

APPENDIX

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STRUCTURAL ADEQUACY REPORT



## **STRUCTURAL ASSESSMENT REPORT**

**Albion Park Butter Factory (Former)  
23 Calderwood Road, Albion Park NSW 2527**

**INGLIS Project No: 2020136  
Report Reference No: 2020136-RPT-001**

**Client: Cardno**

**Client Contact:**



**Report Date: 18 August 2021**



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Project No.: 2020136  
Report Ref.: 2020136-RPT-001

Cardno  
16 Burelli Street  
Wollongong NSW 2500



**RE: Structural Assessment of Albion Park Butter Factory (Former)**  
**23 Calderwood Road, Albion Park NSW 2527**  
**Client: Cardno**

Thank you for inviting INGLIS Engineering to undertake a Structural Assessment of the Albion Park Butter Factory (Former). If you have any queries or wish to discuss our report further, please do not hesitate to contact the undersigned on 0428 192 180.

For INGLIS Engineering Pty Ltd

A handwritten signature in blue ink, appearing to read 'David Portman'.



CPEng NER RPEQ  
Director/Principal Engineer

## Revision History

Revision	Description	Date	Author	Reviewer	Signatory
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This report does not address work procedures and engineering details required for any complex repairs, nor the requirements to avoid overstressing or maintaining stability of any structures during repair. It shall be the responsibility of those implementing repairs to maintain the structure in a structurally sound and stable condition. This report is based on the assumption that all existing structures and modifications thereof, were engineer designed and certified by others in compliance with all relevant Australian Building Codes and Appropriate Engineering Practices. This report does not in any way imply certification of any structure, or part thereof.

This report does not include the assessment of any building services such as electrical, gas, plumbing, drainage or stormwater or the presence of pest infestation. Similarly, it does not include the assessment of any elements which were inaccessible unless it is specifically referred to in the above report.

The observations and comments contained within this report do not alleviate the design engineer, builder, certifying authorities and customer of their relevant statutory obligations in relation to the relevant structures.

This report is intended to be read in colour only.



# 1. INTRODUCTION

Cardno commissioned INGLIS Engineering to undertake a structural assessment of the Albion Park Butter Factory (former) at 23 Calderwood Road, Albion Park. This was the first assessment of the structure by INGLIS Engineering and this report is the primary deliverable of the engagement.

The NSW Government Office of Environment and Heritage reports the original building was constructed circa 1884-1885, with various alterations constructed in the following years. The age of the alterations is unknown; however, we understand the building remains unchanged since at least c1948. Photographs 1.1 and 1.2 are historical reference photos of the building.



**Photograph 1.1 - Historical Photo (Date Unknown)**

<https://www.environment.nsw.gov.au/heritageapp/HeritageItemImage.aspx?ID=2380001#ad-image-4>



**Photograph 1.2 - Historical Photo (Date Unknown)**

<https://www.environment.nsw.gov.au/heritageapp/HeritageItemImage.aspx?ID=2380001#ad-image-5>

## 2. REFERENCE STANDARDS AND PUBLICATIONS

The works performed under this assessment were completed in accordance with the intent of the relevant documents listed in:

- AS 2870-2011 Residential slabs and footings.
- AS ISO 31000 Risk Management - Principles and Guidelines.
- SA/SNZ HB 436 Risk Management Guidelines.

## 3. PHOTOGRAPHIC OVERVIEW

Our structural engineer David Tarlinton attended the site on 19 November 2020 to inspect the accessible elements of the building. At the time of inspection, photographs were taken on a digital camera. The photographs have not been altered in any way other than, in some cases, by cropping, correction of brightness, compression or addition of annotation for the purposes of clarity only.

A complete photographic record of the inspection is included in the appendices of this report. Unless noted otherwise, all photographs reproduced in this report were taken during the inspection on 19 November 2020.

Photographs 3.1 to 3.5 provide an overview the butter factory building.



**Photograph 3.1 - Eastern Elevation as Inspected**





**Photograph 3.2 - Northern Elevation as Inspected**



**Photograph 3.3 - Southern Elevation as Inspected**





**Photograph 3.4 - Western Elevation as Inspected**



**Photograph 3.5 - Interior (Typical) as Inspected**

## 4. SITE OBSERVATIONS AND RISK ASSESSMENT

- 4.1. Our structural engineer David Tarlinton attended the property on 19 November 2020 and conducted an external and internal visual (non-invasive) site inspection of the building.
- 4.2. The general construction methodologies of the building were as follows:
  - 4.2.1. Footing System: Unknown. Likely concrete or masonry.
  - 4.2.2. Floor: Concrete slab.
  - 4.2.3. External Walls: Single storey timber-framed.
  - 4.2.4. Internal Walls: Single storey timber-framed.
  - 4.2.5. Roof: Low pitched gable timber-framed and metal sheet.
  - 4.2.6. Verandah: Low pitched skillion timber-framed and metal sheet.
- 4.3. In describing observations within this report, a set of defined damage classifications were adopted in accordance with the intent of Table C1 of AS 2870-2011 Residential slabs and footings. This Standard has been widely used in its various editions for over 25 years and it provides useful and standardised guidance for most typical forms of “residential type” construction (particularly in relation to the classification of damage, foundation performance and site maintenance). Refer extract in Figure 4.1.

<p style="text-align: center;">APPENDIX C</p> <p style="text-align: center;"><b>CLASSIFICATION OF DAMAGE DUE TO FOUNDATION MOVEMENTS</b></p> <p style="text-align: center;">(Normative)</p> <p>Classification of damage with reference to wall is given in Table C1. Classification of damage with reference to concrete floors is given in Table C2.</p> <p style="text-align: center;"><b>TABLE C1</b></p> <p style="text-align: center;"><b>CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS</b></p> <table> <tr> <th>Description of typical damage and required repair</th><th>Approximate crack width limit (see Note 1)</th><th>Damage category</th></tr> <tr> <td>Hairline cracks</td><td>&lt;0.1 mm</td><td>0 Negligible</td></tr> <tr> <td>Fine cracks that do not need repair</td><td>&lt;1 mm</td><td>1 Very slight</td></tr> <tr> <td>Cracks noticeable but easily filled. Doors and windows stick slightly</td><td>&lt;5 mm</td><td>2 Slight</td></tr> <tr> <td>Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weather tightness often impaired</td><td>5 mm to 15 mm (or a number of cracks 3 mm or more in one group)</td><td>3 Moderate</td></tr> <tr> <td>Extensive repair work involving breaking out and replacing sections of walls, especially over doors and windows. Window frames and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted</td><td>15 mm to 25 mm but also depends on number of cracks</td><td>4 Severe</td></tr> </table> <p>NOTES:</p> <ol style="list-style-type: none"> <li>Where the cracking occurs in easily repaired plasterboard or similar clad-framed partitions, the crack width limits may be increased by 50% for each damage category.</li> <li>Crack width is the main factor by which damage to walls is categorized. The width may be supplemented by other factors, including serviceability, in assessing category of damage.</li> <li>In assessing the degree of damage, account shall be taken of the location in the building or structure where it occurs, and also of the function of the building or structure.</li> </ol>			Description of typical damage and required repair	Approximate crack width limit (see Note 1)	Damage category	Hairline cracks	<0.1 mm	0 Negligible	Fine cracks that do not need repair	<1 mm	1 Very slight	Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2 Slight	Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weather tightness often impaired	5 mm to 15 mm (or a number of cracks 3 mm or more in one group)	3 Moderate	Extensive repair work involving breaking out and replacing sections of walls, especially over doors and windows. Window frames and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15 mm to 25 mm but also depends on number of cracks	4 Severe
Description of typical damage and required repair	Approximate crack width limit (see Note 1)	Damage category																		
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**Figure 4.1 - Table C1 of AS 2870-2011**

- 4.4. A visual condition assessment was completed and a risk assessment of the identified structural issues was conducted in accordance with the general requirements of AS ISO 31000 and HB 436. The risk assessment consisted of:
- 4.4.1. An assessment of identified structural issues.
  - 4.4.2. A failure likelihood rating.
  - 4.4.3. A failure consequence rating.
  - 4.4.4. A qualitative risk assessment to determine the level of risk.
  - 4.4.5. A priority rating and action plan including recommendations outlining proposed remedial works.
- 4.5. The risk assessment and priority rating criteria used for this audit is outlined in Tables 4.1 to 4.4

**Table 4.1 Likelihood**

Table of Likelihood (Frequency)		
Score	Occurrence	Frequency Score
<b>A - Almost certain</b>	The unwanted event could occur several times per year at the specific site/location.	Definite history of occurrence (1/1yr < frequency < 10/1yr)
<b>B - Likely</b>	The unwanted event could occur several times per year in the company; or could happen annually at the specific site/location.	Probably occur, history of near misses (1/5 yrs < frequency < 1/1yr)
<b>C - Possible</b>	The unwanted event could well have occurred in the company at some time in the past 10 years.	May happen once per lifetime (1/10yrs < frequency < 1/5yrs)
<b>D - Unlikely</b>	The unwanted event has happened in the relevant industry at some time; or could happen in the company within less than 100 years.	Unlikely but possible (1/100yrs < frequency < 1/10yrs)
<b>E - Rare</b>	The unwanted event has never been known to occur in the industry, but could happen in the company within less than 100 years.	May not be experienced (frequency < 1/100yrs)

**Table 4.2 Consequence**

Table of Consequence			
Score	Harm to People (P)	Asset Damage and Other Consequential Losses (A)	Impact on Reputation (R)
<b>5 - Catastrophic</b>	Multiple Fatalities	Operations seriously affected (Loss > \$10M)	Major damage, public and media outrage (national). Major costs (PA, courts, EPA, clean-up)
<b>4 - Major</b>	Fatality or Permanent Disabilities	Major damage to facility (\$1M < Loss < \$10M)	Major release of pollutants, public and media concern (State). Significant costs (PA, courts, EPA, clean-up)
<b>3 - Moderate</b>	Incapacitations or injuries requiring time off work	Moderate damage to facility (\$100k < Loss < \$1M)	Serious release of pollutants, public and media attention. Likely EPA court action and clean-up costs
<b>2 - Minor</b>	Significant Injuries - Medical Treatments, non-permanent injury	Minor Damage to facility (\$10k < Loss < \$100k)	Transient release, some public and media attention, need to notify EPA, some clean-up costs
<b>1 - Insignificant</b>	Minor Injuries - First Aid Treatments (cuts/bruises)	No damage, easily addressed (Loss < \$10k)	Brief transient release, no media or public interest, no need to inform EPA, easy clean up

**Table 4.3 Risk Rating Matrix**

RISK MATRIX							
Likelihood	Consequence						
		1	2	3	4	5	
	A	H	H	Ex	Ex	Ex	
	B	M	H	H	Ex	Ex	
	C	L	M	H	Ex	Ex	
	D	L	L	M	H	Ex	
	E	L	L	M	M	H	
		Insignificant	Minor	Moderate	Major	Catastrophic	

**Table 4.4 Risk Rating and Priority**

Risk Rating	Priority	Action Required	Repair Requirements
Extreme	1	Bring to the immediate attention of management. Formal assessment required. MUST reduce the risk as a matter of priority.	Urgent. Equipment and working area are dangerous. Remediation work required immediately.
High	2	Bring to the immediate attention of management. Further Assessment required. MUST reduce the risk as a matter of priority.	Necessary. Equipment is inadequate. Precautionary measures should be put in place by management, until remediation work is completed.
Medium	3	Review effectiveness of controls. Ensure responsibilities for control are specified.	Remediation. Equipment is deficient. Remediation work required. (No urgency).
Low	4	If practical reduce the risk.	Maintenance. Equipment may be sub-standard. General Maintenance required. (No urgency).



Structure: Building  
Element: External





Inspection History			
Inspection Date	19/11/20		
Likelihood Score	D		
Consequence Score	3		
Risk Rating	Medium		
Priority	3		
Photo Record	As Shown and Refer Appendix A.		
Observations/Comments			

- The structure is partially enclosed by a security fence albeit still accessible.
- This risk assessment is based on the current compromised state of the security fence. We recommend installation of a security fence around the entire building with provision of a locked access gate. The security fence should be maintained until remedial works are complete. If unauthorised access is restricted the risk rating will revert to Low.
- The majority of the eastern verandah has collapsed and is dilapidated beyond repair.
- The pitched roof framing is partially collapsed and the structural integrity of the roof framing is compromised. The roof sheeting and battens on the southern side are missing. In the current state the remaining roof frame may be dislodged and become airborne debris and any significant wind storm event.
- Moderate rotting and termite damage in some of the exposed timber roof frame members.
- Moderate rotting and termite damage in the external timber framed windows, doors and associated frames.
- Moderate to severe deterioration of weatherboards including peeling and general degradation of painted surfaces.
- Dislodged and missing weatherboards.

Structure: Building  
Element: Internal



Inspection History			
Inspection Date	19/11/20		
Likelihood Score	D		
Consequence Score	3		
Risk Rating	Medium		
Priority	3		
Photo Record	As Shown and Refer Appendix B.		
Observations/Comments			

- The structure is partially enclosed by a security fence albeit still accessible.
- This risk assessment is based on the current compromised state of the security fence. We recommend installation of a security fence around the entire building with provision of a locked access gate. The security fence should be maintained until remedial works are complete. If unauthorised access is restricted the risk rating will revert to Low.
- Moderate to severe rotting and termite damage in some of the exposed timber wall frame members.
- Moderate rotting and termite damage in the internal timber framed windows, doors and associated frames.
- Moderate to severe deterioration of wall and ceiling lining boards including peeling and general degradation of painted surfaces.
- Extensive dislodged and missing wall and ceiling lining boards.
- Moderate cracking, spalling and settlement of the concrete floor slab.



**Structure: Miscellaneous**

**Element: Cattle Yards, Shed, External Pavement.**



Inspection History			
Inspection Date	19/11/20		
Likelihood Score	E		
Consequence Score	2		
Risk Rating	Low		
Priority	4		
Photo Record	As Shown and Refer Appendix C.		
Observations/Comments			
<ul style="list-style-type: none"> <li>• Moderate cracking, spalling and settlement of the external concrete and stone pavement.</li> <li>• Dilapidated chicken coop/shed. We understand this item is not of heritage significance.</li> <li>• Moderate rotting, termite damage and general dilapidation of the timber framed cattle yards and loading ramp. We understand these items are not of heritage significance.</li> </ul>			

## 5. CONCLUSION AND RECOMMENDATIONS

- 5.1. On the basis of our observations and the risk assessments outlined above, we consider the overall building is in poor to fair condition and the structural integrity of some building elements has been compromised.
- 5.2. With appropriate remedial work and partial reconstruction, the building structure and overall building fabric can be salvaged to extend the serviceable life of the structure.
- 5.3. With regard to make-safe actions, we recommend the following works be completed as soon as practicable:
  - 5.3.1. Installation of a security fence around the entire building with provision of a locked access gate. The security fence should be maintained until remedial works are complete.
  - 5.3.2. Engage a licenced builder to undertake temporary make-safe repairs to the roof framing, tiedown, bracing and roof sheeting. In the current state the remaining roof frame may be dislodged and become airborne debris and any significant wind storm event.
- 5.4. A detailed summary of recommendations for remedial actions and cost estimates is provided in Table 5.1. Failure to implement the recommended remedial actions will lead to further degradation of the structure to a stage where it will become dilapidated beyond repair.

**Table 5.1 Remedial Actions and Cost Estimate**

Item No.	Building Element	Recommended Action	Priority Refer Table 4.4	Cost Estimate
1	Security Fencing	<ul style="list-style-type: none"> <li>Install and maintain security fencing until completion of remedial/make-safe works.</li> </ul>	3	\$5,625
2	Heritage Consultant	<ul style="list-style-type: none"> <li>Provision for heritage consultant assessment, (if required):</li> <li>Conservation management plan and report.</li> <li>Statement of heritage impact.</li> <li>Archival recording.</li> </ul>	N/A	\$25,000
3	Architectural	<ul style="list-style-type: none"> <li>Provision for architectural plans for DA submission (if required).</li> </ul>	N/A	\$6,000
4	Structural Engineering	<ul style="list-style-type: none"> <li>Provision for detailed engineering design of remedial works.</li> </ul>	N/A	\$7,500
5	Development Application	<ul style="list-style-type: none"> <li>Provision for Development Application for remedial works (if required).</li> </ul>	N/A	\$5,000
6	Pest Consultant	<ul style="list-style-type: none"> <li>Prepare specification for termite management and baiting system requirements.</li> </ul>	3	\$3,500
7	Wall Framing	<ul style="list-style-type: none"> <li>Remove wall linings to facilitate engineering inspection and determine the overall extent of frame damage.</li> <li>Reconstruct timber wall framing in accordance with the engineering design and with consideration of the relevant heritage requirements.</li> <li>All timber framing shall comply with engineering design and AS 1684.2.</li> <li>All timber shall be termite resistant durability class 1 structural hardwood.</li> </ul>	3	\$25,000



Item No.	Building Element	Recommended Action	Priority Refer Table 4.4	Cost Estimate
8	Roof Framing	<ul style="list-style-type: none"> <li>Remove ceiling linings to facilitate engineering inspection and determine the overall extent of frame damage.</li> <li>Reconstruct timber roof framing in accordance with the engineering design and with consideration of the relevant heritage requirements.</li> <li>All timber framing shall comply with engineering design and AS 1684.2.</li> <li>All timber shall be termite resistant durability class 1 structural hardwood.</li> </ul>	3	\$25,000
9	Verandah Framing	<ul style="list-style-type: none"> <li>Reconstruct mass concrete pad footings and timber roof framing in accordance with the engineering design and with consideration of the relevant heritage requirements.</li> <li>All timber framing shall comply with engineering design and AS 1684.2.</li> <li>All timber shall be termite resistant durability class 1 structural hardwood.</li> </ul>	4	\$25,000
10	Roof Sheeting	<ul style="list-style-type: none"> <li>Replace the missing roof sheeting along the southern side of the building. Repair or replace any damaged sheeting.</li> <li>Sheeting type, colour and fixings to comply with any relevant heritage requirements.</li> </ul>	3	\$10,000
11	External Linings	<ul style="list-style-type: none"> <li>Reinstate external linings after frame repairs.</li> <li>Replace any missing or dilapidated weatherboards. Repair existing where applicable.</li> <li>Weatherboard type, colour and fixings to comply with any relevant heritage requirements.</li> </ul>	4	\$25,000
12	Internal Linings	<ul style="list-style-type: none"> <li>Reinstate internal linings after frame repairs.</li> <li>Replace any missing or dilapidated wall and ceiling lining boards. Repair existing where applicable.</li> <li>Lining type, colour and fixings to comply with any relevant heritage requirements.</li> </ul>	4	\$25,000
13	Doors	<ul style="list-style-type: none"> <li>Repair timber doors to operable condition.</li> <li>Hinges, fixings, etc. to comply with any relevant heritage requirements.</li> </ul>	4	\$12,500
14	Windows	<ul style="list-style-type: none"> <li>Repair timber windows to operable condition.</li> <li>Hinges, fixings, etc. to comply with any relevant heritage requirements.</li> </ul>	4	\$7,500
14	Termite Protection	<ul style="list-style-type: none"> <li>Install termite management system to pest consultant specification.</li> </ul>	3	\$5,000
Note: Estimate for budgeting purposes only. All cost to be confirmed by relevant consultants and contractors.				<b>TOTAL</b> <b>\$212,625</b> <b>ex GST</b>

## APPENDIX A: PHOTOGRAPHS (BUILDING - EXTERNAL)





External

Photograph A1



External

Photograph A2



External

Photograph A3



External

Photograph A4





External

Photograph A5



External

Photograph A6



External

Photograph A7



External

Photograph A8





External

Photograph A9



External

Photograph A10



External

Photograph A11



External

Photograph A12





External

Photograph A13



External

Photograph A14



External

Photograph A15



External

Photograph A16





External

Photograph A17



External

Photograph A18



External

Photograph A19



External

Photograph A20





External

Photograph A21



External

Photograph A22



External

Photograph A23



External

Photograph A24



External

Photograph A25

## APPENDIX B: PHOTOGRAPHS (BUILDING - INTERNAL)





Internal

Photograph B1



Internal

Photograph B2



Internal

Photograph B3



Internal

Photograph B4





Internal

Photograph B5



Internal

Photograph B6



Internal

Photograph B7



Internal

Photograph B8





Internal

Photograph B9



Internal

Photograph B10



Internal

Photograph B11



Internal

Photograph B12





Internal

Photograph B13



Internal

Photograph B14



Internal

Photograph B15



Internal

Photograph B16





Internal

Photograph B17



Internal

Photograph B18



Internal

Photograph B19



Internal

Photograph B20





Internal

Photograph B21



Internal

Photograph B22



Internal

Photograph B23



Internal

Photograph B24





Internal

Photograph B25



Internal

Photograph B26



Internal

Photograph B27



Internal

Photograph B28





Internal

Photograph B29



Internal

Photograph B30



Internal

Photograph B31



Internal

Photograph B32



## APPENDIX C: PHOTOGRAPHS (MISCELLANEOUS)



Miscellaneous

Photograph C1



Miscellaneous

Photograph C2



Miscellaneous

Photograph C3



Miscellaneous

Photograph C4





Miscellaneous

Photograph C5



Miscellaneous

Photograph C6



Miscellaneous

Photograph C7



Miscellaneous

Photograph C8





Miscellaneous

Photograph C9



Miscellaneous

Photograph C10



Miscellaneous

Photograph C11



Miscellaneous

Photograph C12



