and enclosure including decontamination unit (including showers and storage with shower gel and nail brushes, and waste water drained via an appropriate filter);
4. Removing asbestos and cleaning-up the entire building through (see Figure 1.4 below for asbestos removalists in action and Figure 1.7 for other pre- and post- clean-up photos):
    a. Bobcat operation to remove all waste throughout the building including equipment such as ovens, waste sitting on the ground etc. It was assumed these were contaminated with asbestos;
    b. The removal was then separated into three stages: ground floor, first floor and roof;
    c. Wet stripping of sprayed friable asbestos on steel beams (see Figure 1.5 below). This required working at heights, and scaffolding was used to reach these areas;
    d. Removal of other items containing asbestos, including ceiling tiles, vinyl tiles, doors etc;
    e. Removal works were conducted during the day as to not to disturb the community;
    f. Dry stripping of friable material was not allowed.
5. Double bagging asbestos in 200nm thick plastic and sealed with tape and the exterior labelled;

**Figure 1.4: Asbestos removal in progress**

### Project setbacks and challenges

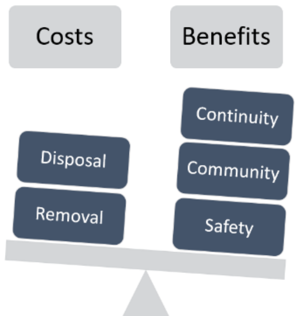
Prior to commencement the site was in a very unsafe state, with severe vandalism, syringes and other hazards. In response, significant time was taken to ensure no staff were injured, which included considering clean-up options. Machinery was used to move items instead of collecting objects by hand.

Another challenge was finding additional asbestos during the removal works which had not been factored into the scope of works. Asbestos was found beneath two ovens that could not be moved during initial inspections. The City of Adelaide was notified immediately and a suitable variation was agreed by both parties quickly and transparently, allowing for work to continue without an impact to project timelines. The productive relationship between all parties throughout the project was essential in overcoming issues of this nature.

[3] http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/641/How_to_Safely_Remove_AsbestosV2.pdf

**Figure 1.5: Results pre- and post-removal using wet stripping of steel beams with sprayed asbestos (photos 1 and 2), and the viewing window into one of the work areas (photo 3)**

### Business case




The overall cost to remove and dispose the asbestos was approx. $800,000. As the site was abandoned, no business activities had to cease, and residents in surrounding buildings were able to access their apartments during the removal process. Although Council did not own the building and only owned part of the land, it funded the project.

The predominant rationale for funding the asbestos removal was to increase safety to council staff and the community. Other significant but less important justifications included the completion of this work would make it much easier for safe demolition of the building at a later stage, and the project aligned with the City of Adelaide's target to remove all known asbestos from all 174 building assets by 30 June 2018. It is on its way to reaching this target (there are only 65 small-scale assets remaining), and the former Balfours building was one of the sites that required asbestos removal.

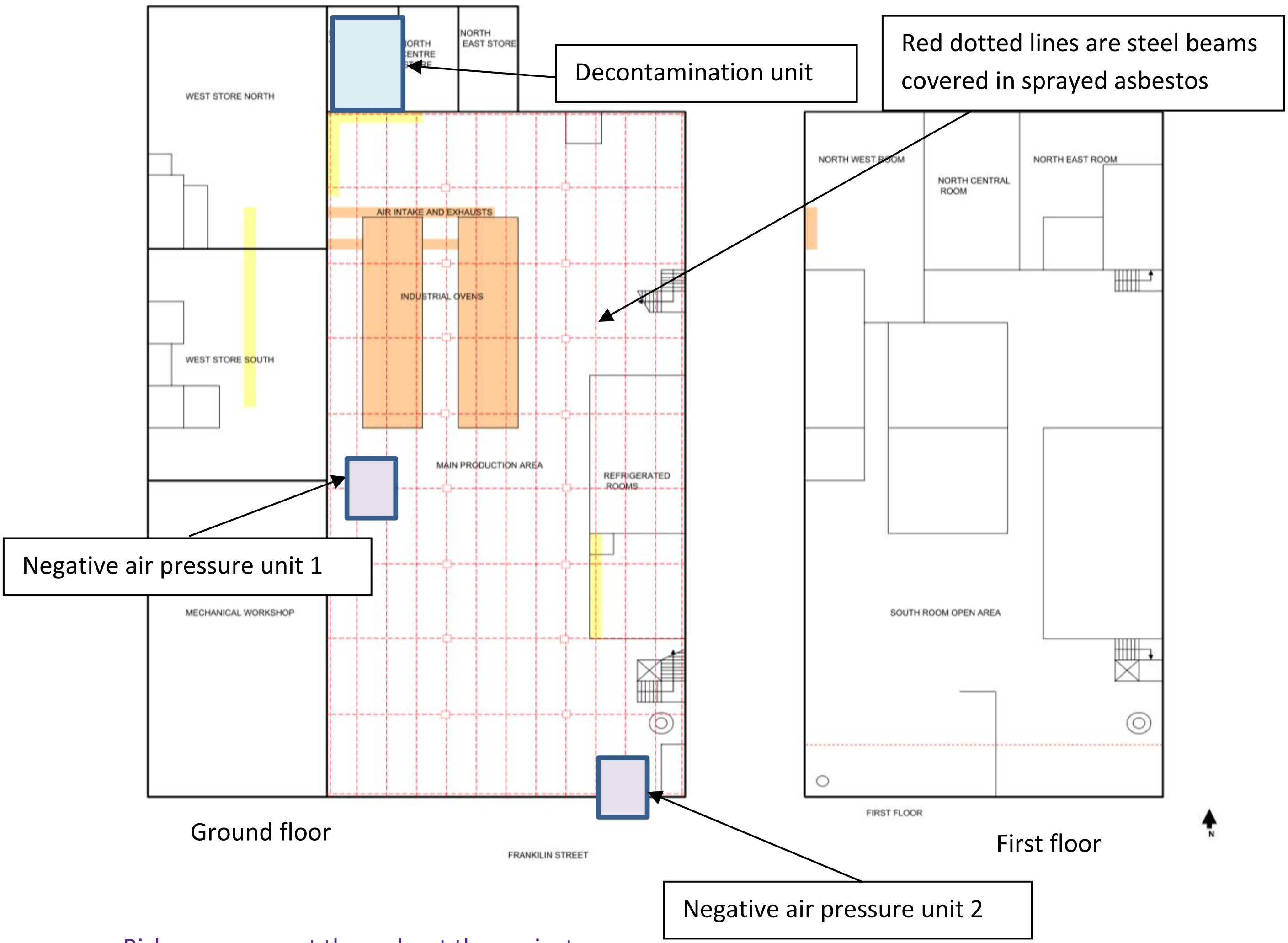
Although not as important, another argument that helped create a sound business case for the asbestos removal in addition to increased safety and the alignment with the City's asbestos removal strategy was the potential for funds to be recouped after the demolition of the building and re-sale of the land. Council engaged in discussions with neighbouring developers and other land owners to reach an agreement in regard to this, to ensure that some of the funds could be returned to Council upon selling the land. Note that the land has now been sold and the area is set up for an apartment building with over 500 apartments.

### Removal site plan

The site plan, including location of key installations is provided in Figure 1.6. The removal works was separated into three areas: ground floor, first floor and the roof. The ground floor was completed first, with plastic sheeting erected across the floor and walls (see Figure 1.4) and scaffolding used to reach the steel beams. The decontamination unit was installed at the northern entrance near the temporary office set up for the project, with two negative air pressure units used to draw the airborne fibres away from the decontamination unit (for ground floor). The extent of asbestos coated steel beams on the ground floor can be seen in dotted red lines running up and across the length of the building.

Temporary office

**Figure 1.6: Site Plan of Former Balfours Building**




## Risk management throughout the project

Identified risks and methods for mitigating these is summarised in Table 1.3 below.

**Table 1.3: Risks and mitigation strategies**

| Risks identified | Mitigation strategies |
|---|---|
| The building had been heavily vandalised with dangerous items on the ground including needles and broken glass | An extensive clean-up was undertaken in the first instance to ensure that workers would not be injured when undertaking the asbestos remediation works. Given friable asbestos was spread throughout the building, all items were classed as contaminated and a bobcat was used instead of by-hand removal for rubbish. |
| Holes in the building could lead to airborne asbestos escaping into the atmosphere, placing neighbouring properties at risk | The smoke method was used twice to detect holes in the building where air was escaping. In addition, an independent air monitoring company conducted constant air monitoring and reporting throughout the project, and this was checked daily. |
| Construction works could disturb residents which could lead to complaints and slow production | Residents were informed of the project through letterbox drops and provided clear signage with contact details on the surrounding fencing for questions or complaints. The removalist company also conducted some of the removal later in the day to minimise inconvenience to the surrounding residents. |

### Consultative approach taken – a key to success

Throughout the project a high level of communication and consultation was maintained between the City of Adelaide, Carters Asbestos Management and McMahon Services. During the removal program undertaken by McMahon Services, Carters Asbestos Management conducted two site visits a week and provided feedback on process and protocol and site conditions. Weekly progress reports were also completed by Carters Asbestos Management for the City of Adelaide. Regular air monitoring reports were also completed and provided to Carters Asbestos Management and the City of Adelaide.

Community consultation was also important for the project's success. The community consultation strategy focused on informing residents of the project while minimising community worry and inconvenience caused by the project. As such, McMahon Services conduced a letter drop, and contact details were provided on signs around the site. All queries were directed to Council to ensure consistent responses from the project team. While there were a few inquiries, there were no complaints received from the community throughout the project.

**Key consideration for future projects**

*One of the key components to a successful outcome was the constructive communication between McMahon Services and the Superintendent, Carters Asbestos Management. Although Carters Asbestos Management were the project managers, they sought McMahon Services' advice throughout and asked for their view on how tasks should be undertaken. McMahon Services also responded positively when Carters Asbestos Management had feedback.*

## Innovation and excellence

The project was highly successful, delivered within budget and the allocated timeframes. Importantly, there were no complaints from the community, no accidents or injuries, no detection of airborne asbestos outside of the building at any stage and high levels of client satisfaction with the job. It remains one of the largest friable asbestos removal projects in Adelaide, and an excellent case study considering the extensive nature of the contamination present at the site.

Key reasons for this success included:

1. Initial scoping of work and planning. This ensured the tender documentation was detailed enough to invite accurate responses. Tenderers were also invited on site to help with their bid;
2. Strong communication between the client, project managers/superintendent and removalists;
3. Smoke testing to identify potential openings in the building;
4. Ensuring the client was aware of potential variations in the scope of work that may arise.

**Figure 1.7: Internal images of the site pre- (images 1 and 2) and post- (image 3) asbestos removal**



# Amcor Paper Mill Asbestos Removal and Demolition

## Case Study 2 – Amcor Botany Mill

### Project overview

Over a six-year period, Amcor Packaging (now Orora) demolished its old mill to make way for a new paper mill (B9) in Botany, NSW. Asbestos was widespread across the site and in various forms, with approximately 280 tonnes removed in earlier stages, and later stages requiring the removal of 4,000 $m^2$ of roof and wall sheeting across numerous sheds at the site, as well as friable asbestos pipe insulation.

Due to the size and complexity of the demolition and asbestos removal, a team of up to 32 workers from the demolition and asbestos removal company were employed on the project, including a team of eight specialists from interstate. To safely remove asbestos at height, a purpose built aerial works platform was used for the upper levels to eliminate the hazard of working on a fragile roof, and a 'glove bag' removal method was used for service pipes insulated with friable asbestos where complete negative air encapsulation was not possible. Table 2.1 summarises key information from the case study.

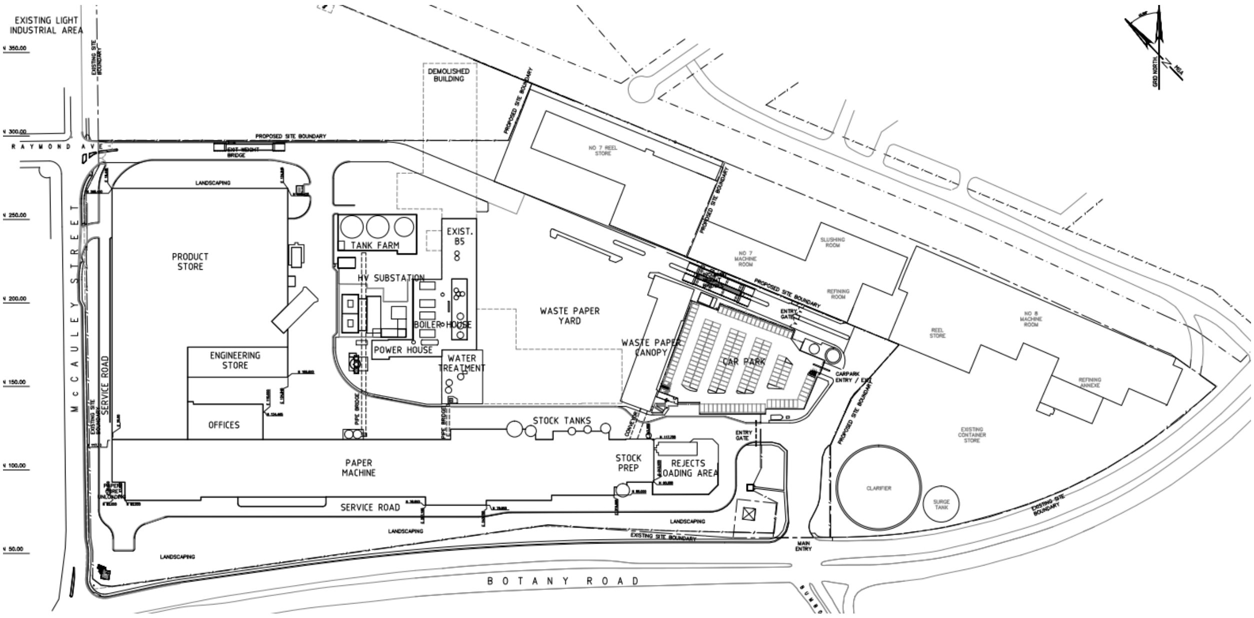
**Table 2.1: Key information from the asbestos removal case study**

| Key information | Finding |
| --- | --- |
| **Location** | Botany, New South Wales |
| **Removal period** | July 2010 - March 2013 |
| **Type of asbestos and volume** | Earlier works (2010 – 2011, total of 280 tonnes of asbestos removed) included:<br>• 2,000 $m^3$ of friable asbestos;<br>• 500 $m^2$ of bonded asbestos sheeting;<br>• 500 m of asbestos pipe lagging.<br>Later works (2012 – 2013) included:<br>• 4,000 $m^2$ bonded asbestos roof and wall sheeting;<br>• 300 LM friable asbestos pipe insulation;<br>• An unknown volume of friable asbestos from B7 Mill and asbestos contaminated materials in soil. |
| **Cost to remove** | Approx. $7.6 million for demolition and asbestos removal, privately funded |

## Background

Amcor Packaging (now Orora) invested approximately $500 million developing a new Paper Mill (named ‘B9’) in Botany, 11 kilometres from the Sydney CBD. The new mill was built on vacant land adjacent existing mills, which were later demolished to make way for the entire B9 building. Demolition and construction was carried out in stages to allow uninterrupted operation of the existing paper mills[4]. A mill-wide site plan is provided in Figure 2.1 and shows that the site is large and complex, with various pieces of plant and machinery that had to be safely removed.

**Figure 2.1: Mill-wide site plan**




## Project planning

Asbestos was identified in the early stages of the facility upgrade. However, the extent of the asbestos across the site was unknown, and each stage required additional testing to confirm approximate volumes and types of asbestos. Sampling indicated both friable and non-friable asbestos throughout the site, and Amcor engaged McMahon Services to conduct the demolition and asbestos removal. To ensure safety and appropriate planning, McMahon Services conducted various assessments and safety documents at each stage, including:

- Safe Work Method Statements (SWMS)
- A Job Safety Analysis (JSA)
- A Work Health Safety Environmental Quality Plan (WHSEQ Plan).

The type of asbestos and volumes identified are highlighted in Table 2.2.

[4] http://www.packaging-gateway.com/projects/amcor-botany/

**Table 2.2: Asbestos type, quantity and location**

| Asbestos Type | Quantity | Location |
|---|---|---|
| Friable asbestos | 2,000 m$^3$ | Power house, boiler house and turbine room (total 280 tonnes of asbestos sent to an EPA dedicated landfill site) |
| Bonded asbestos sheeting | 500 m$^2$ | |
| Asbestos pipe lagging | 500 LM | |
| Friable asbestos pipe insulation | 300 LM | Throughout the B5 Mill. Note there was also an unknown volume of friable asbestos from the B7 Mill (cost was $1 million to remove) |
| Roof and wall sheeting bonded asbestos | 4,000 m$^2$ | Throughout the B5 Mill, as shown in Figure 2. |
| Asbestos contaminated soil | Unknown | During earthworks and the re-laying of the waste paper storage yard |

**Figure 2.2: An example of asbestos roof and wall sheeting from the B5 Mill**

# Asbestos removal program

## Removal program

Demolition works and asbestos removal was conducted in stages over a three-year period. For the purposes of this case study, the later stages of the program have been highlighted, which included the removal of bonded asbestos in the sheds and friable asbestos pipe insulation over a nine-month period, from July 2012 to March 2013.

McMahon Services identified bonded asbestos sheeting on numerous sheds (see Figure 2.2), as well as friable asbestos pipe insulation. As the locations of external asbestos sheets were at wall and roof level and the structures were not load-bearing, two exclusion zones were created – ground based and an aerial/ elevated work platform.

### Ground based

An asbestos barrier tape was used to create an ‘entry controlled’ area, placed approximately 10 metres out from the wall with a series of bollards along the concrete apron for the full length of the work area, with an additional overlap of some 10 lineal metres. Signage warning of the hazardous works were also erected outside the barrier line(s).

### Aerial platform

To remove the upper level bonded asbestos wall panels and roof sheeting, McMahon Services utilised a purpose built aerial work platform (see Figure 2.3). This was surrounded by an exclusion zone at ground level, which encompassed the entire radius of the slewing motion (rotation of crane), as required to hoist and land the work platform from roof level down to ground. This zone was monitored at ground level, and audits were conducted on separate occasions by WorkCover NSW and the Federal Safety Commission, with each reporting on the project's successful implementation of high level safety systems and standards.

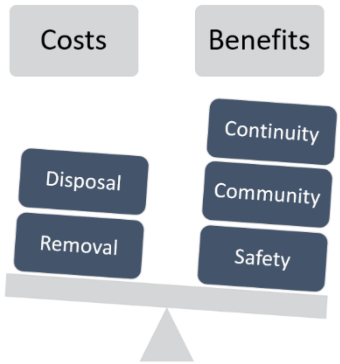
**Figure 2.3: Purpose built aerial works platform and surrounding exclusion zone used to remove the asbestos roof and wall sheeting**

For the friable asbestos pipe insulation, particularly where complete negative air encapsulation was not possible, a 'glove bag'[5] removal method was used for the separation of upper level service pipes. The freed pipes were hoisted down, completely encapsulated and then disposed. The glove bag set up is highlighted in Figure 2.4 below, and workers also maintained a localised supply of PVA solution and water to reduce the risk of airborne fibres.

**Figure 2.4: Setting up the glove bag**

[5] 'Glove bags' are single-use bags constructed from transparent, heavy-duty polyethylene with built-in arms and access ports. The 'glove bag' removal method is suitable for the removal of asbestos lagging from individual valves, joints and piping. See Safe Work Australia (2016) *How to Safely Remove Asbestos Code of Practice.*

### Business case




At $500 million, the new B9 Paper Mill, represented the single biggest investment made by Amcor at the time. Amcor considered the costs and benefits of removing the asbestos and demolishing the old site to the B9 mill. These costs were considered in light of the ongoing demand for the end-product in the market (paper and cardboard) and general trading conditions.

Ultimately, the need for a new mill outweighed the costs of asbestos removal. To further strengthen the business case, mills 7 and 8 continued to operate while B9 was constructed. These mills produced approximately 250,000 tonnes of paper a year which allowed manufacturing to continue until the larger B9 was built and would produce approximately 400,000 tonnes of paper a year. In addition, Amcor was able to sell 36 hectares of land to help fund construction of the B9 mill.

### Management of risks and use of regulations

Management of asbestos was undertaken in accordance with Safe Work Australia (2011) *How to Manage and Control Asbestos in the Workplace* including re-inspection of the materials if renovation and/or removal works were completed. This included updating applicable asbestos registers.

McMahon Services completed a Work Health Safety Environmental Quality Plan (WHSEQ Plan) for the site, which clearly outlined roles and responsibilities, relevant legislative requirements, as well as a risk matrix for asbestos. Daily asbestos log checklists, equipment checks and PPE checks were undertaken by the Supervisor to monitor asbestos equipment and operations. Personal and equipment decontamination facilities were set up to eliminate cross contamination, and air monitoring was undertaken during works to ensure controls are adequate.

Other risk mitigation strategies included:

- A 3-stage decontamination shower system was erected at the point of egress / access for the exclusion zone. All workers and all sealed bags of removed asbestos material(s) passed through this shower before exiting the removal zone;
- An air quality monitoring unit was strategically placed adjacent to the shower unit(s) to test the integrity of the wash down process;
- All tools used for the physical removal of friable asbestos were cleaned down and PVA sprayed before leaving the removal zone;
- Motorized units such as vacuums and grinders were sealed in 200um plastic and only re-opened under controlled conditions;
- Skips were removed from site as soon as is practicable, when full;
- Only EPA accredited waste disposal firms were used to transport and dispose asbestos waste;
- Potential hazards for the glove bag method were identified in the JSA, including working outdoors, working at heights and manual handling. Control measures included completing 'Working at Heights' training, applying sunscreen regularly, wearing brimmed hats (if possible), monitoring fluid intake, monitoring work mates and taking regular breaks;
- McMahon Services ensured their staff were trained in the Safe Removal of Asbestos, and NSW WorkCover accredited for the Removal of Friable Asbestos.

## Innovation and excellence

Construction of the new B9 Mill required demolition of the previous mills, which were large, had complex plant and machinery as well as extensive asbestos contamination throughout. The height and fragile nature of the sheds constructed with asbestos wall and roof sheeting meant that the asbestos removal company had to utilise a purpose-built aerial woks platform. This platform was audited by SafeWork NSW, which commended the asbestos removal company for eliminating the hazard of working on a fragile roof.

Another innovation was the use of the glove bag technique, which was utilised when complete negative air encapsulation was not possible. This separated the upper level service pipes from the friable asbestos insulation, and the glove bag design allowed for partial decontamination followed by 'hot works' separation. The freed pipes were hoisted down, completely encapsulated and then disposed of. An example of an asbestos-free pipe following the use of this technique is captured in Figure 2.5 below.

**Figure 2.5: The finished clean section of the pipe insulation with a PVA solution**

# BOC Facility, Rocklea QLD

## Case Study 3 – BOC Facility Rocklea QLD

### Project overview

Storm damage to asbestos roof sheeting on buildings at BOC Australia's facility in Rocklea, Queensland in 2014 resulted in fragments of bonded asbestos being scattered across the site and contaminating work areas and consumable stock. The subsequent site clean-up and asbestos removal required the majority of the site to be shut for 8 months. Table 3.1 includes key information about the case study.

Over 6,500 $m^2$ of asbestos containing materials were safely removed from the site by three licensed asbestos removal companies over this time. The majority of the material was roof and wall sheeting, but the clean-up also needed to include site debris and contaminated consumable stock and storm water drains. During the removal period, 850 contractors worked on site with zero reported incidents.

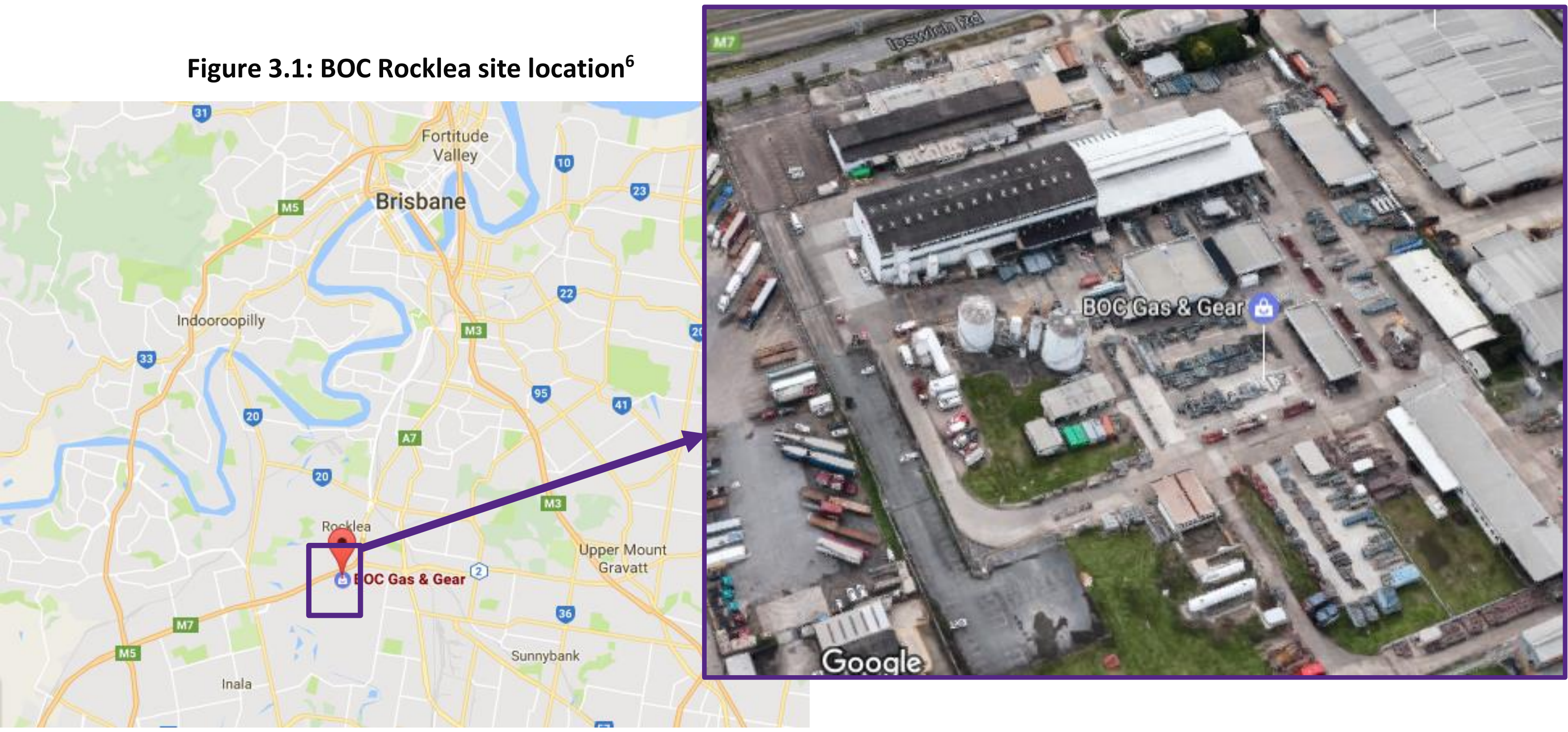
**Table 3.1: Key information from the asbestos removal case study**

| Key information | Finding |
|---|---|
| **Location** | 1688 Ipswich Road, Rocklea, Queensland |
| **Removal period** | April 2014 – August 2015 |
| **Location of asbestos** | Super 6 wall and roof sheeting, floor tiles |
| **Volume** | Over 6,500 $m^2$ of asbestos containing materials removed from site |
| **Cost to remove** | Approx. $3.2 million, privately funded |
| **Key considerations for the asbestos clean-up** | • Management of multiple removal contractors due to the scale of works and availability of resources;<br>• 2 full-time on-site hygienists with sampling equipment used for 5 months;<br>• Cleaning or disposal of contaminated stock;<br>• Stakeholder engagement including employees, contractors, unions, neighbours, retail customers, Workplace Health and Safety Queensland, insurance provider. |

## Background

The BOC Australia site in Rocklea is a hazardous goods-rated, 7-hectare site located in the southern suburbs of Brisbane (see Figure 3.1). The site packages and distributes a range of industrial and medical gases, including oxygen, nitrogen, argon and carbon dioxide. It also manufacturers acetylene.

**Figure 3.1: BOC Rocklea site location[6]**




On 27 November 2014, a storm supercell passed across Brisbane and the surrounding region. The storm produced wind gusts of more than 140 kilometres per hour and large hail stones that caused widespread damage and destruction across the city.

The storm caused extensive damage at industrial gas supplier BOC Rocklea. Three workshops, an administration complex, a direct distribution centre and a regional distribution centre were damaged by hail, wind, airborne debris and water ingress. Due to the severity of the storm, asbestos sheeting debris was spread around the site including the carpark, service road, internal roadways and the front nature strip (see Figure 3.2).

**Figure 3.2: Asbestos debris from the storm was spread around the site**

[6] Map data: Google

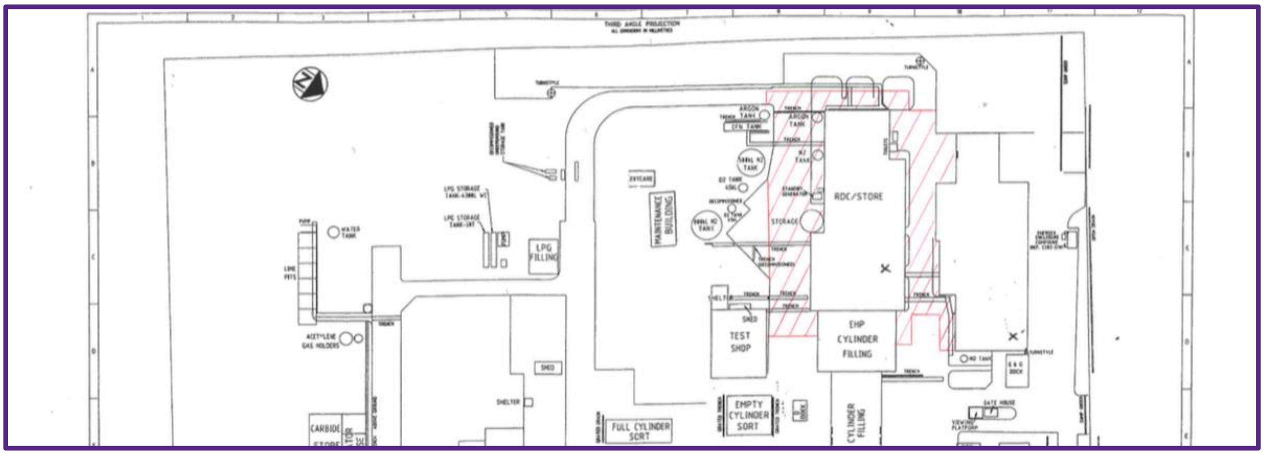
## Site sampling, assessment and project planning

The initial response by BOC was to isolate the site and assess the extent of damage. They then engaged an asbestos removal contractor to check the debris and remove that which was determined to contain asbestos. The entire site was closed for four days after the storm with gate clearances issued for asbestos removal work only. After the initial assessment and clean-up, the part of the site which had no damage remaining was opened, with the other affected areas remaining isolated and shut down.

A business assessment was then made on how to treat the remainder of the site. This included consultation with employees and some expressed concern about returning to the site where some damage still existed, despite the asbestos being bonded and in reasonable condition. Due to the extent of storm damage in other areas of the site and the results of the risk assessment conducted on asbestos, the decision was made to shut the site and proceed with full removal of asbestos from across the site.

Some areas of the site were able to remain operational, where the distance from the building damage was around 150 metres. This allowed the acetylene manufacturing plant to run for one week in every three to ensure business continuity. Employees working in this area had previously received asbestos awareness training as part of the safety management program on the site, so had a good understanding of the risks and controls needed. Figure 3.3 includes the contaminated areas identified on site plans.

**Figure 3.3: Contaminated areas identified on site plans**




To ensure business continuity in other areas, a site was rented in a nearby suburb and upgraded to meet the requirements of a major hazard facility. Using this site for the packing distribution part of the business and leaning on other sites in the BOC network, disruption to operations was minimised.

***"We had unchanged customer service levels throughout the entire process, which was critical for BOC."***

**BOC**

An asbestos register developed from previous asbestos surveys was used to identify the location of all asbestos requiring removal. The vast majority was Super 6 asbestos cement sheeting on the roof and walls of various buildings, but asbestos was also present in vinyl floor tiles located under carpet in administration areas.

# Asbestos removal program

## Overview of removal program

The bulk of the asbestos removal project took place over an eight-month period that was completed in August 2015. Over 6,500 $m^2$ of asbestos containing materials were removed in this time by approximately 80 licenced asbestos removalists from three removalist companies. Two hygienists worked on site for five months, undertaking daily air-monitoring, asbestos sampling and reporting back to the project team.

## Removal planning

**Figure 3.4: Exclusion zones set up around the site**


The project team used the results of the asbestos survey to establish exclusion zones around the site (see Figure 3.4). Temporary fencing with solid hoarding and black plastic was used on the perimeters of the exclusion zones.

In the initial stages, the retail shop located on the site needed to be managed to ensure the public and retail customers were kept out of the exposed areas. Some people who were arriving on site were curious to see what happened and it was necessary for the project team to extend the security fencing to discourage people from entering the main driveway.

## Communication with neighbouring properties

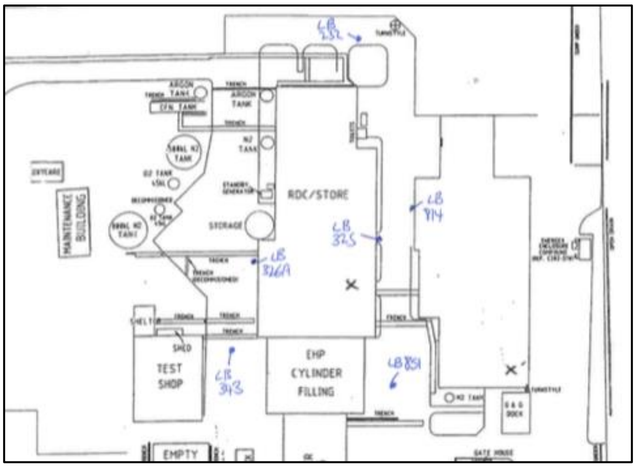
In line with the Safe Work Method Statement (SWMS), Project Managers notified neighbouring properties of the asbestos removal prior to removal. Work areas were also isolated as to not be accessible to the public, with appropriate signage set up.

## Removal methodology

As an interim measure, the removal contractors sprayed the roof materials with a PVA glue to provide some encapsulation, particularly around the storm damaged areas. Due to the large amount of asbestos sheeting and the extent of the storm damage on the 18-metre-high warehouse buildings, one challenge BOC faced was managing the overall project cost, particularly ensuring that safe removal could be undertaken at such height (see Figure 3.5). To manage work from heights within the required budget, contractors employed an approach using two tower scaffolds inside, one tower scaffold outside and the use of an elevated work platform.

**Figure 3.5: Removal of asbestos sheeting from warehouse**

**Figure 3.6: Air monitoring locations**




The hygienist company had six to eight air monitoring units placed around the site at any one time (see Figure 3.6). Most commonly they placed two units adjacent to each wall of the building area being worked on. BOC was particularly sensitive to managing stakeholder expectations and set a threshold level of zero, so that any reading would constitute management action. Throughout the project, no positive readings were detected.

When the storm hit, the warehouses on site were full of equipment and stock such as welding machines and consumables. Some sections of the roof sheeting had collapsed on the contents and testing confirmed asbestos contamination was present over a large amount of stock. The on-site hygienists undertook an assessment of the level of contamination on each item of stock to determine what could be salvaged and what had to be disposed of. For example, items in cardboard packaging were found to be too difficult to clean and were sent to contaminated waste. Some metal containers were able to be cleaned using a wet wipe and vacuum process prior to touch sampling. Racking in the stores also needed to be cleaned and was wet-wiped as it was being dismantled and then quarantined for sampling. Clean racking was then moved to a storage area outside the exclusion zone. In total, the process for managing contaminated stock took eight weeks to complete.

The removal contractors wrapped all asbestos containing material (ACM) in plastic sheeting and placed into lined six-metre skip bins. Once filled, the bins were wrapped and cleaned inside the exclusion zone prior to removal by a licenced contractor. The material was disposed at the Waste and Recycling Facility at Swanbank, further south of Brisbane.

## Business Case


Upon assessment of the damage from the storm, there were a number of options available to BOC, including continuing to the manage asbestos in place. This would involve the identification, encapsulation and repair of the damaged sections. A cost benefit analysis illustrated the difficulty in finding suitable materials to patch and repair the Super 6 sheets and that the long-term problem of safely managing asbestos would not go away, particularly when the likelihood of further storm damage was considered.

The total cost of the project was $22 million including the rebuilding works. The asbestos removal component cost was $3.2 million including all removal works, supervision, occupational hygienists, sampling, testing and disposal costs.

On its own, the removal of asbestos from the established buildings would have been difficult to justify. However, in light of the damage caused by the storm and the cost for the necessary clean-up and reestablishment of contaminated areas, a clear business case for the complete removal from asbestos from the site was established.

### Management of risks

As there were other construction activities happening on site during the asbestos removal work, BOC needed to manage over 850 contractors coming in and out. All contractors undertook an induction package that explained the asbestos hazards, the location of the exclusion zones and the sampling and air monitoring that was being undertaken. Over the eight months of the asbestos removal, there were no reported incidents.

**Figure 3.7 – Removal of Asbestos roofing (left image), contractors on site (right image)**


One key stakeholder was a neighbouring site where some asbestos removal was undertaken near the fence line of the site boundary. In some areas, part of the scaffolding and an Elevated Work Platform needed to use the neighbouring site's grounds. Other stakeholders included unions, Workplace Health and Safety Queensland, BOC's insurance company, retail customers and BOC's global offices.

Due to the large amount of ACM needing to be removed in a short time period, there was a need for a high number of qualified removalists to be working at the same time. BOC found that it would be difficult to access the amount of labour required through the one asbestos removalist company, so they engaged three separate companies to do the work. Some asbestos removalist work was also required to be completed inside confined spaces, such as in trenches and service ducts carrying industrial gases. As a result, some of the removalist staff also needed to undertake confined space training.

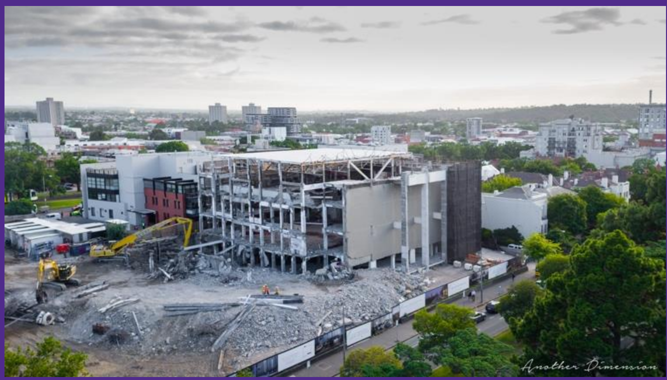
With the number of asbestos removalists working on site, contractor management was an area of focus for BOC. Since there were large exclusion zones and bubble enclosures being used, it was difficult for BOC staff members to access all areas to complete regular compliance checks. As a result, they put some of their staff through Class A and Class B asbestos training, after which they entered these areas with full protective suits and mask and exited through the decontamination units.

**Figure 3.8 – Stormwater debris**

## Innovation and excellence

Due to the intensity of the storm, debris was spread across a large area of the site including on roadways. Investigation showed some debris had made its way into the storm water system and testing confirmed that asbestos fibres were present (see Figure 3.8). A specialist asbestos removal firm was engaged for this particular job and they developed a methodology that was reviewed and approved by Workplace Health and Safety Queensland. A filter system was set up so that when the storm water drains were washed with water, the wash water could be collected, vacuumed out and cleaned of all fibres. The regulator exempted the use of high pressure equipment on asbestos fibres as it was determined that no asbestos fibres could become airborne. Approximately 70 percent of the storm water system on site was cleaned using this method.

# Dallas Brooks Hall, East Melbourne




## Case Study 4 – Dallas Brooks Hall, East Melbourne

### Project overview

The demolition of Dallas Brooks Hall in East Melbourne was one of the largest asbestos removal building projects in Victoria. It involved the removal of over 1,500 tonnes of asbestos materials over a period of 18 months from a site located immediately adjacent to a working hospital (see Table 4.1).

At its peak, the asbestos removal involved 45 removalists and 4 hygienists working on-site at any one time. Due to the extent of removal works, significant and ongoing consultation was undertaken with WorkSafe Victoria and the neighbouring Epworth Freemasons Hospital.

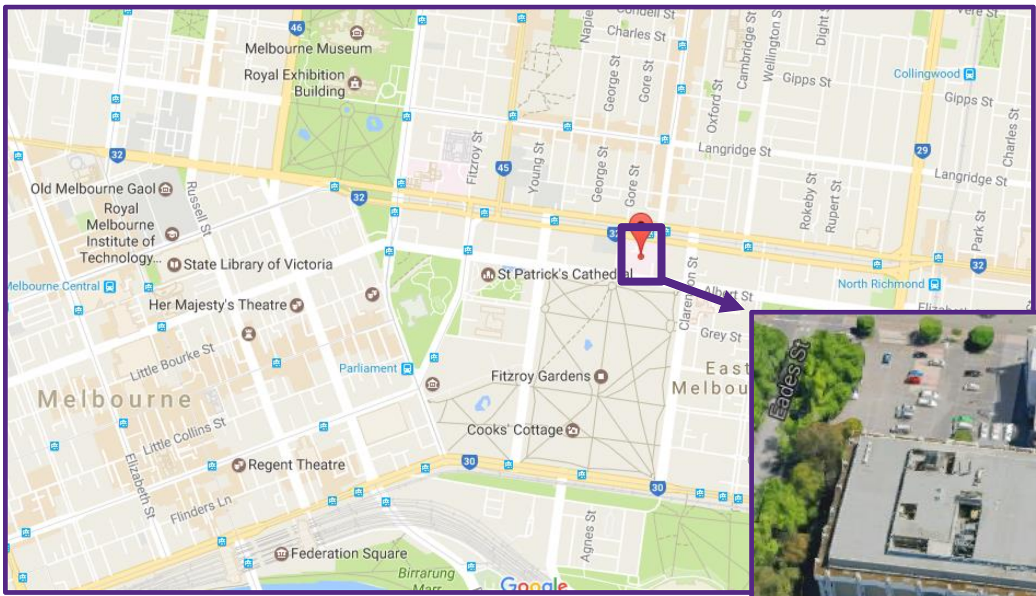
**Table 4.1: Key information from the asbestos removal case study**

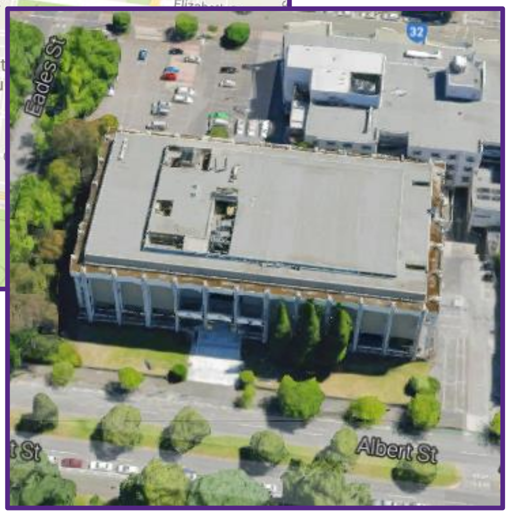
| Key information | Finding |
|---|---|
| **Location** | 300 Albert Street, East Melbourne, Victoria |
| **Removal period** | October 2015 – March 2017 |
| **Type of asbestos** | Asbestos sprayed insulation, gaskets, mastics, bituminous membrane on rooftop surfaces, fire doors, vinyl floor and wall tiles and adhesive, rope seals, mortar and render contamination, fire rated board, asbestos cement sheet. |
| **Volume** | Over 1,500 tonnes of asbestos materials removed from 10,000m$^2$ site over 5 floors |
| **Cost to remove** | Approx. $9 million, privately funded |
| **Key considerations for the asbestos clean-up** | • Early and ongoing consultation ensured stakeholder expectations were met and removal methodologies appropriate;<br>• Area by area removal using encapsulation;<br>• Risk assessment and detailed procedures for 22-metre-high columns established in consultation with structural engineers, demolition company, occupational hygienists and WorkSafe Victoria;<br>• Air monitoring and sampling completed using on-site laboratories. |

# Background

Dallas Brooks Hall, named after Sir Dallas Brooks, a top-ranking Freemason and Victorian Governor, was opened in 1969 as the headquarters of the Freemasons in Victoria at 300 Albert Street, East Melbourne (see Figure 4.1).

**Figure 4.1: Dallas Brooks Hall site location[7]**




The main auditorium, which could seat up to 2,300 was used as a major venue for public events, including music concerts. Changing cultural expectations and an increasing number of venue options in Melbourne meant that the hall was no longer considered a venue of choice within the city.

Mirvac and Freemasons Victoria worked in partnership to redevelop the site with the future development to include a purpose built masonic facility for Freemasons Victoria and a 275-apartment residential building.

> ***"The complexity and cost of asbestos removal can have a significant impact on the business case of a development project. The high property values in East Melbourne helped make this redevelopment a viable project."***
>
> ***Mirvac***

A Hazardous Materials Audit had identified Asbestos Containing Material (ACM) throughout the Dallas Brooks Hall building which needed to be removed from the structure to enable hard demolition. This was a key factor in the evaluation of the business case and was it not for the high value of the real estate in East Melbourne, the project may not have proceeded as it did.

[7] Map data: Google

## Site sampling, assessment and project planning

To assist tenderers in scoping the extent of asbestos removal, a series of investigations were conducted, including some intrusive sampling, in accordance with the requirements of Chapter 4, Part 4.3, Division 6 of the Victorian *Occupational Health and Safety Regulations 2007*.

Asbestos was found in a large range of materials located throughout the building, including:

- asbestos sprayed insulation (see Figure 4.2);
- asbestos contaminated settled dust and debris;
- asbestos contaminated carpet (and underlay);
- fire doors;
- asbestos cement sheet and moulded pipe;
- mastic;
- bituminous membrane;
- vinyl floor and wall tiles;
- black vinyl tile adhesive;
- black adhesive coating to polystyrene insulation;
- in-situ gaskets and pump and valve packing;
- electrical boards and associated components;
- rope seals.

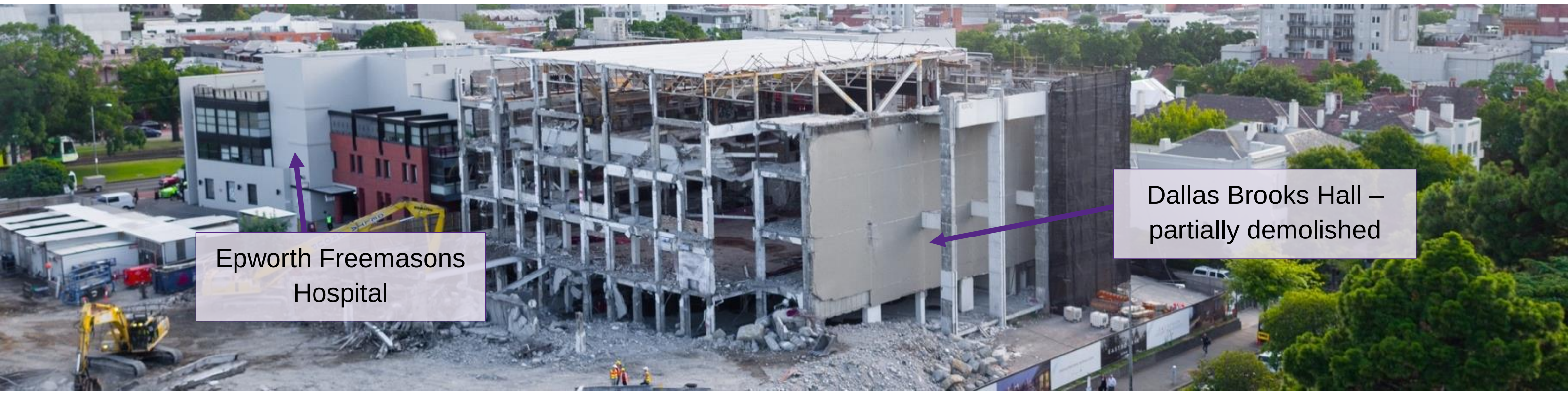
**Figure 4.2: Significantly deteriorated asbestos insulation found directly above cinderblock wall which was built directly up to the base of the insulation**

Once a successful tenderer was selected, the extent of asbestos contamination meant that considerable project planning and consultation was required amongst all parties. WorkSafe Victoria were involved from the outset in developing an acceptable Asbestos Removal Management Plan and were cooperative and instrumental in establishing methodologies and procedures for how asbestos would be removed, how the site would be protected and what air monitoring would be required.

### Community consultation

Being located directly adjacent to a working hospital meant that it was a particularly sensitive site for removing asbestos (see Figure 4.3). Mirvac ensured extensive community consultation was undertaken. There were two public consultation sessions held on Saturday afternoons that had a good level of attendance. This successfully raised community awareness of the upcoming process so that presence of workers in protective suits and masks was not a cause for alarm. It also allowed for community feedback, which resulted in plans for the addition of air monitoring within the hospital, more extensive air monitoring around the hospital and more sensitive limits for notification.

**Figure 4.3: location of asbestos removal works in relation to the hospital**



# Asbestos removal program

## Overview of removal program

The asbestos removal took place over an 18-month-period that commenced in October 2015, with the bulk of the removals occurring in the first 12 months. At its peak, the project involved 45 removalists and 4 hygienists working on-site at any one time. Over 1,500 tonnes of ACMs were safely removed.

The removal was completed area by area across each of the 5 levels under an approved Asbestos Removal Management Plan. Asbestos was located throughout much of the building, with the majority present as limpet asbestos sprayed insulation on structural materials. Redevelopment works could not commence before all ACMs were removed from the site.

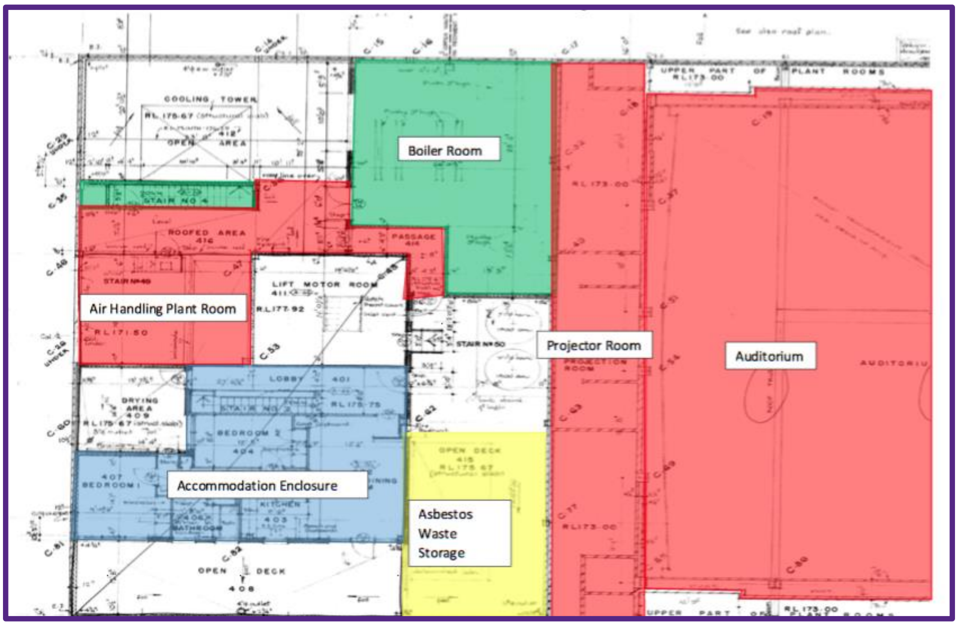
## Removal planning

The Asbestos Management Plan prepared for the removal works included:

- Placement of signage indicating asbestos removal works in progress and no access at exclusion zone boundary to prevent unauthorized access;
- Temporary water supply to be utilized to suppress any possible dust due to excavation;
- Prior to commencing work, all workers required to complete a general site induction and be inducted into specific Work Procedures and Safe Work Method Statements prepared by the asbestos removal sub-contractor prior to them commencing;
- Stakeholders, including neighbours, to be informed prior to commencement of upcoming asbestos removal works;
- Specific asbestos removal methodologies prepared for asbestos within enclosure “bubble”, asbestos waterproofing membrane and expansion joint mastic, asbestos vinyl tiles and adhesive and asbestos waste removal.

Due to the significant volume of asbestos waste requiring removal, specific planning was also required for the movement of waste drums within the building and between floors and consideration for this made in the site traffic management plan (see Figure 4.4 for site plans).

**Figure 4.4: Level 4 site plans showing work areas to be entered under controlled asbestos conditions highlighted in red, temporary asbestos waste storage highlighted in yellow, work areas cleared highlighted in green and work area currently undergoing setup in blue.**



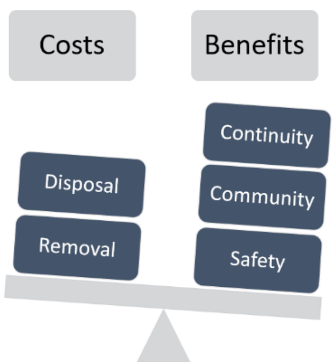
## Removal methodology

For each area in which the asbestos removal occurred, a similar methodology was undertaken (see Figure 4.5):

- The area was first fully enclosed using heavy duty plastic sheeting to prevent the release of airborne fibres;
- A licensed asbestos assessor was then used to visually inspect and smoke test the enclosure for leaks;
- Decontamination units were set up for workers moving in and out of the enclosure to prevent the release of fibres immediately outside the removal area;
- Negative pressure air units were set-up and used for the duration of the works;
- In the main building area, once the ceiling was removed, the area was then re-enclosed up to the next floor level and another visual and smoke assessment completed;
- The limpet asbestos sprayed insulation posed the largest risk as it was friable and present in significant quantities. Removalists firstly wet down the area and then bulk scraped off most the sprayed insulation. Residual material was then removed in a more detailed stage of works that was done in collaboration with hygienists to ensure no asbestos materials remained;
- All asbestos waste was placed into 200 litre drums that were sealed and wet-down prior to transport off-site. The waste was sent to the Bulla Prescribed Industrial Waste landfill, which was approximately 32 kilometres from the site;
- Once an area was cleaned, hygienists inspected the area by visual observation and then issued clearance certificates;
- After clearance, all steel bars were painted as a precautionary measure.

**Figure 4.5 Asbestos removal works were undertaken in enclosed areas**

## Business Case




The total cost of the asbestos removal for this project was around $9 million. This included all removal works, supervision, use of occupational hygienists, sampling and testing, the building of scaffolding in the main auditorium and the final disposal costs.

The safe removal was an essential step in the overall redevelopment project, but also removed the ongoing risks that the building owners and managers would have had from the continuing use of the building.

The asbestos removal was a significant cost in the evaluation of the viability of the overall development. The ultimate decision to move ahead was based on the high property values in East Melbourne which underpinned the demolition program.

### Management of risks

When personnel on the site were first relocated, the air-handling units were turned off and preparation activities commenced that created some dust disturbances. At this time, air monitoring results revealed that levels of air-borne fibres were present which required the site to be treated as an exclusion zone. During this time personnel could only enter with full personal protective equipment, which added complexity to the setup of removal equipment and infrastructure.

Although a detailed and invasive survey of asbestos had been undertaken at the start of the project, additional asbestos containing materials were found during the course of the demolition works. The financial risk for this lay with the demolition company, however clear and timely notification was given to all parties to ensure the correct management of these materials. This also added additional time to this phase of the redevelopment as inspection, analysis and assessment was required prior to the development of additional safe work procedures.

| Key consideration for future projects |
| --- |
| ***Due to the large scale of asbestos removals, ongoing consultation with stakeholders was a critical factor in the success of the project. A range of communication processes were implemented, including weekly newsletters to the hospital and monthly site visits from WorkSafe Victoria.*** |

### Unexpected asbestos discovery

During the project, removalists found unexpected asbestos at the site which would alter the budget and timeframes for completion. Fortunately, the original contract provided provisions and guidance for such discoveries, and this ensured the unexpected finding could be managed efficiently and openly between all parties.

## Innovation and excellence

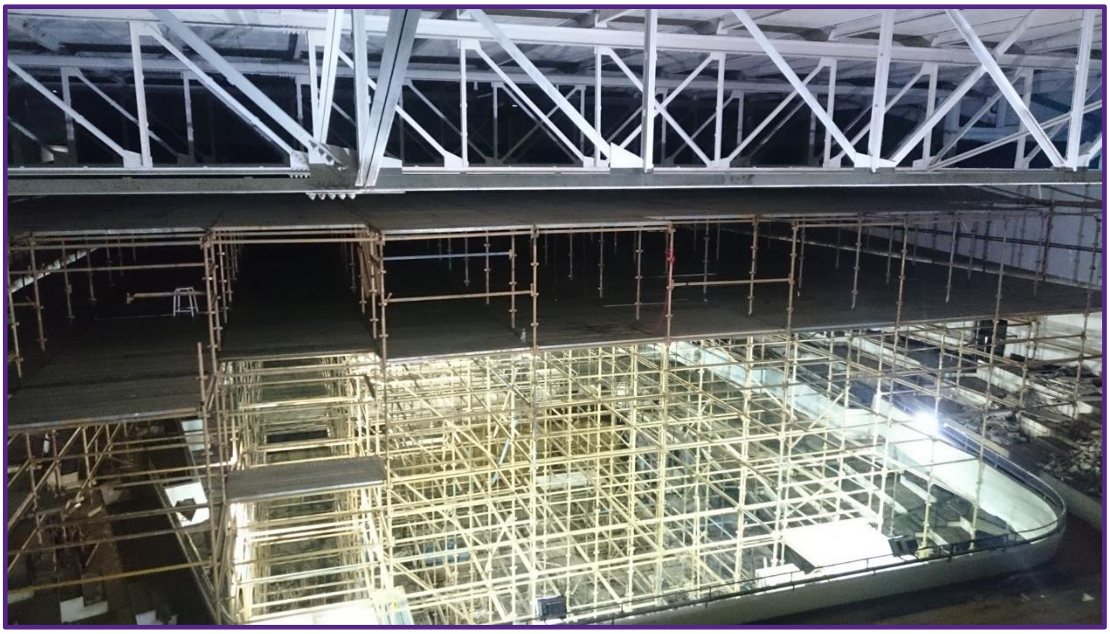
A key challenge that arose during the demolition was the destruction of several 22-metre-high columns that were found to be structurally brittle and weak and that also contained an asbestos storm water pipe (see Figure 4.6). Consultation took place with structural engineers, the demolition company, occupational hygienists and WorkSafe Victoria. It was not feasible to enclose the area around the columns, so an exclusion zone was used within the site and around the adjacent footpaths and carparks. A long-arm excavator was used to demolish the columns under controlled conditions, with any worker required inside the exclusion zone wearing personal protective equipment and additional air monitoring was located at the edges of the exclusion zone. Columns were also sprayed to minimise dust.

**Figure 4.6: The 22-metre-high columns containing asbestos pipe presented a significant challenge to safely demolish**

Where the columns were located too close to the hospital, a variation on this procedure was devised. This involved holding the top of the column, cutting it at the bottom and then lifting it to a more central area on the site for destruction.

The main auditorium was another significant challenge for the project team. Sprayed asbestos was present on the underside of the ceiling and the only way to safely access this area was to construct an extensive birdcage scaffolding across the entire 3-level, 2,300-seat auditorium. As part of the process, the entire auditorium was enclosed and all limpet asbestos sprayed insulation was removed from the top beams and soffits. It took six months to complete the main auditorium area.

**Figure 4.7: extensive scaffolding was used in the main auditorium to safely access the ceiling**



***"This was the largest asbestos removal project we have been involved in, so to have no incidents for the duration of the work was a success story in itself."***

***Delta Group***

# Port Lincoln Hospital Asbestos Clean-Up and Removal

## Case Study 5 – Port Lincoln Hospital

### Project overview

Construction staff identified asbestos in the Port Lincoln Hospital[8] during a $40 million site redevelopment, which triggered a significant asbestos clean-up and remediation project throughout the building. This project has taken 19 months and is now in its final stage (see Table 5.1 for a summary).

This is a significant and challenging asbestos removal project given the hospital has remained open throughout the project to service the local community. Given the constraints of asbestos management at a 'live' site, the removal company has taken a cautious and measured approach. As a result of good planning and communication, there have been no issues reported, no readings of asbestos outside of the asbestos removal areas and no complaints from hospital patients or staff.

**Table 5.1: Key information from the asbestos removal case study**

| Key information | Finding |
|---|---|
| **Location** | Port Lincoln Hospital, Oxford Terrace, Port Lincoln, South Australia |
| **Removal period** | October 2015 – current (May 2017). |
| **Type of asbestos** | Blue (crocidolite) asbestos in walls, bonded asbestos in concrete work and beams, and loose friable asbestos in the ceilings. |
| **Volume** | 175 $m^3$ plus extensive volumes cleaned at the site. |
| **Cost** | Approx. $40 - $50K for asbestos testing and tender development<br>Approx. $2.5 - $3 million for asbestos decontamination and removal (part of an approx. $12 million government funded remediation project). |
| **Distance asbestos transported for disposal** | 650 kilometres |
| **Key considerations for the asbestos clean-up** | • Conducted at a live site – the hospital remained open during the project;<br>• A staged approach with extensive contingency planning required;<br>• Strategies had to be put in place to minimise patient concerns. |

[8] Hospital photo in title box from Eyre Peninsula 765-5CC News 'Premier Officially Opens Port Lincoln Hospital Redevelopment'

## Background

The Port Lincoln Hospital is the main hospital in Port Lincoln, a rural coastal town in South Australia with a population of around 15,000 people. A $40 million redevelopment of the hospital commenced in 2013, and during demolition works for this redevelopment, significant friable asbestos was encountered which was not listed on the asbestos register. In response, a series of asbestos testing was undertaken to confirm the extent of asbestos throughout the building and requirements and costs for its removal or management.

Based on the results, the SA Government developed tender documentation for asbestos decontamination and removal, and awarded a contract in 2015 to a construction management company who subcontracted an asbestos removal company. Work started immediately and has been conducted while the hospital remains open.

**Figure 5.1: Port Lincoln Hospital location**[9]


## Site sampling, assessment and project planning

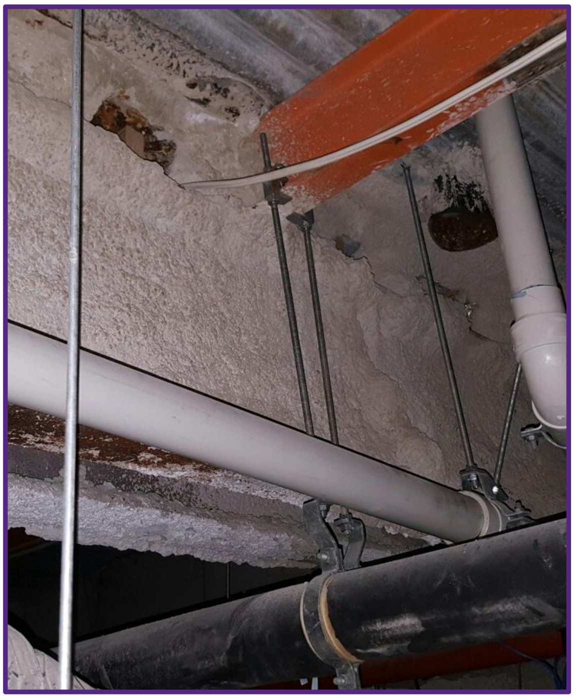
An independent asbestos monitoring company completed a detailed site audit of the hospital prior to the works commencing which revealed loose friable asbestos and blue (crocidolite) asbestos throughout the building (see Figure 5.2 overleaf). The site testing was followed by development of an asbestos management plan. This ensured the building was safe for occupation and enabled an outline of the scope of work required for asbestos decontamination and removal. SA Health then prepared an accurate scope of works as part of request for tender documentation for potential asbestos removalists to respond to. Tenderers were informed of the desired outcomes of the project:

- Health Service continues to operate fully functional during the asbestos remediation process;
- Communication strategies employed to keep all staff /the community /and contractors safe during the remediation process;
- Minimal services down time;
- Site left in a safe manageable state where the asset manager is aware of the ongoing requirements in regard to the management of asbestos.

This tender briefing and the scope of work was critical for the successful delivery of the project. De-Construct was appointed as the preferred asbestos removal contractor.

[9] Map data: Google

**Figure 5.2: Asbestos sprayed beams in ceiling cavity**



### Communication and collaboration to allay concerns

Given the site has remained live throughout the asbestos removal, sound communication has been critical for the project's success. The stakeholders accountable for the successful delivery of the project and establishing appropriate governance were SA Health, Department of Planning, Transport and Infrastructure (DPTI) and Port Lincoln Hospital, with support from SafeWork SA. These stakeholders adopted a communication strategy focused on strong collaboration between all stakeholders, open and honest communication, aligned objectives and a focus on win-win. This was highlighted from the outset, in the tender briefing, and continued during the project.

Hospital staff and patients were notified of the project and raised concerns over patient, staff and visitor health. Hospital staff were also concerned that if the community regularly saw workers in asbestos gear, stress and worry would increase. In response, SA Health provided clear and regular updates to patients on progress (see Figure 5.3), and the removalists worked to minimise the public seeing them in the workplace, restricted access to construction areas, undertook significant air monitoring and reported this to the hospital, and ensured strict quality control was maintained within the construction site.

***"The pre-commencement site demonstration for regulatory bodies and other stakeholders opened up communication channels, allayed concerns and allowed an efficient response to questions."***

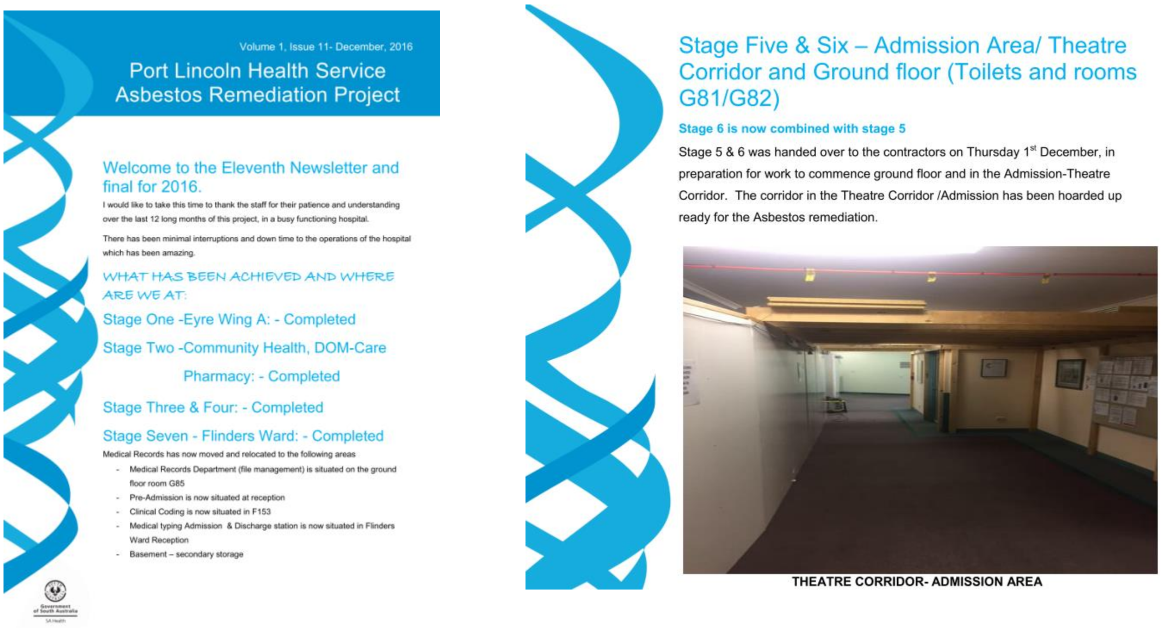
***De-Construct***

At each stage, the Project Management company met with hospital staff to clarify the hospital's requirements. This information ensured that the hospital's requirements were considered when setting up the rooms in each project stage. Examples included ensuring selected corridor and emergency exit access.

When the site had been set up for asbestos clean-up and removal, De-Construct invited relevant authorities (e.g. SafeWork SA, DPTI, SA Health and relevant hospital staff) to view the site and ask questions. They explained the process, what equipment would be used, protective equipment, access and egress for hospital patients and so on. This pre-commencement site demonstration opened communication channels, allayed concerns and allowed an efficient response to questions. De-Construct responded to raised concerns prior to commencing the work.

A monthly newsletter (as presented in Figure 5.3) was also used to keep hospital staff and the public informed on progress. According to SA Health, this was a very effective way of keeping stakeholders up to date.

**Figure 5.3: Extracts from a newsletter updating hospital staff and the public on asbestos removal**



Volume 1, Issue 11- December, 2016

Port Lincoln Health Service
Asbestos Remediation Project

Welcome to the Eleventh Newsletter and final for 2016.

I would like to take this time to thank the staff for their patience and understanding over the last 12 long months of this project, in a busy functioning hospital.

There has been minimal interruptions and down time to the operations of the hospital which has been amazing.

WHAT HAS BEEN ACHIEVED AND WHERE ARE WE AT:

Stage One -Eyre Wing A: - Completed

Stage Two -Community Health, DOM-Care Pharmacy: - Completed

Stage Three & Four: - Completed

Stage Seven - Flinders Ward: - Completed

Medical Records has now moved and relocated to the following areas

- Medical Records Department (file management) is situated on the ground floor room G85
- Pre-Admission is now situated at reception
- Clinical Coding is now situated in F153
- Medical typing Admission & Discharge station is now situated in Flinders Ward Reception
- Basement – secondary storage

Government of South Australia
SA Health

Stage Five & Six – Admission Area/ Theatre Corridor and Ground floor (Toilets and rooms G81/G82)

Stage 6 is now combined with stage 5

Stage 5 & 6 was handed over to the contractors on Thursday 1st December, in preparation for work to commence ground floor and in the Admission-Theatre Corridor. The corridor in the Theatre Corridor /Admission has been hoarded up ready for the Asbestos remediation.

THEATRE CORRIDOR- ADMISSION AREA

# Asbestos removal program

## Overview of removal program

To enable asbestos removal during continued operations, De-Construct conducted the project over nine stages, with each stage representing a different area within the hospital. Each stage involved asbestos clean-up and removal (taking approximately seven weeks), followed by reinstatement of the area (taking up to three months).

In each stage, plastic sheeting was erected with decontamination units installed and monitors set up to monitor asbestos levels (see Figure 5.4). After the site viewing by relevant stakeholders (see previous section), asbestos was wiped down and vacuumed, with the wiper used only once to increase safety and quality control.

Removed asbestos was placed in 1 $m^3$ boxes, which was double lined with plastic, tape sealed, security locked and stored in an asbestos removal area. The box was tested, an asbestos label applied, and the box moved to a secure outdoor shipping container, which was then transported to an asbestos disposal registered landfill in Adelaide (over 600 kilometres by truck).

***"The asbestos box was stored within the construction site. Each was double lined with plastic, tape sealed and required a security code to enter. The outside of the box was tested for asbestos and when this was cleared, it was transported outside to be trucked to a landfill licenced to accept and dispose asbestos."***

***De-Construct***

**Figure 5.4: Plastic lining set up for asbestos removal (left picture) and the outside of a decontamination unit (right picture)[10]**

## Unforeseen challenges

A number of challenges arose during the project and appropriate management of these was essential for the project success. Some of these challenges are outlined below.

**Back-up power**

It was essential that both the hospital and asbestos removal works had access to interrupted power. De-Construct conducted a test run of the back-up power. The blackout simulation was a success, as the backup power continued to run, meaning the decontamination equipment and negative air pressure machinery remained operational. This test procedure helped to further reduce concerns of hospital staff and other stakeholders.

**Stage three works area**

This large area of works required additional planning. To manage the works safely and effectively, tunnels were built between rooms and this stage required five negative air pressure units. Unplanned vernacular beams laced with asbestos were identified in this stage and had to be appropriately cleaned.

**Stage five works area**

This area was below the doctors' rooms and as such, the ceiling could not be removed. Again, effective planning and design led to a solution where additional labour was deployed to hygienically vacuum the entire area and remove the asbestos.

## Asbestos identified during the removal and clean-up

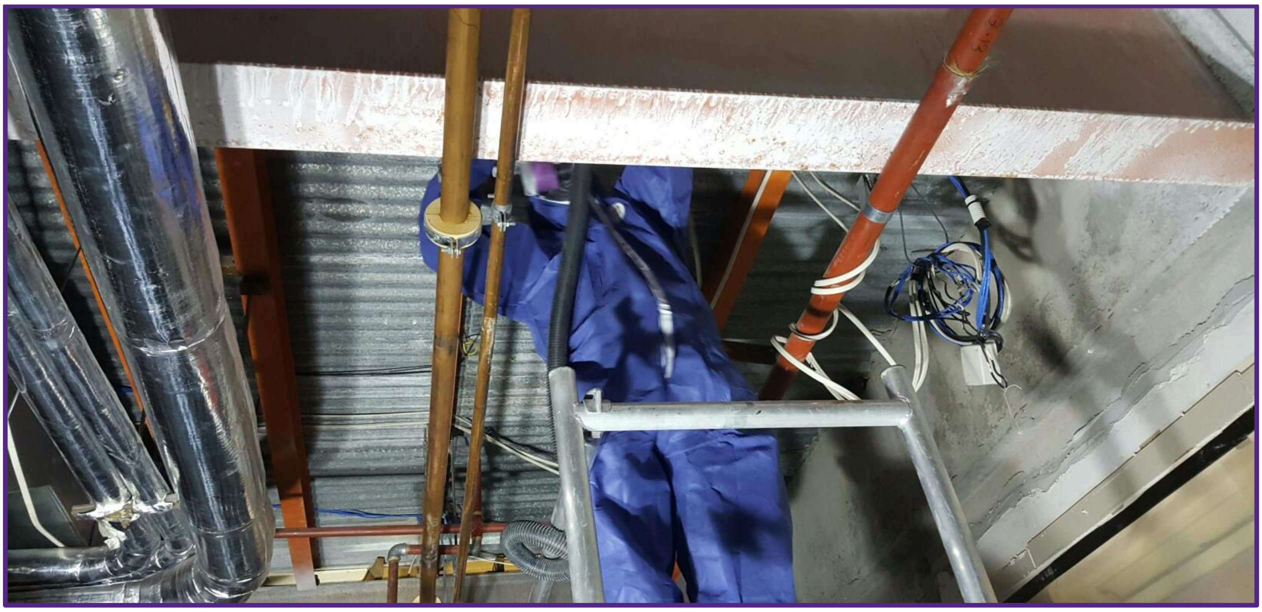
The asbestos identified and associated volumes is highlighted in Table 5.2 below. An image of an asbestos worker treating a ceiling beam can be found in Figure 5.5.

**Table 5.2: Asbestos identified and cleaned/removed during the project**

| Asbestos Type | Quantity | Locations |
|---|---|---|
| Loose friable, blue (crocidolite) asbestos and bonded asbestos | Total 175 $m^3$ of asbestos removed, unknown volume cleaned | Walls and ceilings cavities throughout the hospital |

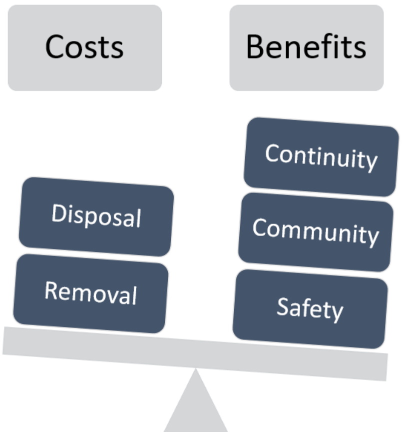
[10] Photos provided by De-Construct

**Figure 5.5: Asbestos removalist treating a beam in the ceiling**



## Business Case

The business case for the removal of asbestos must consider all factors including costs and benefits. In a hospital environment, the health of patients and staff is the highest priority. The presence of asbestos was not factored into the original cost estimates for the hospital redevelopment. However, the South Australian Government moved quickly to prioritise additional funding to cover the costs of removal and clean-up works. Initially, funding of $45,000 was provided to undertake the asbestos site audit and testing and support detailed documentation for the tender process. This provided an accurate removal budget of approx. $2.5 million for asbestos removal as part of a $12 million project spend.




To further build the business case, the SA Government highlighted the benefits of the removal, including increased safety and minimisation of risk to hospital staff and patients. The SA Government were also able to reduce costs and maintain a good service to the community by keeping the hospital open throughout the removal process while ensuring strict quality controls and consistent air monitoring throughout the entire asbestos clean-up process.

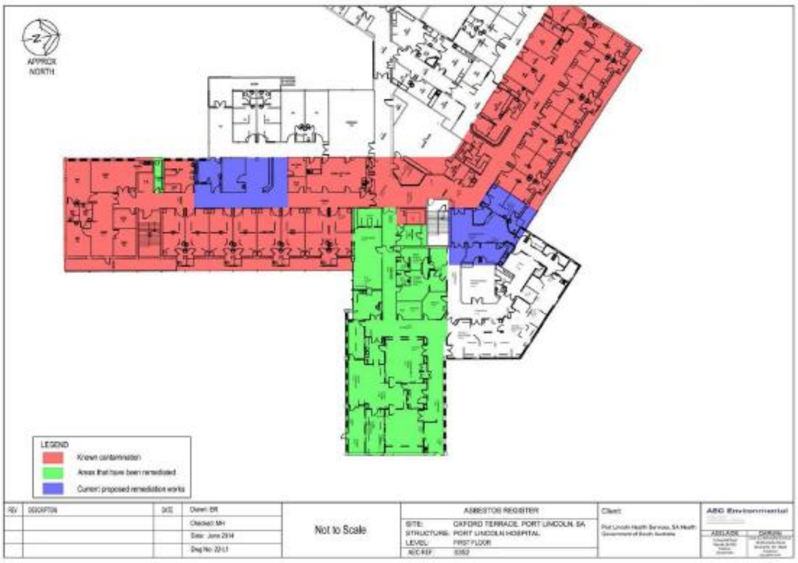
## Removal planning

There were areas of identified asbestos contamination throughout the 3 floors of the building. These are captured in Figure 5.6 overleaf. Sufficient planning and communication ensured hospital staff could continue to work in the hospital throughout the project without impacting their work hours, as equipment and patients have been shifted to areas where the asbestos removal is not taking place.

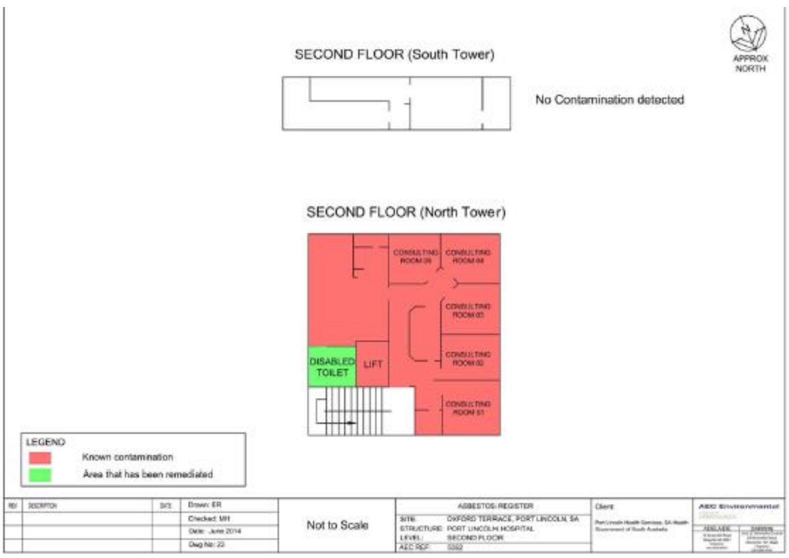
**Figure 5.6: Known contamination prior to commencement, information provided to tenderers (red = known contamination, green = areas that had been remediated, blue = proposed remediation works)**

Ground floor


First floor




Second Floor



### Management of risks

Risks identified prior to commencing the project and management strategies are included below.

**Table 5.3: Risks identified and strategies used to mitigate risk**

| Risk identified | Strategy used to mitigate risk |
|---|---|
| Asbestos becoming airborne and reaching hospital patients and the public | • Constant air monitoring during the project by an independent hygienist;<br>• Assessment of storage boxes prior to transportation, including assessment of asbestos leakage at the seams;<br>• A security code required to open box and double plastic lining within;<br>• When testing of the box was complete, box was removed and transported within a day to a certified landfill;<br>• Additional negative air pressure units used, doubling the recommended negative air pressure in each working space;<br>• Strict quality control followed during the clean-up, for example only using wipe down rags once rather than repeated use. |
| Blackouts occurring during the removal process | • Backup generators installed;<br>• Black out testing conducted in Stage One – the power was intentionally cut and the generator was tested under these conditions. |
| Potential worry and fear of hospital patients | • Signage and communication to patients referred to construction being undertaken at the site, rather than asbestos removal;<br>• Regular updates on progress were communicated to patients via a newsletter.<br>• Concerns from patients were passed on to hospital staff, who notified the construction management company. |

## Innovation and excellence

Some of the key elements to the success of the project are summarised below.

- SA Government provided clear instructions on the desired outcomes during the tender process;
- Prior to commencing asbestos clean-up, key stakeholders were given access to the site and could ask questions. A blackout run was also conducted to demonstrate back-up power worked;
- The hospital provided regular updates to staff and patients on the project's progress;
- De-Construct utilised local employment, hiring and training two local indigenous people who played an important role in the project's success;
- De-Construct followed strict quality control measures, including progressive air monitoring and swabbing. Monitors were installed in public locations such as the hospital corridors, and wipe down rags were used once rather than multiple times prior to disposal.

**Figure 5.7: An example of a hospital ceiling cavity after asbestos clean-up and removal**

# 199 William Street, Melbourne


## Case Study 6 – 199 William Street, Melbourne

### Project overview

Long regarded as an empty 'ghost' property, Built was engaged by Hengyi Australia to complete an extensive demolition and refurbishment of two existing towers on the corner of William Street and Little Bourke Street in Melbourne's CBD. The project involved demolition of every façade across two towers of over 20 stories high.

Over 690 tonnes of asbestos containing materials were removed from a range of areas, with the most difficult challenge presenting as limpet asbestos applied to the concrete infill in between the slab edge and the façade panels. Table 6.1 includes key information from the project.

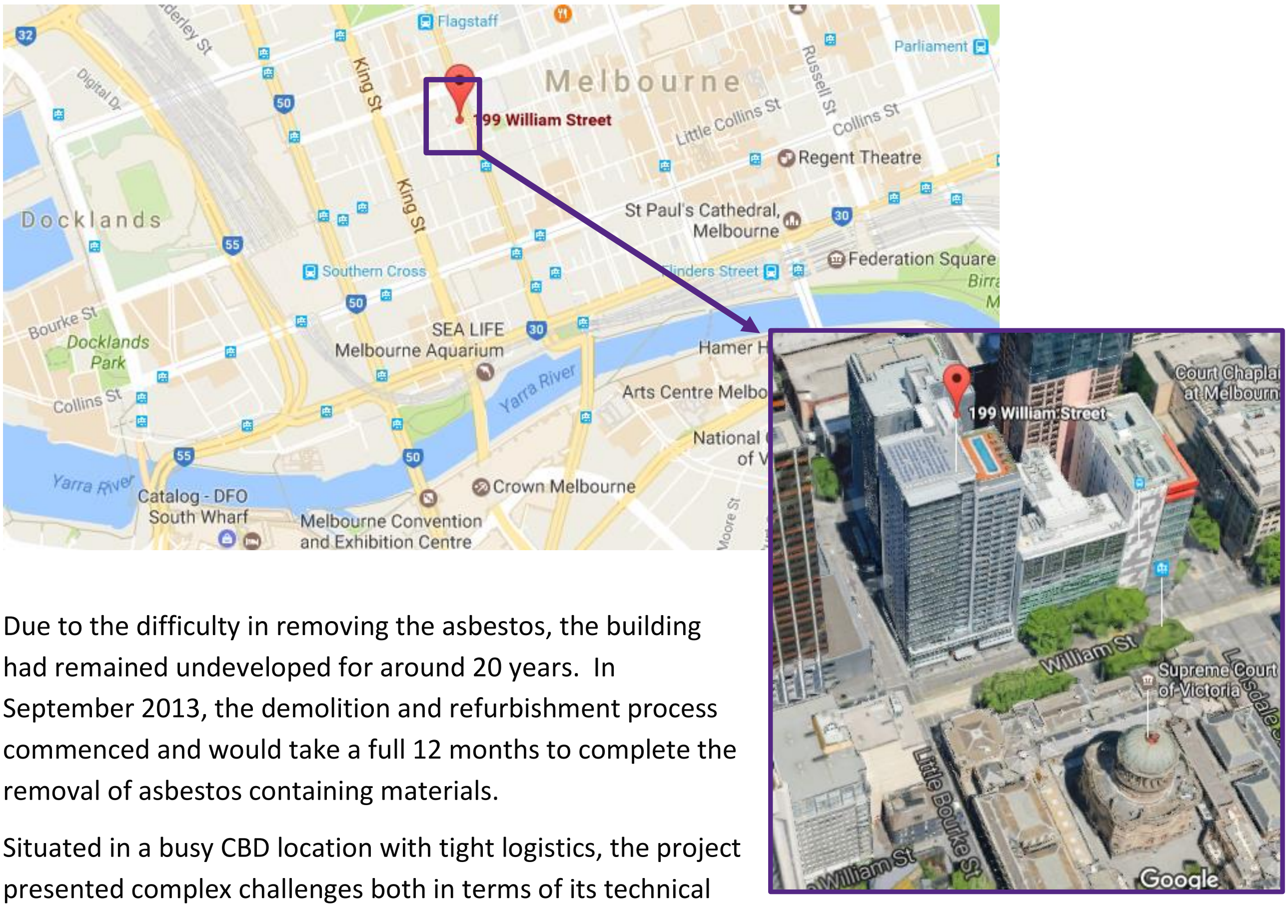
**Table 6.1: Key information from the asbestos removal case study**

| Key information | Finding |
|---|---|
| **Location** | 199 William Street, Melbourne, Victoria |
| **Removal period** | September 2013 – September 2014 |
| **Location of asbestos** | Chiller units, gaskets, membranes, expansion joints, lift doors, switchboards, pipework, ductwork, insulation, floor adhesive |
| **Volume** | Over 690 tonnes of asbestos materials removed from two towers of over 20 building levels |
| **Cost to remove** | Approx. $4.5 million, privately funded |
| **Key considerations for the asbestos clean-up** | • Two full-time on-site hygienists with sampling equipment;<br>• Bubble enclosures built out on to scaffolding;<br>• Class B training given to majority of staff to improve awareness;<br>• Suspected Asbestos Find Procedure developed to limit further exposure;<br>• Permit to Work system with maps for working near asbestos areas;<br>• Consultation with neighbouring building occupants. |

## Background

The buildings at 199 William Street in Melbourne's central business district consist of two connected towers constructed in circa 1964 and 1971 respectively. Both towers had asbestos prevalent throughout, some of which was in notably challenging locations, with asbestos more prevalent in the older tower.

**Figure 6.1: 199 William Street site location**[11]




Due to the difficulty in removing the asbestos, the building had remained undeveloped for around 20 years. In September 2013, the demolition and refurbishment process commenced and would take a full 12 months to complete the removal of asbestos containing materials.

Situated in a busy CBD location with tight logistics, the project presented complex challenges both in terms of its technical demands and the resulting safety measures required. With the two towers being of different design, the locations of asbestos and techniques for its removal varied.

The finished building contains 444 private residential apartments, 97 serviced apartments, multiple office accommodation, retail tenancies, gymnasium and open rooftop pool.

| Key consideration for future projects |
| --- |
| ***Working in a busy CBD location requires extensive consultation with adjacent building owners as well as ongoing reporting of progress in order to manage their expectations and alleviate any concerns.*** |

[11] Map data: Google

## Site sampling, assessment and project planning

The Developer provided the Principal Contractor with initial Hazardous Materials Audits (Division 6 audit under the Victorian *Occupational Health and Safety Regulations 2007*) with a number of areas that were not accessible or had not been inspected which required further investigation. There were up to 12 revisions of the Audits that made it difficult to interpret for costing and project planning purposes. As a result, a new Division 6 Audit was undertaken that updated all revisions and covered the entire building.

**Figure 6.2: Asbestos containing materials were found in a number of areas, including the infill material between the exterior concrete panels**

Asbestos was found in a large range of materials located throughout the building, including:

- Chiller units;
- Gaskets;
- Membranes;
- Expansion joints;
- Lift doors;
- Switchboards;
- Pipework;
- Ductwork;
- Insulation;
- Floor adhesive.

Despite the new and comprehensive Hazardous Materials Audit, some areas of the building could still not be accessed without commencing the demolition work itself, so where there were unknown areas, it was assumed that asbestos was present.

Additionally, a procedure was developed to manage the response where asbestos was found in an area where it had not previously been identified in the Audit. This Suspected Asbestos Find Procedure guided workers on who to notify and how to isolate the area.

### Public consultation and responding to community concerns

Being located within the crowded central business district of Melbourne also meant that managing the expectations of neighbouring building occupants would be critical to the successful execution of the project. Consultation sessions were undertaken with stakeholders to ensure there was a sufficient level of awareness and understanding of asbestos removal techniques, so the sight of workers in full protective suits and masks would not cause unwarranted concern.

A good relationship was established with the neighbours, with the suggestion of one neighbour to use blue plastic rather than clear plastic on enclosures that were facing their building so that their workers would not be distracted or concerned by the works inside the enclosure.

# Asbestos removal program

## Overview of removal program

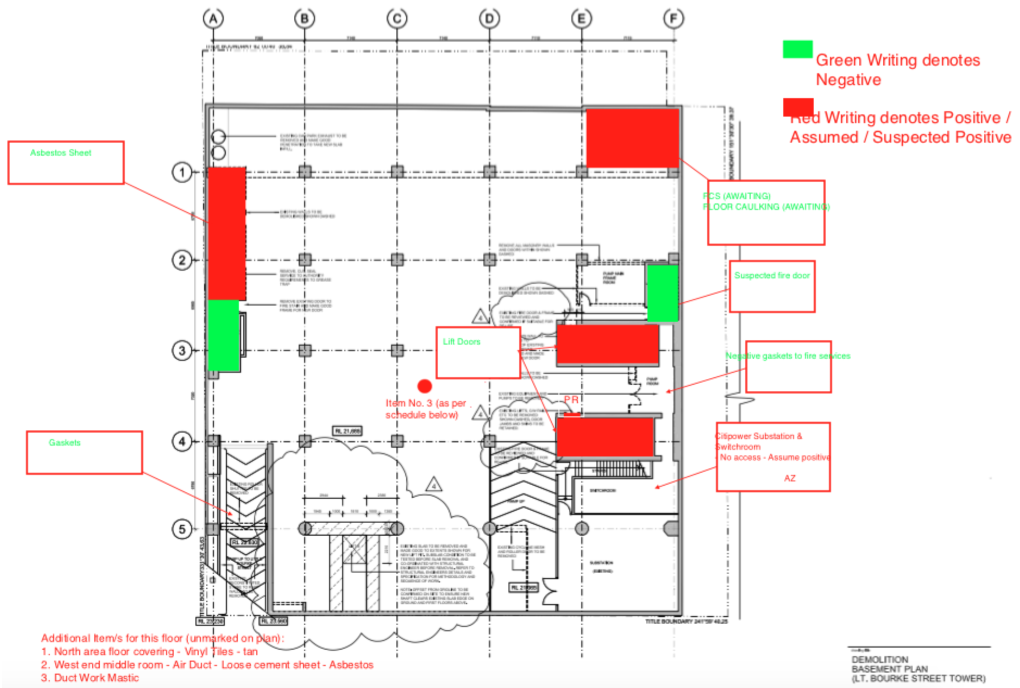
The asbestos removal took place over a 12-month period that commenced in September 2013 and was completed in September 2014. The asbestos removal works were required on each level of the building and needed to be planned progressively to ensure the effectiveness of exclusion zones. Each of the two towers of the building had a plant room located on top which contained boilers with pipe lagging and other components that contained asbestos. These plant rooms needed to be demolished first before works could commence on each floor level below.

## Removal planning

The asbestos audit report was developed such that each building level had its own stand-alone floor plan with colour-coded areas indicating the locations of asbestos and the exclusion zones (see Figure 6.3). These were extremely helpful in communicating to trades workers and controlling where work was undertaken. The plans were also built into the Permit to Work process and any trades work occurring on site was controlled under a permit, which began with a physical walk through of the building level while reviewing the asbestos plans. As a result of this complex project, the Permit to Work process used by Built was improved upon and used for all future projects.

Built engaged Prensa as an independent hygienist and committed to having two hygienists on site for the duration of the asbestos removal works.

**Figure 6.3: Floor plans showing locations of asbestos**




***"Making hygienists available on-site is very important for the success of a large asbestos removal project. It enables quick decisions to be made by providing on-hand technical expertise and immediate testing of samples. The experience of the hygienist is therefore critical."***

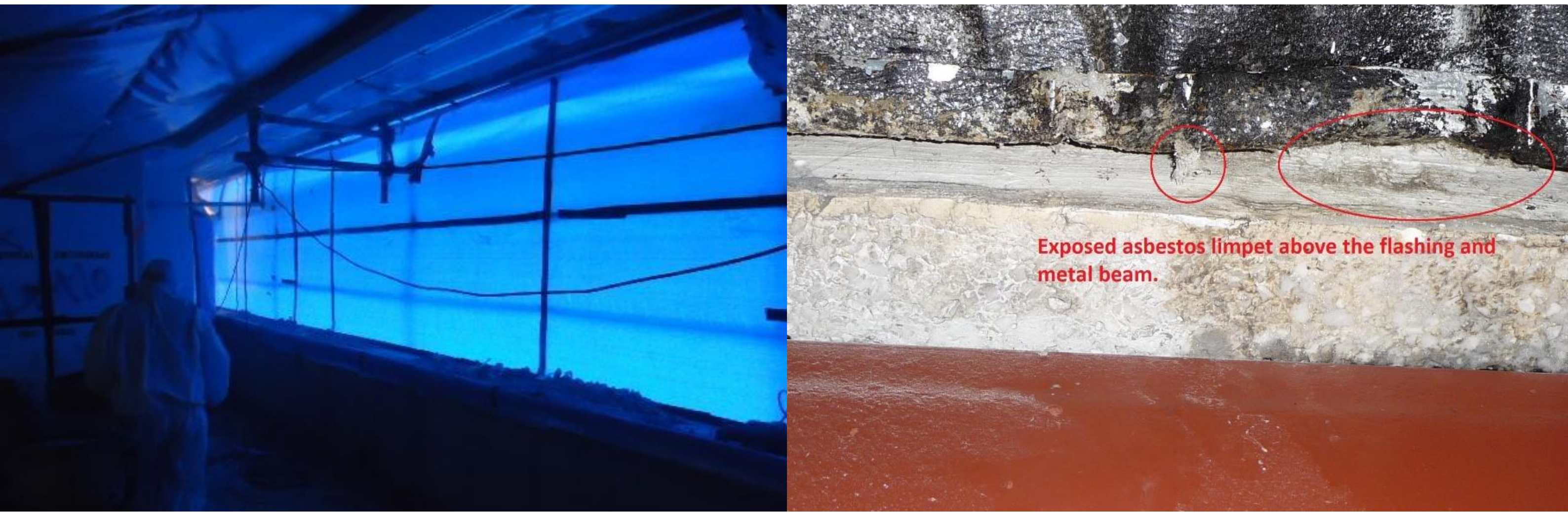
**Built**

### Removal methodology

The asbestos removal works required the integration of demolition, asbestos removal and scaffold all in one. Bubbles were set up to safely isolate the floor from other works and the public. Once the bubble was set up around the floor using the scaffold, the contaminated concrete infill was removed by qualified asbestos removalists and the façade panel was then removed. The scaffold was lowered to the next level and the process repeated on each floor.

One of the most difficult parts of the work was removing the asbestos found in the connections around the spandrel panels (Figure 6.4), which are the horizontal concrete panels on the façade of the building. The concrete infill between the slab edge and the panels contained limpet asbestos, which is classified as Type 1 friable asbestos, the most dangerous type. During construction, the asbestos-containing material had been used as an infill and applied to the concrete and steel connections. Some had spilt onto other surfaces. There was also asbestos along the bottom parts of the windows.

**Figure 6.4: Bubble enclosure used to remove friable asbestos from concrete panels**




A bubble enclosure was used around this work and because the panels were located on the façade of the building the enclosure need to extend out on to the scaffolding on the outside of the building.

Each panel was carefully removed by drilling holes and connecting lifting chains, then oxy-cutting the metal band connections. The panels were lifted away from the building and inspected by hygienists and where splashback of the asbestos infill had occurred this was cleaned. As a precaution the panels were sprayed with a pink PVA-glue to prevent dust before being lifted onto the roof where a designated exclusion zone had been established. The exclusion zone on the roof was necessary due to the unavailable space at ground level where narrow city streets and traffic were predominant. On the roof, the panels were tested for asbestos and clearance certificates issued.

All workers involved in the lift, including the dogmen, wore full protective suits and masks in case there had been splashback on the panels. Asbestos was removed from concrete surfaces by grinding and jackhammering inside the bubble enclosures.

Waste materials were removed in sealed and decontaminated 200 litre drums. The drums were moved using a designated lift and stored in a well identified area prior to removal by a licenced transport operator.

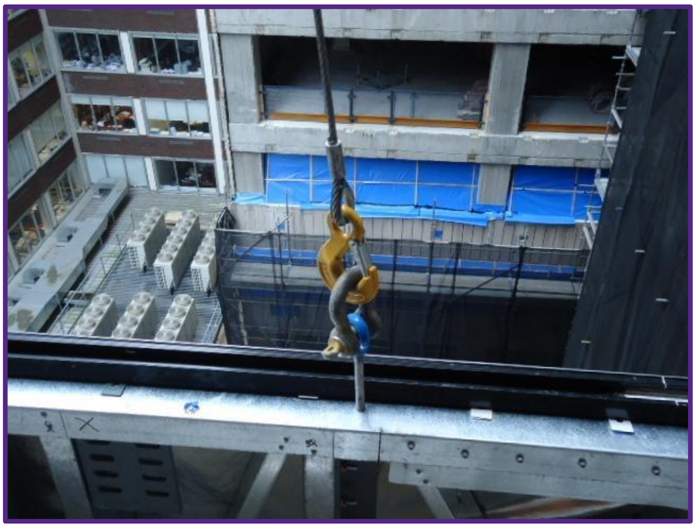

## Business Case

The building at 199 William Street had remained largely vacant since the previous tenants, Telstra, relocated to new premises in 1994[12]. The prime location of the building represented a significant opportunity provided that the asbestos could be safely removed. By undertaking comprehensive asbestos materials audits and applying rigorous safety programs, the cost sensitivity was reduced and the business case for the redevelopment could be more accurately evaluated.

The total cost of the asbestos removal for this project was $4.5 million. This included all removal works, supervision, use of occupational hygienists, sampling and testing and the final disposal costs. The increasing value of real state in the Melbourne CBD supported the positive business case for development of the site.

## Management of risks

**Figure 6.5: Bubble enclosures located on floors above and below panels to be removed**



One of the risks involved in working on a multi-floor building is the potential risk of asbestos exposure to workers on the levels above and below where removal is underway. It was identified that there were risers and cracks in floors that could lead to leakage of air to the adjacent floors. To mitigate this risk, it was agreed to set up bubble enclosures on the floors above and below and exclude any non-licenced workers from those areas (see Figure 6.5). Each enclosure had a double flap at the entrances as well as decontamination units for workers leaving the area. This process was quite challenging to execute from a project management perspective due to each section of the building having critical paths, but once confronted with hold points all relevant stakeholders were engaged to think through the process with the removal of asbestos in a safe manner being held at the forefront.

The ongoing management of sensitive stakeholders was another key consideration in this project. There were 200 workers on the job during the asbestos removal phase and all needed clear communication on the risk management processes. Air monitoring results were reported and displayed daily and there were weekly toolbox sessions. Contractors kept up to date with asbestos locations and exclusion zones through the Permit to Work process. WorkSafe Victoria was consulted on the asbestos removal methods, particularly in relation to the concrete infill material on the spandrel panels. Neighbouring building occupants were also communicated to on a regular basis, starting with 4 major sessions for a broad range of stakeholders and then weekly updates on progress and reporting of air monitoring results to the facilities managers.

[12] Wong 2012. 'Melbourne's abandoned skyscraper' *Marcus Wong*, January 9th 2012.

## Innovation and excellence

Built has a strong commitment to workplace health and safety and believes that safety begins with culture.  To ensure every person involved in the project had a shared understanding of the risks involved with the asbestos removal part of the redevelopment, they committed to training over 80% of employees and subcontractors in Class B asbestos removal.  This was one of the key success factors for the project and why there were no major incidents raised for the duration of the work.

Implementation of an Unexpected Finds Procedure added to this, such that when well trained workers exposed potential asbestos as the first exterior panel was removed, they could identify the risk, halt any further work and call in the hygienists to investigate and sample.

Built believe that no major incidents were raised due to the consultation with all workers, focus on asbestos upfront in the Site Induction and Class B training provided to all Built staff and subcontractors, which together created a site culture that respected asbestos and the procedure required to remove it safely. An example safety sign can be found in Figure 6.6.

**Figure 6.6: Safety signage**


# Laboratory Upgrades, The University of Melbourne

## Case Study 7 – Laboratory Upgrades, The University of Melbourne

### Project overview

The University of Melbourne (UoM) undertook a staged removal of asbestos containing materials (ACMs) as part of upgrades to the laboratories of the East Wing of its School of Chemistry. The 1970s era laboratories were completely gutted and refitted, requiring the removal of asbestos from a variety of different areas. Table 7.1 includes key information from the project.

The removal works were managed in a way that minimised disruption to the building users and carefully considered the communications to a range of stakeholders. The improvements made to this process over the life of the project are a clear illustration of how risk can be managed effectively and efficiently.

**Table 7.1: Key information from the asbestos removal case study**

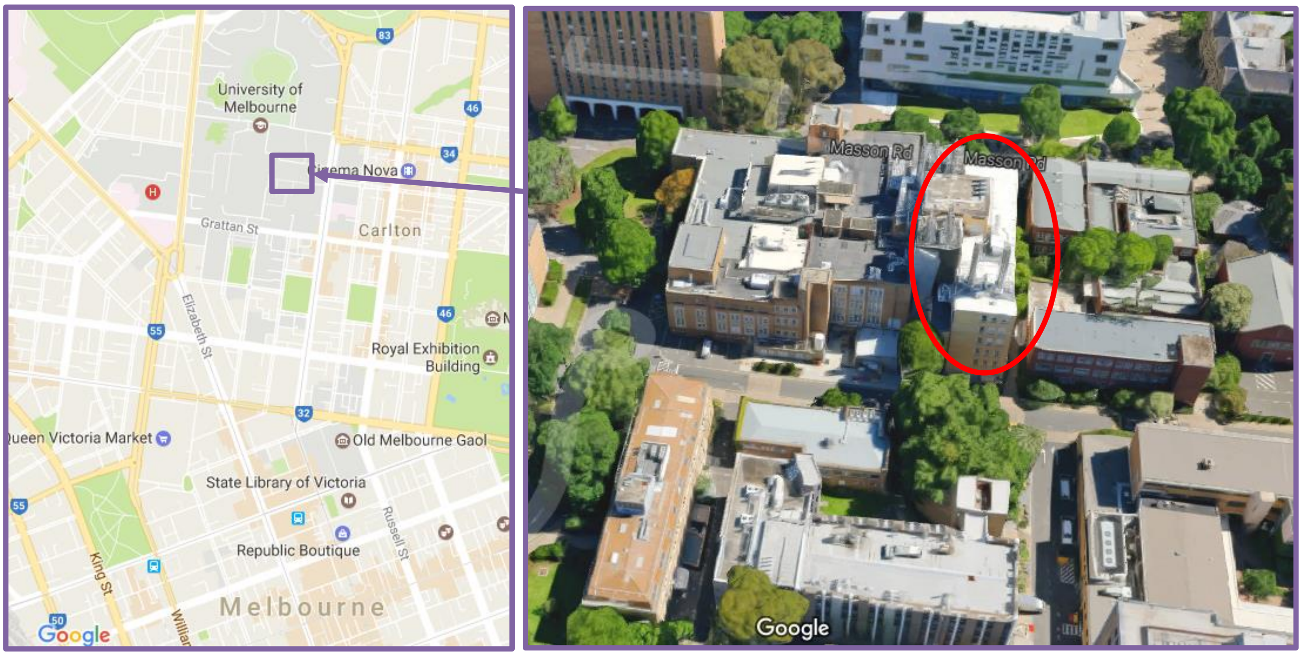
| Key information | Finding |
|---|---|
| **Location** | Chemistry East Wing Building, The University of Melbourne, Parkville, Victoria |
| **Removal period** | 2010 – 2014 |
| **Type of asbestos** | Asbestos cement sheeting, pipe insulation and cladding, mastic seals, vinyl floor tiles and adhesives, fire doors, equipment such as kilns |
| **Volume** | Total floor space area of 2,750 $m^2$ cleared over 5 levels |
| **Cost to remove** | Approx. $350,000 total removal cost, privately funded |
| **Key considerations for the asbestos clean-up** | • Sequencing of tradesmen, builders and asbestos specialists was key to the successful management of the project;<br>• Level by level removal using bubble enclosure and decontamination units;<br>• Continuing use of the building;<br>• Daily communication of air monitoring results;<br>• Use of a project control group to manage communications plan. |

## Background

The UoM's Parkville site includes buildings constructed from mid-1800s through to 2016 (see Figure 7.1 for the site location). Some buildings were constructed or refurbished when ACMs were more likely to be used. Additionally, installed laboratory equipment was also manufactured during these times.

The Chemistry East Wing Building at UoM houses 5 levels of research laboratories constructed in the 1970s and due to their age and condition were upgraded as part of a major building refurbishment.

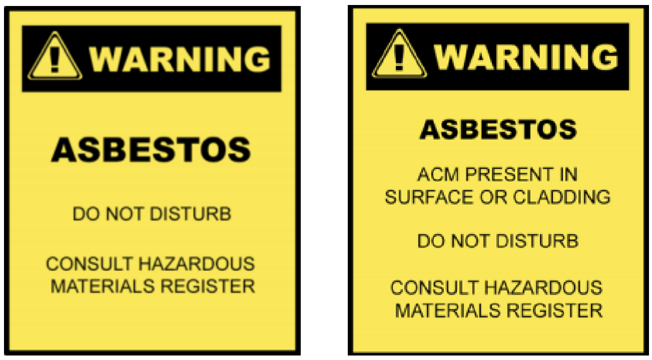
**Figure 7.1: Chemistry East Wing site location**[13]




UoM had undertaken in-situ asbestos surveys over several years, including university-wide programs completed in 2007-2008 and 2013-2014. Labelling was applied directly on or adjacent to ACMs (see Figure 7.2 for an example), at the entrance to work areas and on site plans. All asbestos was included in the University's Hazardous Materials Register.

The upgrades to the laboratories in the Chemistry East Wing building required site-specific, invasive surveys to be undertaken as part of pre-demolition and refurbishment.

**Figure 7.2: Examples of asbestos labelling used by the University**




13 Map data: Google

## Site sampling, assessment and project planning

Prior to commencement of removal works, each level of the building was surveyed for asbestos, including some intrusive sampling, in accordance with the requirements of Chapter 4, Part 4.3, Division 6 of the Victorian *Occupational Health and Safety Regulations 2007*.

Asbestos was found in a large range of materials located throughout the building (see Figure 7.3), including:

- Pipe insulation and cladding;
- Mastic sealant in air ducts and around sinks;
- Behind tiling;
- As a splashback sheet;
- Fire doors;
- Within equipment, such as kilns;
- In fumehoods;
- Vinyl floor tiles and adhesives;
- Asbestos cement sheeting in benches.

**Figure 7.3: Asbestos was found in several areas including pipe insulation, kilns, fume cupboards and vinyl flooring**

As a tertiary education provider, UoM is sensitive to public concerns about asbestos exposure and chooses to directly manages asbestos removal with a project manager rather than to delegate this responsibility to a builder.  This allows UoM to manage the process effectively and to ensure communications are managed in accordance with internal policies and objectives.

The East Wing program was planned around a floor by floor asbestos removal while the remainder of the building remained fully operational with the old laboratories being used for classes.  A Project Control Group was established to manage the entire refurbishment and this group was responsible for developing and managing the communications plan for the asbestos removal.

***"Asbestos is an emotive word and reputation is a key concern.  When the removal works take place, how asbestos is removed from the site and how messages are targeted to stakeholders are all essential considerations for successfully managing an asbestos removal project."***

***University of Melbourne***

## Asbestos removal program

### Overview of removal program

The asbestos removal took place over a 4-year period that commenced in February 2010 and finished in April 2014. Approximately 2,750 $m^2$ of old laboratories were cleared over 5 levels of the Chemistry East Wing. A typical laboratory prior to refurbishment is seen in Figure 7.4, with the floor layout found in Figure 7.5 overleaf).

The asbestos removal process was refined and improved upon over the course of the project, with lessons learnt during the works on the first level being applied to subsequent levels. These improvements related to the management and coordination of the various contractors involved to minimise costs and project delays and in managing stakeholder expectations.

**Figure 7.4: Typical laboratory prior to refurbishment**


### Initial sampling and setbacks

Initially, contractors undertook site assessments whilst the laboratories were still in use which limited the degree to which invasive sampling could be undertaken. As a result, additional ACMs were identified during the stripping of the first laboratories which required sampling, testing and removal, resulting in additional cost and time to the program.

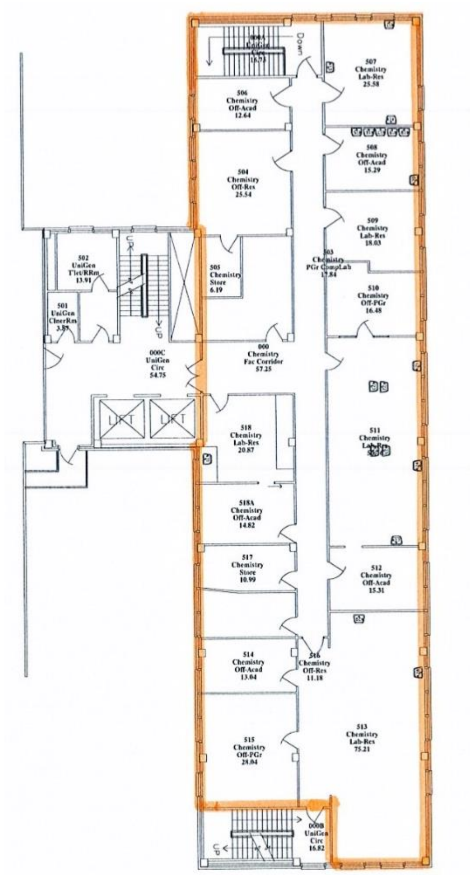
To avoid further delays, a different approach was taken for the remainder of the project. Prior to removal works, all services were decommissioned in the removal area and a fully invasive asbestos survey was undertaken in controlled conditions. During the survey wall panels and risers were removed, laboratory benches were broken open and parts of the floor tiles were lifted. Where the work was particularly invasive, vacuuming and air testing were undertaken.

Once all asbestos had been identified, a number of removalist companies were invited to provide a quote. As part of this process, they walked around the work area with the hygienist so that the scope of works was clear and any questions could be answered. The successful company then notified WorkSafe Victoria, with the total time required upfront at around three to four weeks. The prospective builder was then handed over a fully certified and sterile site to commence their refurbishment works. This time spent planning was invaluable to the removal works and then laboratory refurbishment being undertaken smoothly.

## Removal methodology

For each building level, the entrances were clearly marked as a restricted area. Within this area, asbestos bubble enclosures were erected with air-locks and showers for decontamination. Each floor was divided up into areas with bubbles enclosures progressively used for each area where friable ACMs were being removed. Some areas that only contained non-friable ACMs did not require the use of bubble enclosures.

**Figure 7.5: Example of floor layout prior to refurbishment**



Pumps were located on the floors above and below the work area to ensure effective air locks. Air testing was undertaken with daily results communicated to stakeholders.

ACMs were encapsulated in drums and plastic sheeting for removal offsite by a licensed asbestos removal contractor. All containers were decontaminated prior to removal. Due to the sensitivity around stakeholders, asbestos materials were collected for removal but were only moved out of the restricted areas at times of low activity, such as early in the morning and on weekends.

## Business Case

The laboratory upgrades were an essential part of maintaining the UoM's position as a leading tertiary education facility in Australia, and the associated asbestos removal works were critical to this project. The total cost of the asbestos removal for this project was approximately $350,000 as part of a total $17.5M project.

The UoM's approach to managing asbestos is to remove ACMs where they are easily accessible and difficult to manage in situ as part the hazardous materials register and labelling program. The laboratory refurbishment project gave the University the opportunity to remove significant amounts of ACMs from the register that would have otherwise not been possible.

## Stakeholder concern and communication

To allay staff concern, Health and Safety Representatives provided information on the asbestos removal project, health risk and regulatory requirements. This provided staff the opportunity to comment and ask questions, including OHS officers located within each faculty. Air-testing results were also communicated daily to reduce concern (note that no positive readings were detected across the duration of the project).

## Management of risks

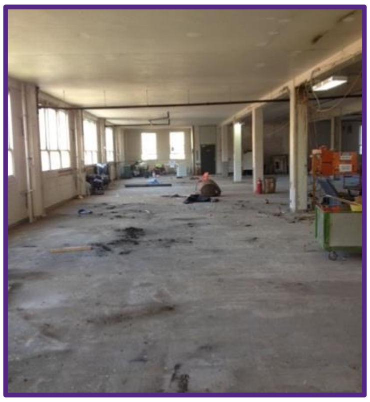
UoM is a busy site and removal of ACMs was undertaken in a highly-controlled manner. Areas where removal of ACMs and other hazardous materials were being undertaken were isolated and clearly labelled with appropriate signage. Access to these areas restricted to only key personnel and contractors. The asbestos removal works, occurred only within the isolated areas, providing an additional level of control between the removal works and regular building users. Wherever possible, hazardous material was removed from site out of hours to reduce risks.

Another risk area that was carefully managed was the isolation of mechanical services. Asbestos was found in the mastic used in the flanges between sections of steel ducting in the ventilation services. A mechanical services contractor was used to fully isolate each section of the system by cutting and sealing duct sections elsewhere within the building to allow other floors outside the removal area to remain operational. The contractor could then work on the affected area by cutting around the flange and taking out the whole duct join for disposal as asbestos contaminated waste.

**Figure 7.6: Risks were present in ventilation ducting, sinks and fumehoods**

There was also a risk of other hazardous materials being disturbed during the asbestos removal works. For example, chemicals had accumulated inside some sink traps and around fumehood ducting, and this needed to be carefully cleared and removed in parallel with the asbestos removal works.

**Figure 7.7: Area after demolition**



## Innovation and excellence

The lessons learned from the asbestos removals on the first building level were utilised in the development of a refined process for the other levels. By comprehensively identifying ACMs upfront through the isolation of the floor and a fully invasive sampling process, both time and cost were reduced.

Builders who subsequently worked on the laboratory refurbishment were offered a sterile site and therefore could move quickly and without risk of uncovering additional asbestos. This also meant all stakeholders were more comfortable in the knowledge that the risk had been managed upfront.

***"Managers of projects that involve asbestos removal need to make sure adequate time is planned in for the correct identification and removal of asbestos. It is not practical to remove asbestos under duress as it increases risk in an activity that is already high risk."***

***University of Melbourne***

**Figure 7.8 – Example of the new laboratories**

# Ausgrid, Sydney


## Case Study 8 – Ausgrid, Sydney

### Project overview

Ausgrid is a leading utilities company, providing electricity supply to homes and businesses across Sydney, the Central Coast and the Hunter regions. As part of a detailed asbestos management program, Ausgrid identified six pole transformer substations commission between 1933 and 1967 that were coated with an asbestos-based paint. Located in residential suburban areas of Sydney, detailed communication with residents was critical to successful asbestos removal.

As the transformers were progressively removed, Ausgrid worked with their licenced asbestos removal company and assessor to refine the removal approach and were able to significantly reduce the cost of substation removal while retaining high levels of protection. This was achieved by moving from full cleaning of the timber poles within a containment cell to using the glove bag removal technique.

**Table 8.1: Key information from the asbestos removal case study**

| Key information | Finding |
|---|---|
| **Location** | Suburbs in south of Sydney, NSW |
| **Removal period** | 2016 – 2017 |
| **Location of asbestos** | Paint on the substation structures contained asbestos in the rare form of Anthophyllite and Tremolite, which are amphibole asbestos fibres and/or Antigorite, which is a serpentine asbestos fibre. |
| **Volume** | A total of 15 tonnes was removed (around 2.5 tonnes per site) and disposed of as asbestos waste |
| **Cost to remove** | Approx. $1.2 million, privately funded |
| **Key considerations for the asbestos clean-up** | • Location of substations adjacent to residential housing;<br>• Detailed communication with residents;<br>• Improvements in asbestos removal techniques reduced costs. |

## Background

As part of their corrective maintenance program, Ausgrid identified that the low voltage housings of their two-pole transformer substations may contain remnants of asbestos millboard packing from a previous removal program. Of the original 522 of this substation type that were commissioned between 1924 and 1974, only seven H type and six Y2 type remained on Ausgrid Network at the time of investigation (March 2016). Substation locations are seen in Figure 8.1.

**Figure 8.1: The substations were located within the former St George County Council area**[14]


Ausgrid conducted a desktop investigation and construction drawings and historic records indicated the use of 'asbestine fire retardant paint' on some surfaces. Prior to the desktop investigation, the specification and use of asbestos-containing paint within the Ausgrid Network was an unknown historical practice.

Ausgrid commenced field investigations and engaged independent licenced asbestos assessors to locate, inspect and sample the substations for the presence of asbestos.

Results for the six Y2 type substations were negative for millboard, however additional analysis was required for the paint samples due to "unknown fibres" being detected. Subsequent analysis by X-Ray Diffraction (XRD) analysis indicated asbestos in the rare form of Anthophyllite and Tremolite, which are amphibole asbestos fibres and/or Antigorite, which is a serpentine asbestos fibre. The paint was used on the outside surfaces of the low voltage box and on the entire lengths of the two poles.

[14] Map data: Google

## Site sampling, assessment and project planning

Initially, the Asbestos Register for all remaining two-pole transformer substations was updated to indicate the suspected presence of millboard and asbestos-containing paint. Access conditions were also put in place requiring the use of Level 1 – Precautionary Asbestos PPE to be worn by all workers.

Once confirmed as containing friable asbestos paint in poor condition, the substations were immediately isolated using temporary fencing (see Figure 8.2).

**Figure 8.2: Initial isolation of two-pole transformer substations**

Ausgrid published the first of multiple safety alerts advising workers of the presence of friable asbestos-containing paint on these substations in the St. George region. All planned work on poles identified as having remnants of a painted finish was prohibited and network outage and critical operations were only to occur using Level 3 – Emergency Response PPE. Ausgrid also updated its Asbestos Register, GIS and SAP systems.

## Asbestos removal program

### Overview of removal program

Ausgrid undertook a program of substation replacements that included the safe removal of asbestos containing materials. The substations were progressively replaced from 2016 through to 2017.

### Removal planning

At the conclusion of each transformer substation removal, Ausgrid chaired project debriefs and reviews with the asbestos removalists and assessors. As a result of this process, new and innovative removal methods were proposed and trialled which not only reduced the cost of the overall asbestos removal project, but also minimised the disruption time and visual impact incurred by residents and members of the public.

### Removal methodology

**Figure 8.3: Removal Method 1**


**Method 1:** Full cleaning of asbestos containing paint and clean general waste for disposal.

1. Operating under Network Access permit, requiring access permit recipient on site daily;
2. Enclosure/containment cell is formed out of scaffolding to 12 metres which has 6 levels accessed from an open stairwell;
3. Negative pressure units on 4 out of 6 levels;
4. All asbestos paint was scraped with hand tools and shadow vacuumed with HEPA filtered vacuum cleaners, or placed into 200µm thick asbestos waste bags and sealed with duct tape;
5. Once all asbestos paint was removed, the removal area, including all plastic asbestos waste bags within the containment cell and the containment cell itself, was decontaminated by vacuuming with a HEPA filtered vacuum cleaner, wet-wiping and spraying all surfaces with PVA glue;
6. A Clearance Certificate for the poles was provided stating they are free from asbestos
7. Poles removed and disposed of as "clean general waste".

**Figure 8.4: Removal Method 2**


**Method 2:** Partial cleaning of asbestos containing paint and asbestos waste classification for disposal.

1. Substation decommissioned and removed from the network (therefore not operating under Network Access permit, or requiring access permit recipient on site daily);
2. Enclosure/containment cell is formed out of scaffolding to 12 metres which has six levels accessed from an open stairwell;
3. Negative Pressure units on 4 out of 6 levels;
4. All loose and flaking asbestos paint to be scraped with hand tools and shadow vacuumed with HEPA filtered vacuum cleaners, or placed into 200µm thick asbestos waste bags and sealed with duct tape;

5. Once all loose and flaking asbestos paint has been removed, an area of at least 0.2 m of paint around the radius of the pole removed from the surface of the timber to allow for the cutting of the pole;
6. Assessor conducts a visual clearance inspection for the surface where the pole is to be cut;
7. Once visual clearance is achieved, remaining surface area of the pole encapsulated with Emerclad or similar, and wrapped in 200um thick plastic sheeting at a minimum of 2 times around the pole;
8. The encapsulation is visually cleared by the Assessor and the Removalist cuts the pole, utilising dust suppression techniques with a low-pressure mist water spray;
9. Pole segments placed in skip lined with 200um thick plastic sheeting and disposed of as asbestos waste.

**Figure 8.5: Removal Method 3**

**Method 3:** Localised removal using glove bag technique on timber header beam and poles to allow cutting into sections. Each section was wrapped and disposed as asbestos waste.

1. Substation decommissioned;
2. Scaffold height overall of 12 metres, however works mainly on two levels. Level 1 – header beam and Level 2 – enclosure/containment cell incorporating decontamination unit, airlock and negative pressure unit;
3. Glove bag technique used to remove paint on timber header beam
    - Glove bags spaced equally on header beam and sealed. Plastic sheeting inside glove bags cut to reveal four sections of the header beam approximately 100-200 mm width. Asbestos containing paint is then removed using hand scrapers and decontaminated using a HEPA filtered vacuum cleaner, wet-wiping and spraying all surfaces with PVA glue. The header beam was then cut using hand saws into 4 sections and wrapped and disposed of as asbestos waste.
4. Containment cell erected around the two main vertical poles;
5. Glove bags technique used within containment cell for removal of paint from poles at sections along the pole length. Plastic sheeting cut to sections. Asbestos containing paint is then removed from these sections using hand scrapers and decontaminated using a HEPA filtered vacuum cleaner, wet-wiping and spraying all surfaces with PVA glue;
6. Asbestos containing paint from timber poles removed following the dismantling of the access scaffolding;
7. Poles cut at the cleaned sections and the segments disposed of as asbestos waste.


## Business Case

All six of the two-pole transformer substations were already planned for replacement with new single pole substations at the time the asbestos identification was made. The presence of asbestos on electricity network assets in a public space ensured availability of funding and adherence to timelines.

The costs for the asbestos removal varied depending on the method used. Ausgrid worked with their licenced asbestos removal company and assessor to refine and optimise the methods used and managed to significantly reduce the cost of substation removal while retaining high levels of protection.

For the initial method of removal, the costs included the contracting of a class A licenced asbestos removalist and an independent licenced asbestos assessor. Ausgrid also incurred internal costs, with a Hazardous Material Coordinator present for the duration of the projects work to issues access permits. Community costs included changes and closures to roads and footpaths under traffic control for 16 days at 10 hours per day.

For the final method of removal, the time required for the licenced removalist and assessor was almost halved. Road and footpath control was only required for seven days at eight hours per day and no Ausgrid site presence was required as there were no access permit conditions.

For removal of a single two-pole transformer substation, the cost saving between the two methods was $123,000 in contracted services alone, which was approximately 45% of the total cost.

## Management of risks

Ausgrid utilised a range of risk controls from their safety management system for the asbestos removal works. These included the completion of workplace health and safety risk assessments and site hazard and risk profiles, the utilisation of work specifications, technical specifications for asbestos removal and Asbestos Removal Control Plans and notification of SafeWork NSW.

During the works, Ausgrid used Network Access Permits, undertook daily site meetings and hazard assessment checks and daily pre-start checks on equipment, scaffold and the enclosure. All power transformers and power lines in the vicinity of the site were isolated where possible to minimise risk and where this was not an option, Ausgrid provided individuals with the necessary expertise on site to give advice and support to the asbestos removalists throughout the project, further minimising the risk.

Safe Work Method Statements were used for both friable and non-friable asbestos removal, which included a site plan, appropriate respiratory and personal protective equipment, the use of arc-rated clothing, road closure permits, traffic control and signage.

Control monitoring, personal exposure air monitors and wet, multistage decontamination facilities were used by the removalists each day.

In order to restrict access of the public and others to the removal site, the removal contractors used exclusion and demarcation zones, security fencing and key and gate locks. The site was supervised throughout the works to ensure adherence to all controls.

**Figure 8.6 – Example of communication to residents**

## Improving your electricity supply

Ausgrid

### Poletop transformer substation replacement

Ausgrid is upgrading the power supply in your area by replacing the pole-top transformer substation in Oatley Ave, Oatley.


**Location of pole to be removed**

### What does the work involve?

This substation was installed in the 1940s and has reached the end of its useful life. Ausgrid has also identified the paint on the substation poles contains asbestos. As part of our commitment to provide a safe and reliable electricity network, it is being replaced.

The work to remove the old substation and painted poles, and then install the replacement substation will begin on 13 March 2017. It is expected to take about three weeks and crews will be onsite from **Monday to Saturday between 7am to 5pm.** The supply to individual homes may be interrupted for short periods but we will notify you before any outage.

To do the work safely, crews will need to close part of the footpath and the road, which may impact pedestrians and vehicle parking.

### Safe removal of asbestos

Asbestos was commonly used in homes and businesses before the 1990s and also on parts of the electricity network. Asbestos is a known carcinogen and was banned in 2003.

The safety of the community and our workers is our highest priority. Over the past 10 years Ausgrid has safely removed asbestos from thousands of sites across our network.

Our crews will follow precautionary asbestos safety controls in accordance with Work Health and Safety Regulations.

To minimize any potential exposure scaffolding will be installed around the pole which will be fully enclosed by plastic sheeting to create an airtight barrier. Air pumps will prevent any asbestos fibres escaping.

The area surrounding the site will be fenced off. Air monitoring equipment will also be installed and all waste removed from the site will be disposed of safely.

We thank you for your understanding and patience as we work to maintain a safe and reliable supply to your area.

### For more information

If you have any questions you can contact Ausgrid's Asbestos Management Unit on **(02) 9394 6961** or email hazmat@ausgrid.com.au

Interpreter service 131 450

### Asbestos safety procedures

Work to remove the substation will include a number of safety controls to prevent exposure to asbestos in accordance with the Work Health & Safety Regulation 2011.

**Site setup**

- Barricading the work area to prevent unprotected persons from entering.
- Construction of a sealed enclosure around the asbestos removal area to prevent the release of asbestos.
- Air pumps attached to the enclosure to prevent air being released from the asbestos removal enclosure
- Establish a decontamination area.

**Undertaking work**

- Conduct work in accordance with Safe Work Procedures.
- Wear personal protective equipment (PPE) – including a P2 rated respirator and possibly disposable coveralls.
- Continuous asbestos air monitoring will be carried out throughout the work by an independent licenced asbestos assessor.

**Work completion**

- At the completion of work decontamination will be carried out to ensure all traces of asbestos are removed.
- An independent licenced asbestos assessor will undertake a 'clearance inspection' and conduct asbestos air monitoring before issuing a 'clearance certificate' confirming the removal.
- Disposing of waste as double bagged asbestos waste in accordance with Safety and Environmental Regulations.

Further information on asbestos can be obtained from the SafeWork NSW website www.safework.nsw.gov.au

## Innovation and excellence

Being in sensitive residential areas, the effective communication to residents was a key consideration. All residents were advised that an independent licenced asbestos assessor would be undertaking daily air monitoring as well as a clearance inspection before issuing a clearance certificate confirming the removal. Residents were also advised that all results would be made available to them if they requested them. To date, no request for air monitoring or clearance certificates has been received for any site where removal has occurred.

Where possible residents were verbally briefed and provided with written notification and an offer of further contact if desired. Residents that were not home at the time were left with a detailed flyer in their letterbox that included a contact number for additional information.

# Tas Paper Decontamination and Demolition

## Case Study 9 – Tas Paper (PaperlinX) Decontamination and Demolition

### Project overview

The decontamination and demolition of the Burnie paper mill, and remediation work at the Wesley Vale mill in Tasmania is one of the state's largest ever asbestos removal jobs. Contractors demolished more than 50 buildings and removed 47,000 m$^2$ of bonded asbestos roofing as well as large volumes of asbestos containing materials mixed with other contaminants such as mercury.

The project was conducted safely and thoroughly with no issues raised by the community. The project's success was attributed to three main factors: 1) commitment from the site owner to meet and exceed sound environmental practices, 2) selection criteria for contractors (based on past performance and commitment to sound environmental removal processes), and 3) the strong working relationship between the proponent, WorkSafe Tasmania and the EPA. Table 9.1 includes key information.

**Table 9.1: Key information from the asbestos removal case study**

| Key information | Finding |
|---|---|
| **Locations** | Wesley Vale and Burnie, Tasmania |
| **Removal period** | 2010 - 2013 |
| **Type of asbestos and volume (Burnie site only)** | • 47,000 m$^2$ bonded asbestos (e.g. super six asbestos roof sheeting);<br>• Unknown volume of friable asbestos, asbestos contaminated soil and asbestos containing products mixed with mercury;<br>• Not including asbestos mixed with mercury, 1,207 tonnes of asbestos was removed. |
| **Cost to remove** | Approx. $1.5 million for the Wesley Vale site and approx. $6 million for the Burnie site (for decontamination and demolition, not just asbestos removal), privately funded. |
| **Key considerations for the asbestos removal** | • Large-scale job with over 50 buildings requiring removal;<br>• Complex machinery and redundant buildings;<br>• Dealing with mercury as well as asbestos. |

## Background

With a thriving forestry industry in the 1930s, a pulp and paper manufacturing mill was established in Burnie, north Tasmania. This was later followed by a smaller site in Wesley Vale, approximately 60 kilometres east of Burnie (see Figure 9.1). Tas Paper acquired both sites in 1993. Given the type of manufacturing as well as the production period, significant volumes of asbestos as well as other hazardous materials were used in the building materials and machinery across both sites.

Tas Paper (then owned by PaperlinX) made the decision to cease operations at the Wesley Vale site in 2009 and the Burnie site in 2010. Tas Paper was aware of extensive volumes of asbestos and mercury at both sites and due to this, the company wanted to ensure that decommissioning of the plants was completed in a safe and environmental sound manner. From 2010 to 2013, Tas Paper engaged numerous contractors and worked with WorkSafe Tasmania and the EPA Tasmania to ensure the efficient and effective removal of materials was completed.

**Figure 9.1: Location of the two sites and Wesley Mill (top right) with Burnie Mill (bottom right)[15]. The Cell Plants are highlighted on each as these were the focus of the Environmental Effects Reports given the presence of mercury at these locations.**


[15]Map data: Google

From Tas Paper (2011) *Burnie Mill Environmental Effects Report (EER) for Demolition of Redundant Cell Plant Area*

From Tas Paper (2010) *Wesley Vale Mill Environmental Effects Report (EER) for Demolition of Redundant Cell Plant Area and Remediation of Contamination*

## Site sampling, assessment and project planning

### Ensuring appropriate environmental management at each site

Prior to Tas Paper ceasing operations, several buildings had been decommissioned and soil and building contamination assessments had been completed at both sites on several occasions from 1994 through to 2000. These reports identified the type and location of contaminants present and provided good baseline information to inform the demolition works.

Before commencing demolition, Tas Paper completed Environmental Effects Reports for the Demolition of Redundant Cell Plant Area and Remediation of Contamination for the EPA. These reports included a description of the demolition project, potential environmental impacts, and commitments of the proponent to manage these. Following this, EPA Tasmania assessed each site and completed Environmental Assessment Reports. These reports included assessments of the environmental issues highlighted by Tas Paper, and provided subsequent recommendations and requirements to proceed.

### Engaging contractors and subcontractors

A key to the success of this project was the engagement of the demolition and asbestos removal contractors. Tas Paper was keen to ensure that all relevant environmental risks were well managed and that shortcuts would not be taken. Not only was it critical for Tas Paper to be committed to conducting the work in a safe and environmentally sound manner, but it was important that the contracted companies were committed as well. As such, Tas Paper considered each contactor's history, performance and made it clear that a cautious and environmentally sound approach was critical for engagement. Contractors were also required to submit their methodology to Tas Paper and WorkSafe Tasmania for approval prior to commencing.

Once engaged, contractors and subcontractors received information about the site which included an indication of the types of hazardous materials including asbestos, and approximate volumes. This is captured in Table 9.2 below.

**Table 9.2: Asbestos identified at the sites**

| Asbestos Type | Quantity | Locations |
|---|---|---|
| Bonded asbestos (e.g. super six asbestos roof sheeting) | 47,000m$^2$ | Roof sheeting at the Burnie site. Total asbestos sent to licensed landfill in Tasmania = 1,207 tonnes (note that this does not include the asbestos found in mercury contaminated items) |
| Friable asbestos | Unknown volume | Burnie and Wesley Vale |
| Contaminated soil | Unknown volume | Burnie and Wesley Vale |
| Asbestos containing materials mixed with mercury | Unknown volume | Found in Burnie and Wesley Vale. Note that asbestos containing materials also contained mercury and were therefore transported to Brisbane for decontamination and safe disposal. |

### Communication with surrounding businesses and residents

Another key to the project's success was the community consultation undertaken prior to and throughout the asbestos removal process. Tas Paper staff conducted letter box drops and visits to the surrounding businesses and residents. This provided the opportunity to discuss the project and reduce community fear and anxiety. Contact details were also provided in case community members had any queries or concerns. In addition, there was extensive road-based signage erected around the site, with contact numbers of relevant Tas Paper staff. If contractors were asked queries from residents, these were forwarded on the Tas Paper staff to ensure consistent responses and a central point of contact.

## Asbestos removal program

### Overview of removal program

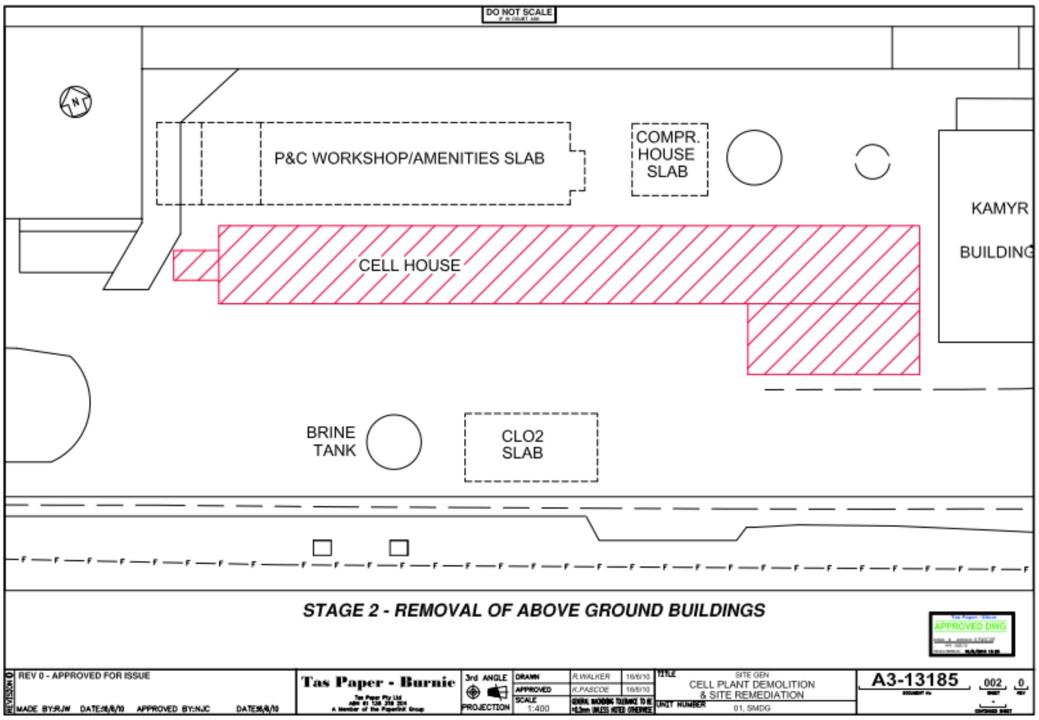
McMahon Services was appointed to complete the first asbestos and mercury removal and demolition project. This involved the removal of asbestos and mercury from the Cell House and several other buildings at the Wesley Vale site, followed by demolition of selected buildings. Given asbestos materials at this site contained mercury, all materials were placed into 20 foot containers lined with plastic and then transported to Brisbane to be appropriately treated and prepared for landfill. Photos are captured in Figure 9.2 below.

**Figure 9.2: Asbestos contaminated items wrapped in plastic marked with asbestos signage (left image) prior to transportation to Brisbane via shipping containers (right image) for treatment and disposal**

Following the Wesley Vale decontamination and demolition project, contractors moved to the Burnie site, which was a much larger job. The contractors decommissioned and demolished over 50 buildings at this site, many of which had significant volumes of asbestos. Notably, the Cell Plant area contained roofing materials with bonded asbestos, and other areas had soils with varying degrees of contamination.

A key asbestos removal job at the Burnie site was the removal of 47,000 $m^2$ of asbestos roof sheeting from buildings across the site. The Cell Plant building, which is presented in Figure 9.3, provides a good example of the types of buildings demolished during the project with asbestos roof and guttering. Asbestos containing materials that were free from mercury contamination were transported to a Tasmanian landfill licenced to take asbestos. However, as with the Wesley Vale project, materials contaminated by mercury were transported to Brisbane for appropriate treatment and disposal.

**Figure 9.3: Cell Plant building, South Western side (roof and guttering was asbestos, top image) and a drawing of the Cell House at the Burnie site prior to remediation and removal (bottom image)** [16]

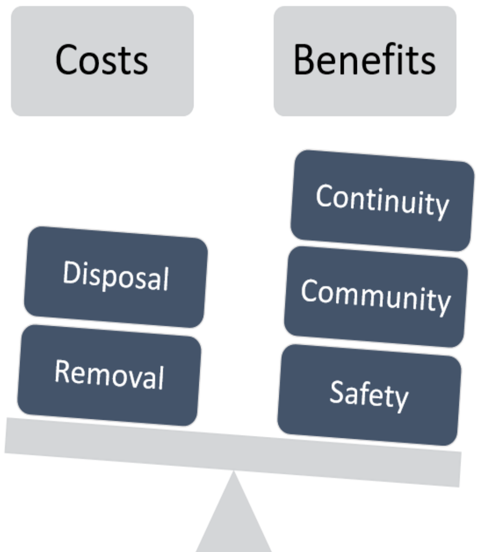

Removal of asbestos roof sheeting at height posed challenges in terms of access and planning. McMahon Services used a crane to hoist a team of removalists onto the roof (see Figure 9.4) to enable safe and successful removal of these roof materials.

[16] Sourced from Tas Paper (2011) *Burnie Mill Environmental Effects Report (EER) for Demolition of Redundant Cell Plant Area*

**Figure 9.4: The crane and container used to hoist asbestos removal staff onto the roof for safe removal of asbestos**

Supporting the asbestos removal process was a rigorous approach to occupational hygiene during the cell plant demolition. The presence of mercury necessitated additional measures which included blood tests, requirements for workers to be clean shaven, a ban on fish consumption during the removal period and a precise decontamination process for crews suiting up and existing the cell plant.

## Business case




Tas Paper was driven by two key factors when assessing the business case for asbestos removal. Firstly, the need to adhere to the relevant regulations when decommissioning the site; and secondly, a strong internal driver to ensure responsible environmentally sound land management. The cost for the demolition works, including removal of asbestos and other contaminants, was over $7 million across both sites. The removal program designed by Tas Paper ensured that the project was completed in an environmentally sound manner, above and beyond the required regulations, so future land users were not at risk and that further remediation would not be required.

Given the sites had ceased operation, no income from the paper mills was generated during the decontamination and demolition phase. However, after the Burnie site had been demolished, land could be sold off to the adjacent businesses. This provided some reimbursement for the work after completion.

### Management of risks and use of regulations

The key risks identified for this project and the response is included in Table 3 below.

**Table 9.3: Risks and mitigation strategies**

| Risk | Mitigation strategy |
|---|---|
| Management of mercury and asbestos contaminated buildings and land | • Removal, packaging, handling and transportation of asbestos materials was conducted as per the EPA and WorkSafe Tas requirements in accordance with the relevant Acts and Regulations. In addition, Tas Paper ran a Mercury and Asbestos Hygiene Training Session for those involved;<br>• ACMs were appropriately contained (in plastic wrapping) and then either sent to a Tas landfill licensed to accept asbestos, or to Brisbane if the materials also contained mercury. Air monitoring was undertaken throughout the project by an independent specialist;<br>• At the end of the Burnie project, no contaminated materials or soil was left at the site. |
| Asbestos removal at heights | Asbestos removalists were hoisted by crane onto asbestos roofs in a crane workbox. Individuals had a harness and ropes to secure to the workbox. |
| Removal of asbestos during summer with high temperatures and workers wearing heavy suits | Tas Paper ensured contractors had an appropriate fatigue management system which included regular breaks. |
| Removal of materials with mercury contamination | Additional precaution was taken when dealing with mercury contaminated materials. This included specific training on mercury, control measures for the mercury dust/ vapour, and an alternative transport destination and decontamination method (conducted at a special site in Queensland). |

## Innovation and excellence

According to Tas Paper, the success of the project was driven by three key factors:

1. Tas Paper committed to doing the work properly, and their staff went above and beyond what was required. This included a detailed environmental effects report for both sites, ensuring all contaminated materials were managed in line with regulations. These reports are now used as a guide for other proponents proposing to conduct similar works in Tasmania.
2. Contractors responsible for asbestos removal and building demolition were carefully selected based on past performance and a commitment to completing the work in an environmentally sound manner according to Tas Paper, WorkSafe Tas and the EPA Tas requirements. Tas Paper asked for the contractors to outline a detailed proposed methodology for undertaking the works to enable a clear outline of how they would complete the work according to the requirements.
3. The positive and open working relationship between Tas Paper, WorkSafe Tasmania and EPA Tasmania was another key component to the project's success. Tas Paper was in regular contact with these agencies and provided extensive information both before and throughout the project. WorkSafe Tas and EPA Tas conducted site visits prior to commencing the works, and Tas Paper ensured these agencies had seen the proposed decontamination and demolition procedures for approval. WorkSafe Tas also provided an additional resource and information source for Tas Paper on appropriate approaches to the decontamination and demolition.

# Northern Territory Indigenous Communities Asbestos Remediation Programs

## Case Study 10 – Northern Territory Indigenous Communities Asbestos Remediation Programs[17]

### Project overview

Many buildings in remote communities across Australia contain asbestos. Due to harsh weather conditions and lack of maintenance, these structures pose threats to remote communities if asbestos fibres are released into the air. Managing and removing asbestos at these sites can also be challenging due to their remoteness.

The Northern Territory government recently implemented two asbestos removal programs aimed at reducing community health risks due to asbestos contaminated buildings. These programs demonstrate success both in the removal of asbestos containing materials (ACMs) and through the high level of local community participation, and increased employment opportunities.

**Table 10.1 Key information from the asbestos removal case study**

| Key information | Finding |
|---|---|
| **Location** | 54 remote communities across the Northern Territory |
| **Removal period** | Asbestos removal program 1: 2012 – 2013, program 2: 2015 - present |
| **Type of asbestos** | Various - friable and non-friable in buildings. |
| **Cost to remove** | Approx. $45 million for both programs ($25 and $20 million respectively), government funded. |
| **Distance from licensed landfill used for disposal** | Alice Springs and Darwin landfills used, depending on which is closer. |
| **Key considerations for the asbestos clean-up** | Large scale asbestos removal in remote communities brings significant challenges including cost, skill shortages, distance from licensed landfills, and the uncertainty regarding the location and volume of asbestos. |

[17] Images above supplied by the Department of Housing and Community Development

## Background

Like most states and territories, the Northern Territory is home to several asbestos legacy buildings. Exposure to harsh weather conditions coupled with a lack of maintenance on these buildings can lead to degrading of walls and roofing, and asbestos can become airborne. This poses a threat to the community as they may breathe in the released asbestos fibres.

The Northern Territory Government recognises the health risk and aims to remove or remediate all asbestos contaminated materials in the territory by 2030. To help meet this aim, the government has implemented numerous asbestos programs to identify and remove asbestos across the territory. Most recently, the Federal Government has provided $45 million in funding[18] for the Department of Local Government and Community Services to drive two asbestos remediation programs.

The first asbestos remediation program was completed from 2012 to 2013, and after commencing in 2015, the second program is still running. The current asbestos remediation program is near completion and has included assessment of 330 buildings (non-government public owned assets such as houses, stores, churches etc) from 54 remote indigenous communities (see Figure 10.1 for an example). Asbestos was identified in less than 100 of these buildings, and the government has worked to remove or safely seal asbestos in these buildings. There are now less than 30 remaining buildings that require asbestos removal in the current program. The below image is the location of one of the remote indigenous communities that has completed the asbestos remediation program.

**Figure 10.1: An example of a remote indigenous community (Pmara Jutunta) where the asbestos remediation program has been completed (left image)[19] and another example of a remote community in the Northern Territory from a closer view (right image)[20]**


[18] http://www.abc.net.au/news/2017-03-03/funding-dispute-about-asbestos-clean-up-in-nt-remote-communities/8323728

[19] Map data: Google

[20] Sourced from https://www.mcmservices.com.au/projects/asbestos-audit-community-clean-program/

### The challenge

There are several challenges associated with asbestos removal in remote communities. These include but are not limited to high costs (in some cases the cost to remove asbestos from a single house can be up to $100,000 with each subsequent house decreasing slightly in cost[21]), unknown volumes and locations of asbestos due to previous poor tracking and documentation, a community lack of awareness of the problem and risk, limited capability within some communities to deal with asbestos, and the vast distances from licenced contractors who can efficiently deal with this problem.

The Northern Territory Government has addressed these challenges through the asbestos remediation programs. The most recent program has not only met these challenges but also created employment opportunities for local community members.

## Asbestos removal program

Buildings containing asbestos that are in poor condition present a risk to communities. These buildings were targeted in the most recent asbestos remediation program and in total, 54 remote indigenous communities in the Northern Territory took part in the program. An outline of the approach is provided below.

### Approach

1. Engage asbestos removal contractors
    a. Each of the asbestos removal contractors was required to demonstrate how they would be contributing to the development of the local community.
    b. Contractors were required to employ an Indigenous Liaison Officer and local Indigenous workers who had completed an accredited non-friable asbestos removal training course.
2. Scope the required work
    a. The government worked with the asbestos removal contractors to scope the required work for each community that had buildings containing asbestos. This involved an initial audit of an asbestos register and potential buildings to target to establish a clearer picture of the sites that required assessment.
3. Stakeholder Liaison (occurring throughout the program) and training
    a. Stakeholders were consulted and notified of what was happening as well as informed on asbestos and the associated health risks. For safety, buildings thought to contain asbestos in were then fenced off and warning signs put up.
    b. Stakeholders included building owners, building occupiers, land councils, the federal government and traditional owners of the land.
    c. According to those involved in the program, stakeholder liaison was the most important element for the successful delivery of the program.

[21] ASEA Report – *Remote Australian Communities: The asbestos legacy* (2017)

**Figure 10.2: Stakeholders listening to an information session on the scope of work, safety and Q&A[22]**

d. Training of local community members was also undertaken to identify and remove the asbestos materials in buildings. A registered training provider was selected to deliver the training program covering the units from (CPCCDE3014A) *Remove Non- Friable Asbestos*, and the training was appropriately adapted to the cultural and literacy skills of Indigenous participants.

e. Removal contractors and licenced assessors who were overseeing the removal works were required to attend the training sessions to meet the participants and assist.

**Figure 10.3: Asbestos training[23]**

4. Hygienist inspection

   a. Following the stakeholder engagement and training, an independent hygienist assessed the extent of the asbestos, location and dimensions in each building.

   b. The hygienist then wrote a report which included recommendations on the removal and remediation of the asbestos containing materials.

   c. It was important that each building be dealt with on a case by case basis. Buildings were sometimes demolished, the asbestos containing materials removed and the building restored, and in some cases the asbestos was safely sealed and appropriate signage displayed to warn others that asbestos materials were beneath the surface.

[22] Soured from presentation to the first international conference on asbestos awareness and management by the Department of Community Services, Northern Territory

[23] Sourced from *Australian Government and Northern Territory Government Asbestos Removal Program*, Youtube video

**Figure 10.4: An independent hygienist assessing the extent of asbestos within a building[24]**

5. Management of asbestos containing materials
    a. Based on the Hygienist's report, the asbestos containing materials were then either removed from the site or sealed, and this process was undertaken in accordance with Northern Territory and national legislation.
    b. This was undertaken by local community members who had been appropriately trained, as well as the asbestos removalist contractors.
    c. Contractors used trucks licensed to transport asbestos, and disposed the asbestos to landfills approved to accept asbestos.

**Figure 10.5: Asbestos removalists in training (left image) and asbestos removalists dampening a wall containing asbestos to reduce the risk of airborne fibres (right image)[24]**

6. Close out
    a. After asbestos remediation, there were several site requirements to ensure proper 'close out'. This included a visit by an assessor who:
        i. Conducted a practical completion walk through to ensure the work was completed
        ii. Took photographs
        iii. Completed clearance certificates
        iv. Checked disposal receipts
        v. Updated the asbestos register.

[24] Soured from presentation to the first international conference on asbestos awareness and management by the Department of Community Services, Northern Territory

## A key set back

Attempting to build local knowledge in asbestos management did not come without barriers. A key set back to this process was the divided opinion on the format of the asbestos management training in remote indigenous communities. Community members highlighted that having non-local organisations provide training to increase local capability could be perceived as outsiders getting local communities to be exposed to asbestos risks to clean up mess that was not due to their own activities. In response, a collaborative approach was taken, where local, familiar or other indigenous companies provided information sessions and training in collaboration with companies that were not local but had the necessary expertise in asbestos management.

## Lessons learnt

Asbestos removal from remote communities in Australia brings significant challenges to ensure a successful and low-cost outcome. Some of the key lessons learnt from running these programs included:

- Extensive community engagement is crucial for program success. This includes before, during and after the asbestos removal, and with all stakeholders. Educating the community and getting them involved is critical for the project's success. It may help to focus on land councils, long-term active residents, senior community leaders and Elders as the key stakeholders[25].
- Wherever possible, increase local capability through training of local staff and community members. It is important for the identification and removal work to be done internally or locally to decrease costs and increase local skills and capacity. This could be through training council or community members to ensure they can conduct the work themselves. This may also help to actively engage and motivate councils to take part in raising asbestos awareness and removing it from the community. For an example of this in action, see below.

***An example of training and up-skilling of residents to reduce costs[26]***

*The Victoria Daly Regional Council (approx. 300km south of Darwin) recognised an issue with the significant cost to engage an external licenced contractor to identify and remove a building containing asbestos. In response, council acquired its own removal licence and trained the Health and Safety Manager. This Manager is now a qualified supervisor and Class B removalist (for bonded asbestos). The council also owns the necessary equipment, machinery and tools required for asbestos removal. This not only saves on costs but increases local employment as well as leading to better compliance as there is direct oversight of removal jobs undertaken.*

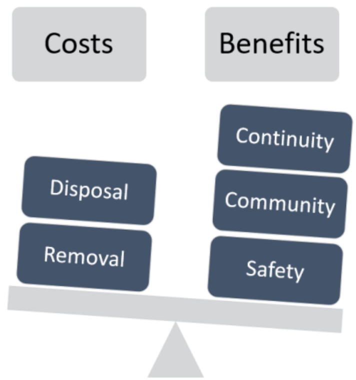
- It is also important to establish partnerships and build collaborations across the community and with commercially successful business partners. This includes increasing the participation of Indigenous corporations and land councils[27].

[25] https://www.asbestossafety.gov.au/australias-asbestos-legacy-remote-indigenous-communities
[26] From ASEA Report – *Remote Australian Communities: The asbestos legacy* (2017)
[27] https://www.asbestossafety.gov.au/australias-asbestos-legacy-remote-indigenous-communities

- Each community and building is unique, which is why communication with the community and feedback from members is critical for ongoing success. There is not a 'one size fits all' approach but rather, and ongoing iterative process where some flexibility may be required at times and adjustments of the approach based on the unique requirements of the community and buildings.
- While some flexibility is beneficial, safety cannot be compromised. As such, it is also important to be strict on the standards that need to be followed and even set these higher than required to ensure compliance.

### Business case

Due to the remoteness of some communities and the required skills and licences to remove asbestos, engaging an external contractor to remove asbestos can be up to $100,000 for a single house which is very expensive. It is also time consuming and logistically difficult given the remoteness and uncertainty of asbestos locations and volumes.




Despite these high costs, removal or management of the asbestos remains important. Ignoring the buildings with asbestos presents risk to human health, with the harsh weather conditions and lack of maintenance to some buildings leading to asbestos becoming airborne.

The Northern Territory Government and the Federal Government built a business case of addressing health concerns while minimising costs through utilising local resources. Local communities were involved in the process and trained in asbestos management and removal. As such, the asbestos removal programs reduce the risk of asbestos-related diseases in the community, are completed as to minimise costs, and increase employment opportunities for the community. This approach also increases compliance and 'buy-in' from the community, making it a strong business case for conducting the work. Another cost minimisation exercise was assessing each building on a case-by-case basis. Rather than knock down each building, the most cost effective method for making the building safe was used (knock down versus remove and remediate), further strengthening the business case.

### Management of risks and use of regulations

Key risks and the associated response to mitigate these risks are highlighted in Table 10.2 below.

**Table 10.2: Risk mitigation strategies**

| Risk | Mitigation strategy |
|---|---|
| Identified asbestos becomes a health risk prior to removal | After communicating with the relevant stakeholders, fencing was immediately erected and appropriate signage put up. Higher risk areas were targeted first, and the community educated on what is going on and why it is unsafe. |
| Costs become too high and ongoing funding ceases | Ongoing training for community members and council staff can be a great way to minimise costs and ensure the program continues within a respective community. Each building is also assessed on a case-by-case basis, where the costs and impacts of demolishing versus removal and remediation are considered prior to commencing, to minimise costs. |
| Removal and transportation of asbestos can be dangerous and requires appropriate licenses | Appropriate training was undertaken to provide councils and community members with the required license to remove bonded asbestos. Transportation of asbestos was only undertaken in licensed vehicles. |
| Lack of commitment from local community leads to delays and increased time to conduct the work | Community engagement is critical for the program's success and this includes ongoing communication with the relevant stakeholders. |

## Innovation and excellence

The asbestos removal programs in the Northern Territory are great examples of managing and removing asbestos legacy waste in the remote communities of Australia. Demonstrated excellence includes:

1. The increased local knowledge and employment. So far, the program has resulted in the training of 279 community residents, and subsequently 151 Indigenous people have been employed. A total of 12,658 hours of work have been undertaken[28];
2. Engagement of the community. The community has shown an active interest in finding out more and minimising risk to themselves and future generations;
3. Contractor obligations in the tender process. Each asbestos removal contractor was required to demonstrate how they would be contributing to the development of the local community;
4. Cost was minimised through taking a case-by-case approach. Rather than having contractors arrive and simply demolish all buildings, each community has been treated uniquely. Community members are given the opportunity to be involved, and the building is assessed for the most cost effective, efficient and logical method for managing the asbestos (remove and refurbish, safely seal in the asbestos and put up appropriate signage, or demolish the building).

[28] ASEA Progress Report *Indigenous Communities "Medium Risk" Asbestos Remediation Program*

# Case Study 11 – CSBP, Western Australia

## Project overview

CSBP undertook an extensive asbestos removal program across its chemicals and fertiliser sites in Western Australia. Due to a significant number of large sites at various locations, the program has run in stages for some time. Over this time, most asbestos removed has been bonded cement sheeting used on its site structures. This case study discusses work conducted over the last 5 years (see Table 11.1).

The business case for undertaking the works considered reductions in maintenance costs, improved storage conditions for products and removal of asbestos risk. Consulting with stakeholders early in the process was a key factor in the successful completion of their removal program. Table 11.1 contains key information from the project.

**Table 11.1: Key information from the asbestos removal case study**

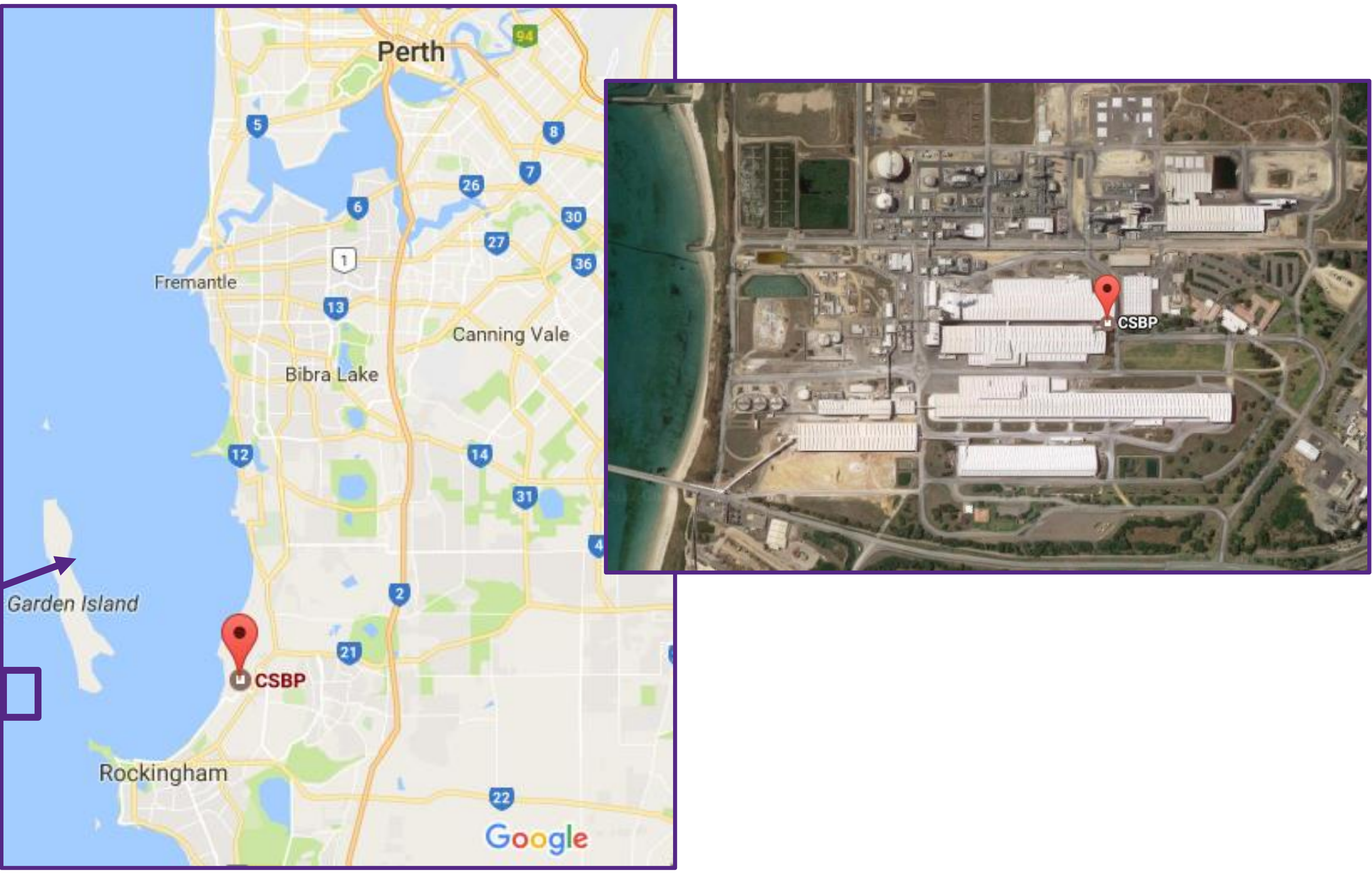
| Key information | Finding |
|---|---|
| **Location** | Kwinana and other sites, Western Australia |
| **Removal period** | 15-year program conducted in stages, with the last stage from 2012 to 2017 |
| **Location of asbestos** | Bonded chrysotile asbestos cement sheeting on roof and walls of various site structures |
| **Volume** | A total of 1,175 tonnes removed over the last 5-year period |
| **Cost to remove** | Approx. $5.7 million over the last 5-year period, privately funded |
| **Key considerations for the asbestos clean-up** | • Early consultation with stakeholders;<br>• Regular supervision;<br>• Defined exclusion zones to allow ongoing site operations. |

## Background

CSBP is a chemical and fertiliser manufacturer in Australia providing chemicals and fertiliser products for commercial use. Their Western Australian operations includes chemical and fertiliser manufacturing at Kwinana (see Figure 11.1) and regional fertiliser distribution centres in Geraldton, Bunbury, Albany and Esperance.

Many of the buildings on these sites were constructed with asbestos cement sheeting on the walls and roof. Given the extensive number of buildings containing asbestos across multiple sites, the company has been progressively removing this material over a period of 15 years, with all major structures using asbestos cement sheeting planned for removal by the end of 2017.

**Figure 11.1: CSBP Kwinana site location[29]**




[29] Map data: Google

## Asbestos removal program

### Overview of removal program

CSBP managed its asbestos removal program by identifying the priority buildings and planning the projects to be undertaken each year based on the priority for removal. Over the past five years, contractors have removed 1,175 tonnes of asbestos roof and wall cladding.

### Removal planning

Typically, it would take two to six months for scoping, tendering and engaging with stakeholders and then six to ten months to complete the physical works.

### Removal methodology

A similar approach was used to remove asbestos across all sites. Large warehouse buildings were addressed in sections, with the cladding removed and replaced in a single section before the works were moved on to the next.

The removal contractor set up exclusion zones that ensured the asbestos removal work was a minimum of 20 metres from other work areas on the site. An independent hygienist set up air monitoring around the work to test for fibres. All workers inside the exclusion zone wore personal and respiratory protective equipment, with a decontamination area set up at the exits.

**Figure 11.2: Crane and scaffold access**

**Figure 11.3: Removalists worked from the side of a cage utilising fall protection equipment**

Removing asbestos sheeting from roof areas provided a challenge in terms of safe access. Different methods were used throughout the removal program, but in all cases CSBP ensured that their procedures for working at heights were complied with. In some areas, removal contractors used a scissor lift at the side of the building and then exited the basket fully anchored to purloins with fall arrest equipment. Other methods used by removal contractors included the use of cranes, scaffolding and boom-type elevated work platforms to access the areas as well as mesh walkways that spread load on to support battens.


## Business Case

CSBP put together a business case to justify the removal of the asbestos containing materials from their buildings that included a range of incentives.

Benefits included a reduction in the costs of maintaining the buildings, as maintenance and repair costs in areas where building had been damaged were much higher when managing asbestos materials than it was on modern structural materials. Some of the buildings themselves also had water leaks, so the cost of total asbestos removal was partially offset by how much it would have cost to repair the water leaks.

Despite CSBP's procedures for managing asbestos in situ, it was ultimately decided that the risk of retaining the asbestos materials was greater than the cost of removal. Removing the asbestos completely would eliminate any future risk to employees, contractors and others being exposed to asbestos fibres.

Additionally, there was consideration of natural weather events causing damage to the sheeting that would disrupt operations on the site and contaminate products.

## Management of risks

The asbestos removal project at a warehouse on the CSBP Kwinana site in 2013 required the careful management of stock throughout the project. High usage stock was moved out of the warehouse to allow ongoing access, but less used stock, such as motors, pumps and maintenance spares, was able to remain inside sections of the warehouse while asbestos removal work continued in other sections. This stock was located inside the exclusion zone and was covered in tarpaulin sheeting. On the occasion that stock was required, staff entered the exclusion zone with full personal protective equipment and upon exit would pass through the decontamination unit. At the end of the project, all stock that had remained in the stores was fully cleaned.

**Figure 11.4: Asbestos roof sheeting on warehouse**

Despite all of the controls put in place, fragments of asbestos roof sheeting were identified on the cross-beams in the roof area as part of final checks. CSBP engaged a licenced asbestos assessor to take lift samples in the area which identified spots containing asbestos. They then employed an asbestos removalist to wet wipe and vacuum all areas to ensure a full clean. During this process, stores personnel were consulted on the methodology and the clearances.

## Innovation and excellence

CSBP put a lot of emphasis on consulting with stakeholders at the beginning of their site projects. Due to the emotive and hazardous nature of asbestos, early conversations were held with employees and contractors to raise awareness of asbestos risks and of the control methods that were to be employed on the site.  CSBP's project manager would also undertake regular site visits to engage with employees and ensure any concerns were addressed.

***"Up front stakeholder consultation is an essential factor in delivering a successful asbestos removal project. We ensure we communicate to employees and contractors well before mobilisation of work so that any concerns are addressed up front."***

***CSBP***