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RUDDERS BOND STORE / FORMER SYMONDS FACTORY

Preliminary Conservation Strategy

Post-Salvage Phases

FINAL

August 2016

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CLIENT: CPB Dragados Samsung Joint Venture

PROJECT NAME: 53-57 Campbell Road – Preliminary Conservation Strategy ; Post Salvage Phases

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1 INTRODUCTION

1.1 Brief

EXTENT Heritage Pty Ltd has been commissioned to prepare a Preliminary Conservation Strategy regarding the options for retention, conservation, relocation and reinstallation of the extant laminated timber arches of the Rudder's Bond Store, located at 53-57 Campbell Road, St Peters.

Condition B34 of the infrastructure approval under Section 115ZB of the *Environmental Planning & Assessment Act 1979* for WestConnex Stage 2, and the Rudders Bond Store at 53-57 Campbell Street which forms the focus of the subject condition, states:

> ***The Proponent must salvage sections of the laminated timber from the Rudders Bond Store prior to demolition of the building and assess options for its reuse within the project area at St Peters and maximise its use within the operational facilities. The sections to be salvaged must be determined in consultation with the Heritage Council of NSW (or its delegate). The Proponent must submit to the Secretary written advice from the Heritage Council of NSW that it is satisfied with the proposed level of salvage, prior to the building being demolished.***

An assessment has been undertaken on the opportunities and constraints which have been generated as a result of this condition and within the heritage and project environments, and the following advice has been prepared to inform the decision making process to meet this condition. The Preliminary Conservation Strategy aims to present the various conservation opportunities regarding the timber arches taking into consideration the current condition of the historic fabric. The options presented should also facilitate discussion on the inherent challenges in regards to costs, logistics, long- and short-term storage, reinstallation, interpretation and ongoing maintenance.

Following discussion with CPB Dragados Samsung Joint Venture (CDSJV), it has been confirmed that the work to salvage the arches (involving cutting into segments and removing from site) will be done by others and is not in the scope of this conservation strategy. Therefore, while this strategy may guide the development of the salvage operation, it focuses primarily on the materials conservation strategies post-salvage i.e. during storage offsite.

1.2 Limitations

The historical overview provides sufficient historical background to provide an understanding of the place in order to assess the significance and provide relevant recommendations, however, it is not intended as an exhaustive history of the site.

Fabric Analysis

An intensive fabric analysis would identify different elements of the structure's built fabric and grade its significance. This information could then inform its suitability or appropriateness for retention and conservation. An intensive fabric analysis has not been carried out as part of this Preliminary Conservation Strategy, however our historical review has clearly identified that the laminated timber arches are highly intact elements of a local and possibly State heritage significant structure.

As such, this Preliminary Conservation Strategy focuses solely on the conservation management of the laminated arch elements. The retention and conservation of other building fabric of the Rudders Bond building was not considered a part of this assessment.

1.3 Authorship

The following staff members at EXTENT Heritage Pty Ltd have been involved in the preparation of this Preliminary Conservation Strategy:

[redacted]	NSW Director
[redacted]	Team Leader, Heritage Places
[redacted]	Senior Heritage Advisor
[redacted]	Heritage Advisor
[redacted]	Heritage Advisor
[redacted]	Heritage Advisor

1.4 Ownership

The subject site is owned by Roads and Maritime Services.

1.5 Heritage Listings

The subject building is included on the following heritage registers:

- City of Sydney Council Local Environmental Plan 2012: *Warehouse 'Rudders Bond Store' including interiors* (#I1405)

The building is included on the LEP as an item of Local significance, however recent assessments of the building have assessed it as being on significance at a State level.

1.6 Site Identification & Location

The subject property is located at 53-57 Campbell Road and intersections Lots 101 and 102 Lot DPs 845651 and 871150. It is bounded by Campbell Road to the north-east and Burrows Road to the south-east. The area to the North of the Rudders Bond Store contains Sydney Park, while the streetscapes to the south of the area are characterised by warehouses.

Figure 1 - Map indicating location of 53-57 Campbell Road Building outlined in red (Google Maps29/2/16).

Figure 2 – Aerial photo indicating location of 53-57 Campbell Road Building outlined in red (Dept. of Lands SIX viewer 29-2-16).

1.7 Statement of Significance

The subject site is listed as a local heritage item (#I1405) under Schedule 5 of the Sydney Local Environmental Plan 2012. The Statement of Significance for the *Warehouse 'Rudders Bond Store' including interiors* is as follows:

> *The Rudders Bond Store is historically significant as it represents a later industrial development overlay within the southern suburbs. The building is architecturally significant as it reflects an innovative form of construction for buildings requiring large spans for its time.*

The building is included on the LEP as an item of Local significance, however recent assessments of the building have assessed it as being on significance at a State level.

2 History

The following historical account of the site was prepared by Extent Heritage as part of the Rudders Bond Store Comparative Analysis June 2016. It has been included here to give context to the significance of the building in regards to the manufacturer, Ralph Symonds, the development of the technology of laminated timber structures, and some idea of construction detail.

2.1 Site & Building Development

The former Symonds Warehouse is located at 53-57 Campbell Road, St Peters. The building is the second factory to be located on the subject site, with the first being in existence as early as 1943 and being an igloo style building. It is presumed that Ralph Symonds acquired the site at some stage in the early 1940s and by 1949 had demolished this original factory and replaced with a new factory along Holland Street.

Reportedly this first section was built c1946 at which point the Symonds factory is believed to have begun operating at the site. The full building at its largest extent and as it stood for approximately 40 years. At some stage since then the original c1946 section at the west end of Holland Street has been removed, leaving the c1953 sections of the structure.

Shortly after construction was completed, the council granted permission for the premises to be used for general storage by Rudders with the property being leased to them by Symonds.[1]

Ralph Symonds was a pioneer in the area of timber fabrication and construction, in 1924 he started with the foundation of Standardised Furniture at Marrickville in Sydney, which specialised in sliced veneer faced plywood panels.[2] By 1942 he had registered as a proprietary company and became a public company in 1950. He moved into the design of machines for the manufacture of large sheets and incorporated these into his factories where he produced some of the first durable and fire-resistant plywoods.[3]

Prior to 1943, Ralph Symmods company had occupied a number of sites including Moreley Avenue, Rosebury and Regent Street, Redfern. By 1943, Symonds had commenced construction on his own factory building in Campbell Road, St Peters, which was operational by 1946, though the Morley Avenue plant continued to be the main site of operations until 1958.[4].

Symonds made a name for himself, doing this which other people could not do. He specialised in plywood and worked on the continual development of the product. Symonds maintained "that glue laminated factories were most economic for spans greater than 90ft (27.4 m). Anything less than that

[1] AECOM Australia Pty Ltd (November 2015) *WestConnex New M5 Environmental Impact Statement*
[2] Cochrane, J. *Ralph Symonds Pty Ltd and the Sydney Opera House*, Faculty of Architecture, The University of Newcastle.
[3] Wyatt, Ken (2000) Ralph Symonds Plywood Factory. In: Lowe, PG (Editor); Hill, RF (Editor). Second Australasian Conference on Engineering Heritage, Auckland: Proceedings. Auckland, N.Z.: Institution of Professional Engineers New Zealand: 243-248.
[4] Honchcroft, Y. (1987). *Company History of Ralph Symonds Australia Ltd* (unpublished). Mitchell Library, Sydney.

and it was cheaper to build in steel."[5] Symonds was reportedly considered a larrikin and clashed with the dominant engineering establishment.[6]

Rationing and shortages of steel during World War II, provided the ideal market for Symonds use of laminated timber, with there being advantages in construction times and the ability to span wider areas. Thought to be Symond's first building venture is the extant former National Springs igloo building at 52-54 O'Riordan Street in Alexandria, constructed in 1941 and used for the engineering and construction of aircraft during the war.[7] This building is credited with being the first use of glue laminated timber for large-scale building construction in Australia. The building is a three pin parabolic arch structure for which Symonds fabricated the arches from 29 laminations of low grade rimu. The building's construction demonstrates an early and innovative structural use of laminated timber to achieve the quick construction, efficient use of materials and wide spans needed for wartime factories at a time of materials and labour shortages.[8]

Symonds work was used in the construction of the Sydney Opera House. The technology developed by Ralph Symonds Limited was essential to architect Joern Utzon's method of design development for the structure. Utzon was an ally to Symonds in his willingness to technically develop Symonds ideas about the creative potential for plywood in architecture. Symonds and Utzon appear to have worked in collaboration, with Symonds solutions being applicable to the irregular plan and form of the building. Ralph Symonds died prematurely in 1961 and Ralph Symonds Ltd carried on the work on the Opera House under the direction of Mr Ellis Ezra. [9]

[5] From an address entitled Facts & Fallacies of Timber Design; Reported in Australian Timber Journal; January, 1957; p. 103. In Noland G. (1994) *The Forgotten Long Span Timber Structures of Australia*, *A Thesis for the Degree of Master Of Architecture,* Department of Architecture, University of Tasmania Launceston.
[6] Nolan G. (October 1994) *The Forgotten Long Span Timber Structures of Australia*, *A Thesis for the Degree of Master Of Architecture,* Department of Architecture, University of Tasmania Launceston.
[7] AECOM Australia Pty Ltd (November 2015) *WestConnex New M5 Environmental Impact Statement*
[8] Former National Motor Springs Igloo Building, State Heritage Inventory Listing #5062448, City of Sydney Council.
[9] Cochrane, J. (1998) *Ralph Symonds Pty Ltd and the Sydney Opera House*, Faculty of Architecture, The University of Newcastle.

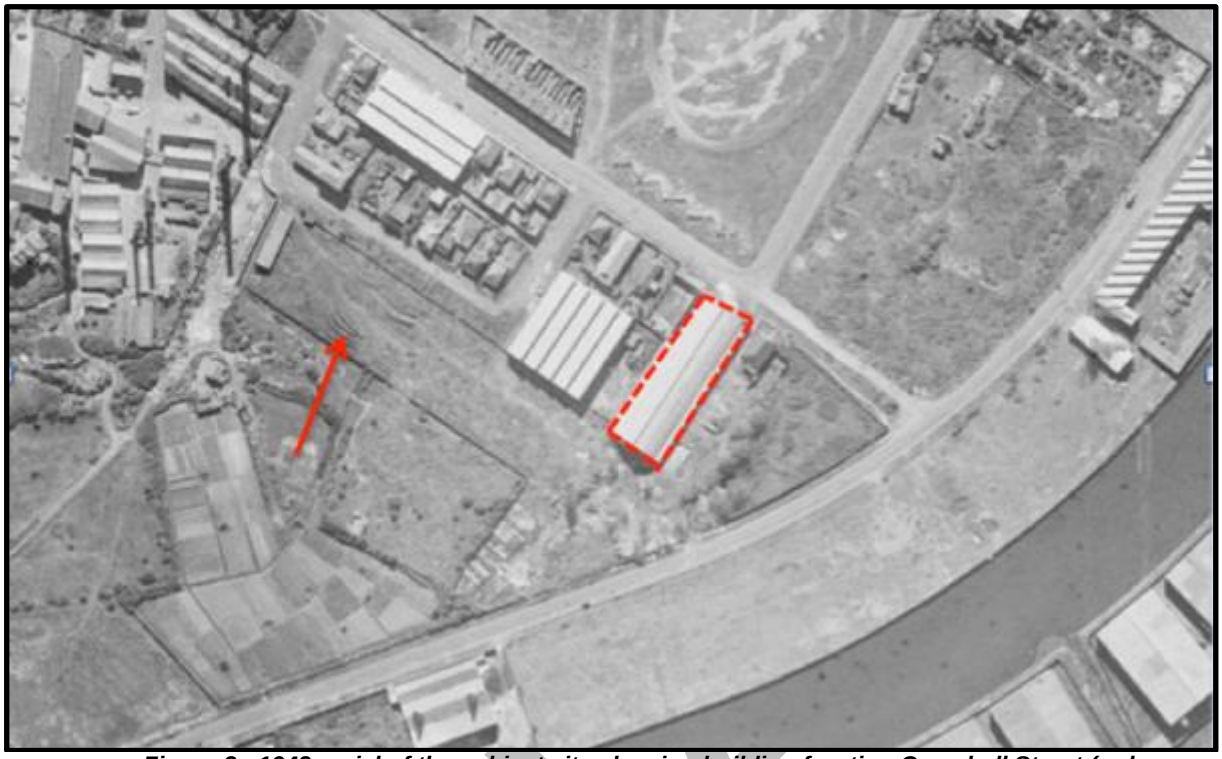

Figure 3 - 1943 aerial of the subject site showing building fronting Campbell Street (red outline) and arch timber in yard (red arrow). (Source: SIX Maps, NSW Land and Property Information)

Figure 4 – The Austral pit which was shared by The Central Brick & Tile Co Pty Ltd. The first building on the subject site can be seen in the background (indicated by red arrow).

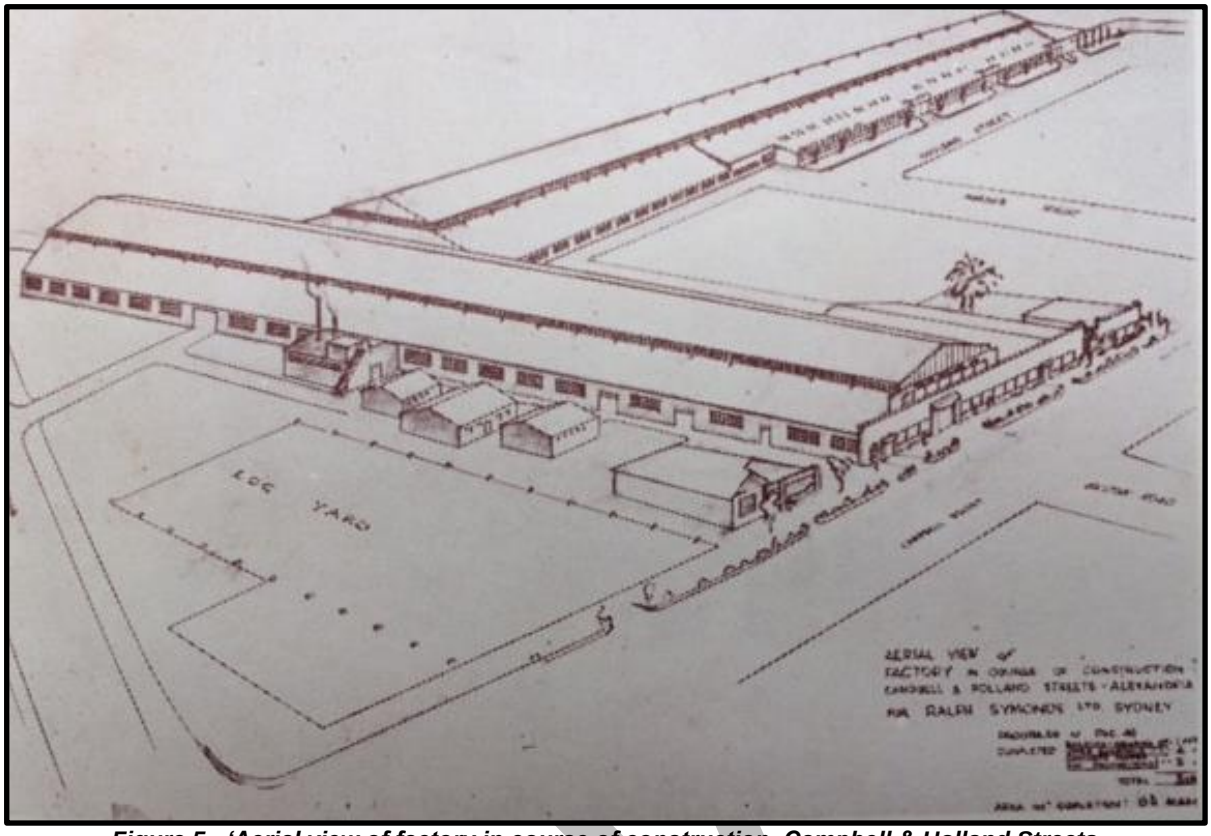

Figure 5 - 'Aerial view of factory in course of construction, Campbell & Holland Streets – Alexandria for Ralph Symonds Ltd, Sydney' c1953. (Source: NSW State Library).

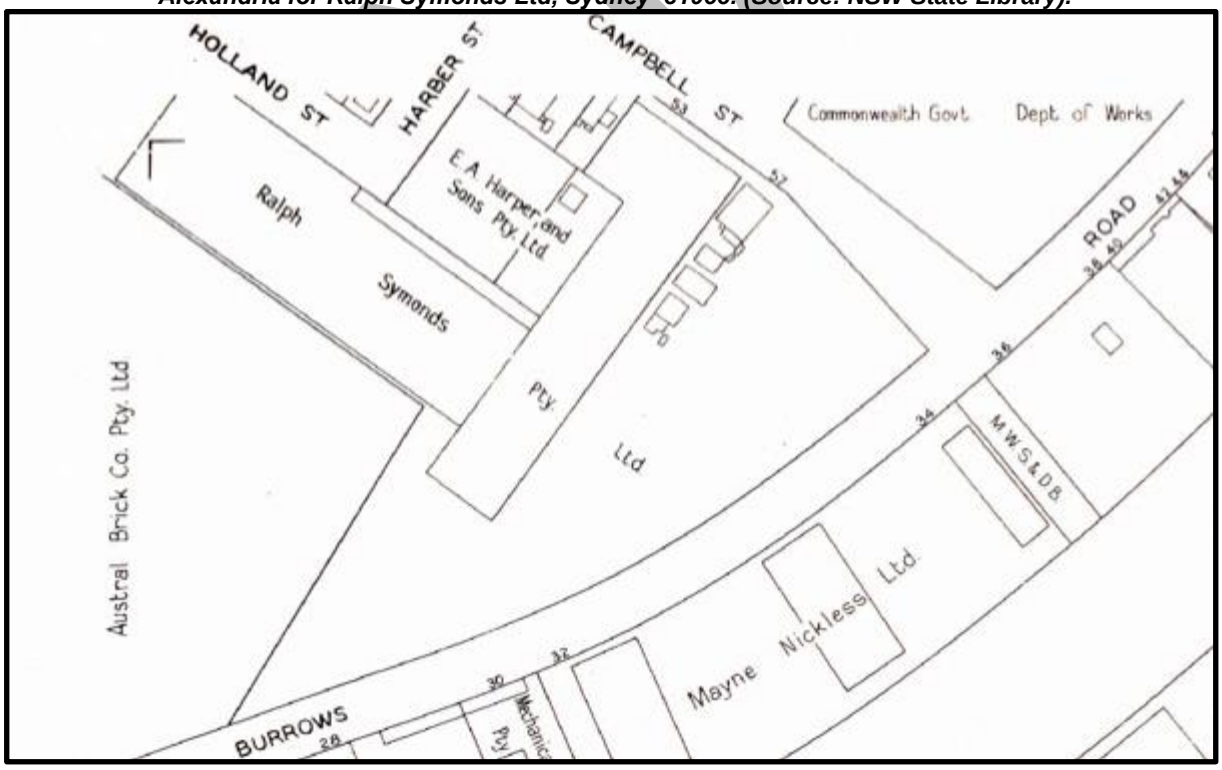

Figure 6 - City Building Surveyors Detail Sheets, c1956, Sheet 26. Shows Ralph Symonds Pty Ltd with building fronting both Holland and Campbell Streets. (Source: City of Sydney Council Historic Maps).

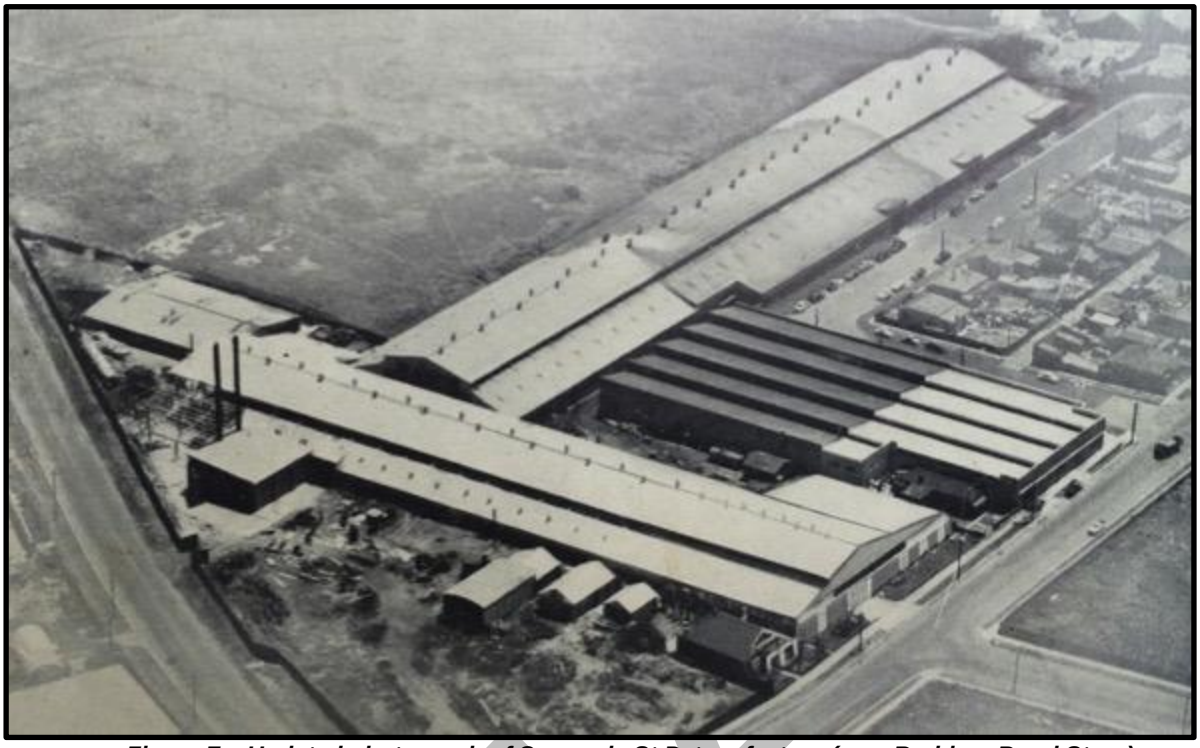

Figure 7 – Undated photograph of Symonds St Peters factory (now Rudders Bond Store), showing full structure as per 1950s layout. (Source: Ralph Symonds promotional material, NSW State Library).

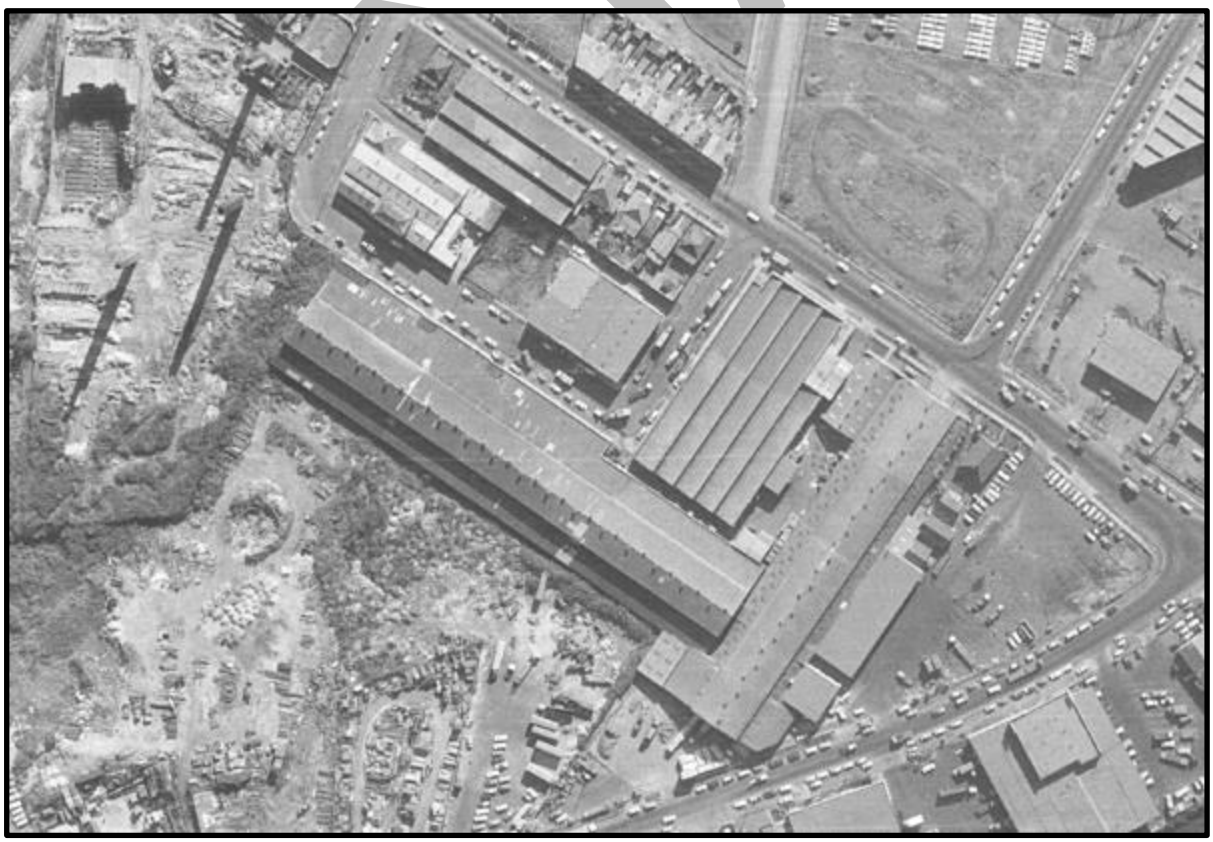

Figure 8 - Aerial photograph, 1970. Shows full building as per early 1950s planned layout. (Source: NSW Department of Lands).

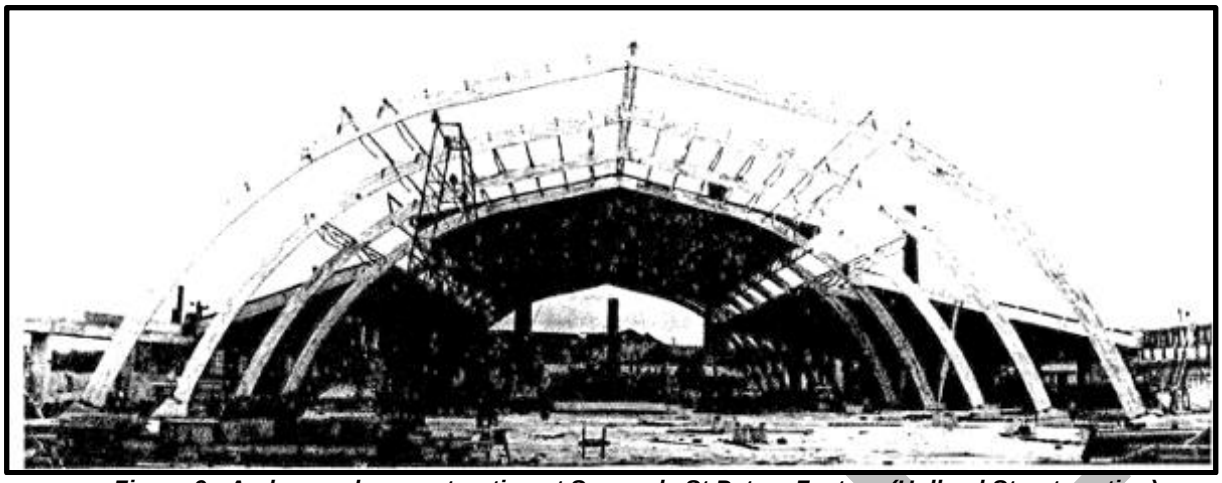

Figure 9 - Arches under construction at Symonds St Peters Factory (Holland Street section), c1946. (Source: Nolan, 1994)

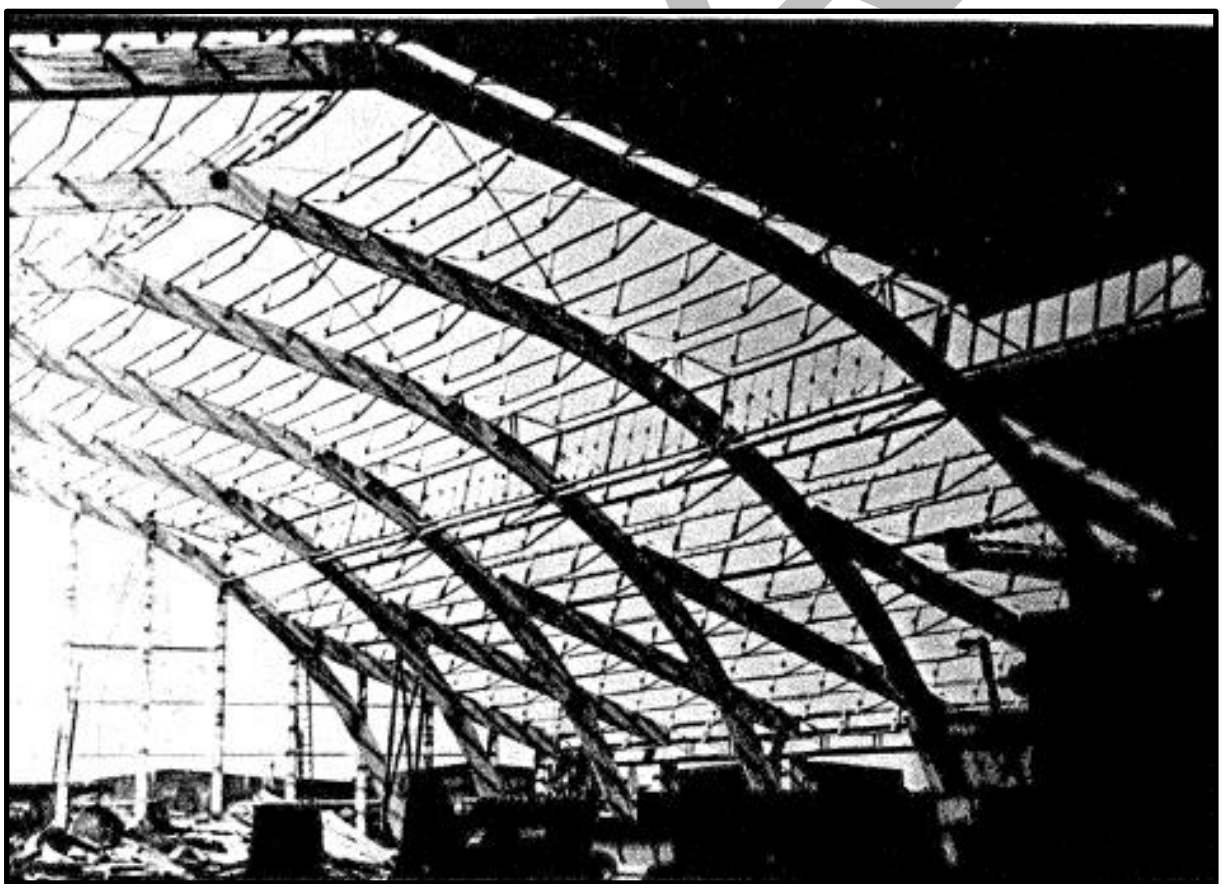

Figure 10 – South end of the Holland Street section, Symonds St Peters Factory, c1946. (Source: Nolan, 1994).

2.2 Rudders Bond – The Current Context

Description

The following building description is taken directly from the WestConnex New M5 Environmental Impact Statement (November 2005), AECOM Australia:

> *The former Rudders Bond Store is 'L' shaped in plan, oriented in a north-east/south-westerly direction and having a second frontage on Burrows Road. The arm of the store extends from the north western side of the building. The Store is currently divided into three tenancies, the one on Campbell Road being vacant, the central portion being leased by Sita Pty Ltd as a recycling centre and the third, southern most section is used by Dial-a-Dump.*
>
> *Externally, the store is constructed of brick (painted cream) to the first storey height. The front is distinguished with round-edged brick supporting columns evenly spaced. The central span contains almost full height access doors. The other spans (eight in all) contain vertically arranged louvres over windows. The roof is of a complex clerestory style, with the pitched corrugated iron and corrugated clear fibreglass roof covering the four central spans. The fall containing the windows is angled in the opposite direction to the pitch of the roof. The final pitch of the roof extends to the walls. The gable is filled with rectangular aluminium windows. In faded paint across the windows is the word 'RUDDERS'.*
>
> *On the interior, the roof structure is supported on arched struts of laminated timber. The timber segments are around 15 millimetres thick and of variable length. The timber is held together with bolted 'D' shaped brackets held by welded bolts on either side. The arched structure leaves the interior space free of columns.*

Additionally, a description of the building was made along with plans in 1994 prior to the removal of the western section of the Holland Street pavilion, which provides they following additional details:

> *The complex has two perpendicular wings of three pin foundation arches. The larger wing consists of 32 bays at 6.1 m centres while the smaller is of 24 bays at 6.1m centres. The arches used throughout are identical and span 31m. Each is a 610 x 100 mm member of 29 laminations, fabricated with casein glues. The 24 arches to the west end of the long arcade are fabricated from mixed hardwoods while the remainder of the arches are radiata or oregon.*
>
> *Secondary rafters run from the line of the arches to form aisles of varying width throughout the building. Purlins are standardised trussed oregon members. These are propped above the arches on each side to form a longitudinal roof light. Elsewhere, they are simple supported over the arches. The floor is concrete on flll with tie beams cast in between the concrete bases of each arch pair. The roof is corrugated AC sheeting.*
>
> *The principal framing to the end walls is 450 x 110 mm plywood box beams at 3 m centres, with vertical fixing to the slab and to the outside faces of the arches.*[10]

[10] Nolan G. (1994) *The Forgotten Long Span Timber Structures of Australia*, *A Thesis for the Degree of Master Of Architecture,* Department of Architecture, University of Tasmania Launceston, p.165.

Figure 11 - Subject site 2016. Shows current extent of the building. The Holland Street arm has been shortened, reducing it in length by half. (Source: Nearmaps, 2016).

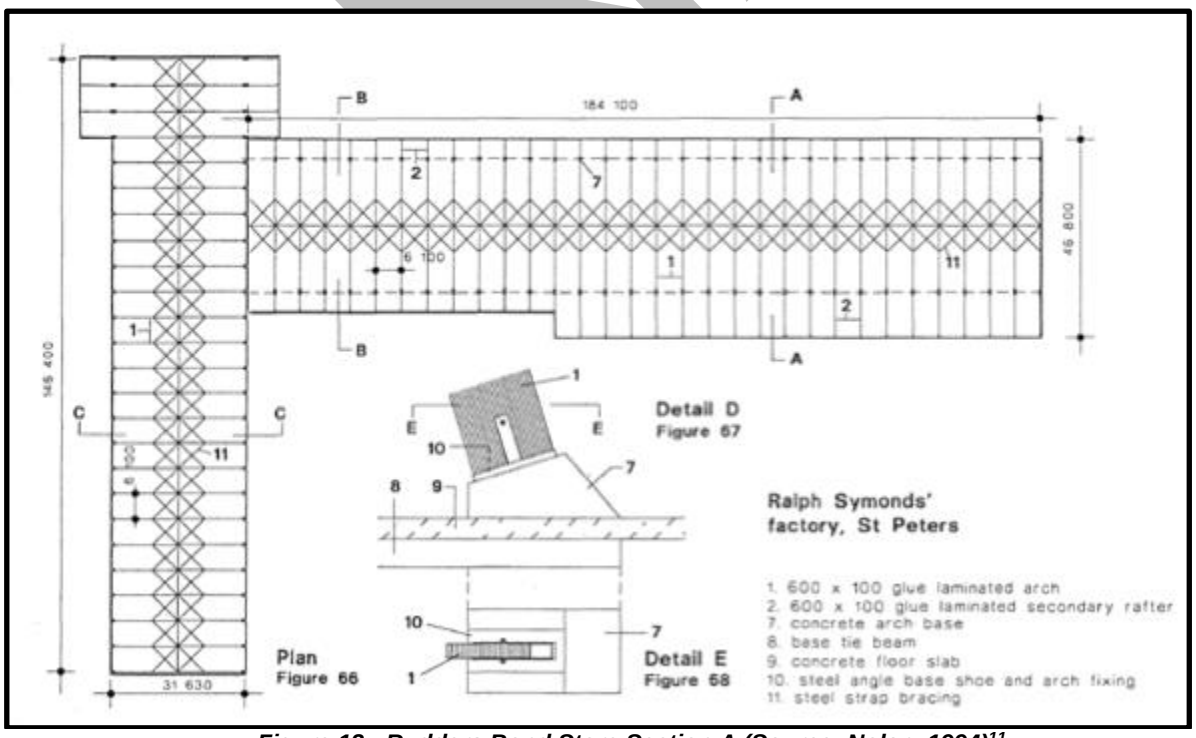

Figure 12 - Rudders Bond Store Section A (Source: Nolan, 1994)[11]

[11] Nolan G. (1994) *The Forgotten Long Span Timber Structures of Australia*, *A Thesis for the Degree of Master Of Architecture,* Department of Architecture, University of Tasmania Launceston.

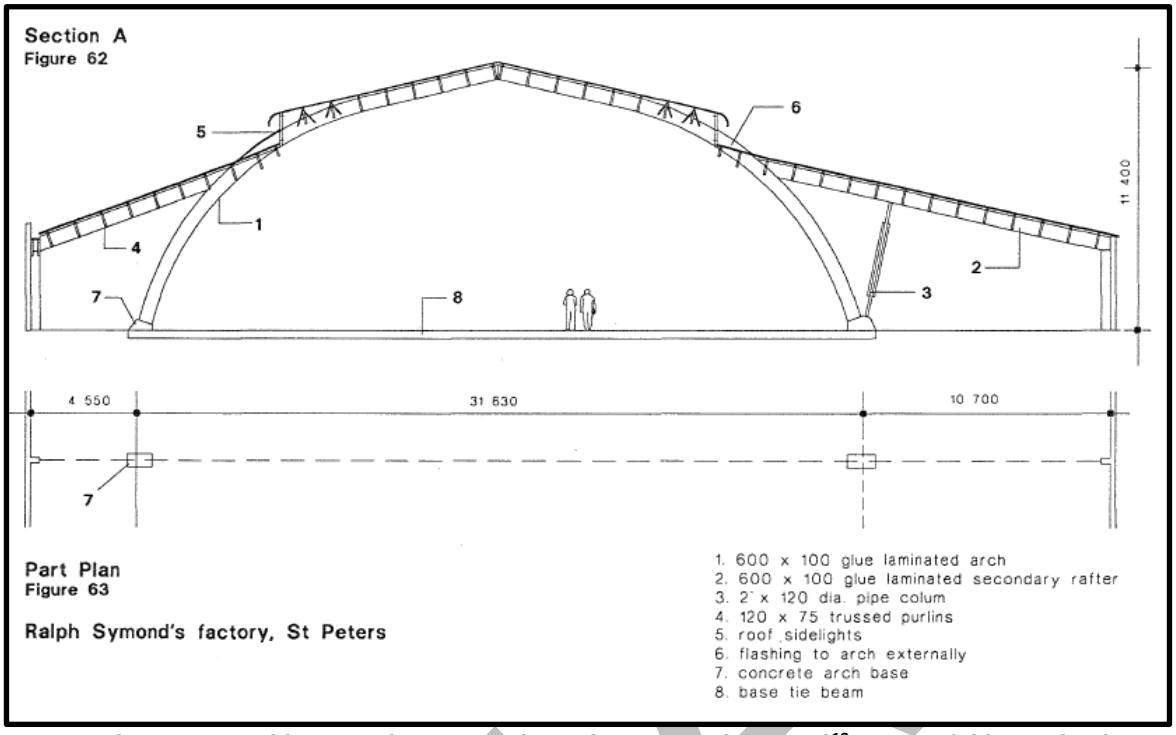

Figure 13 - Rudders Bond Store Section A (Source: Nolan, 1994)[12]. Most of this section has now been demolished.

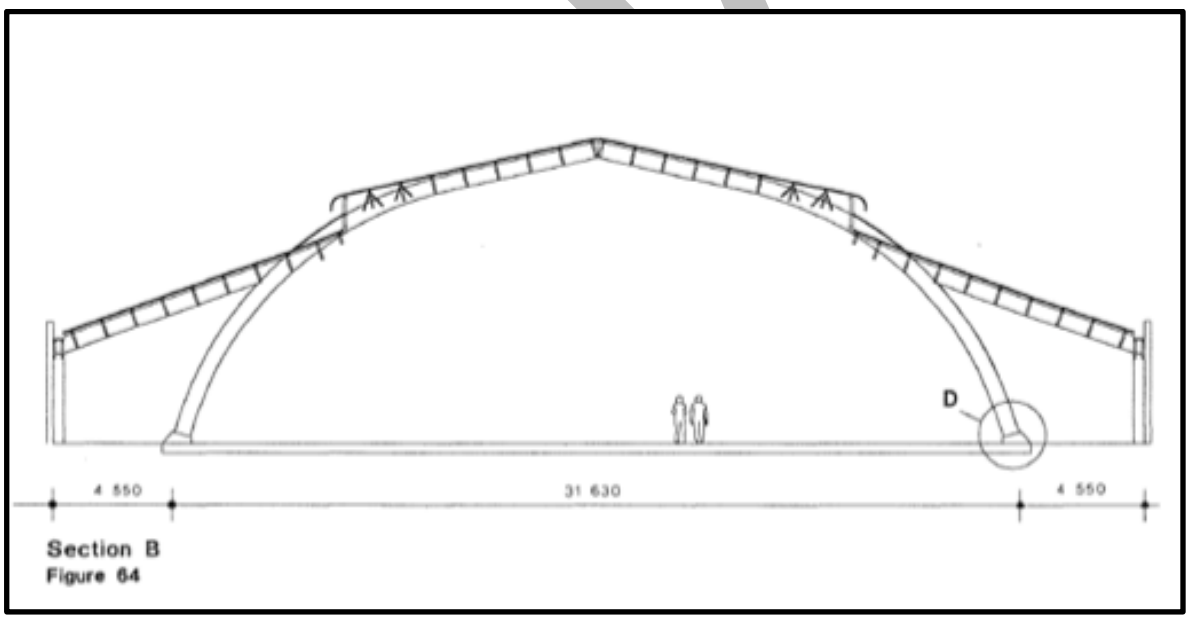

Figure 14 - Rudders Bond Store Section B (Source: Nolan, 1994)[13]

[12] Nolan G. (1994) *The Forgotten Long Span Timber Structures of Australia*, *A Thesis for the Degree of Master Of Architecture,* Department of Architecture, University of Tasmania Launceston.
[13] Nolan G. (1994) *The Forgotten Long Span Timber Structures of Australia*, *A Thesis for the Degree of Master Of Architecture,* Department of Architecture, University of Tasmania Launceston.

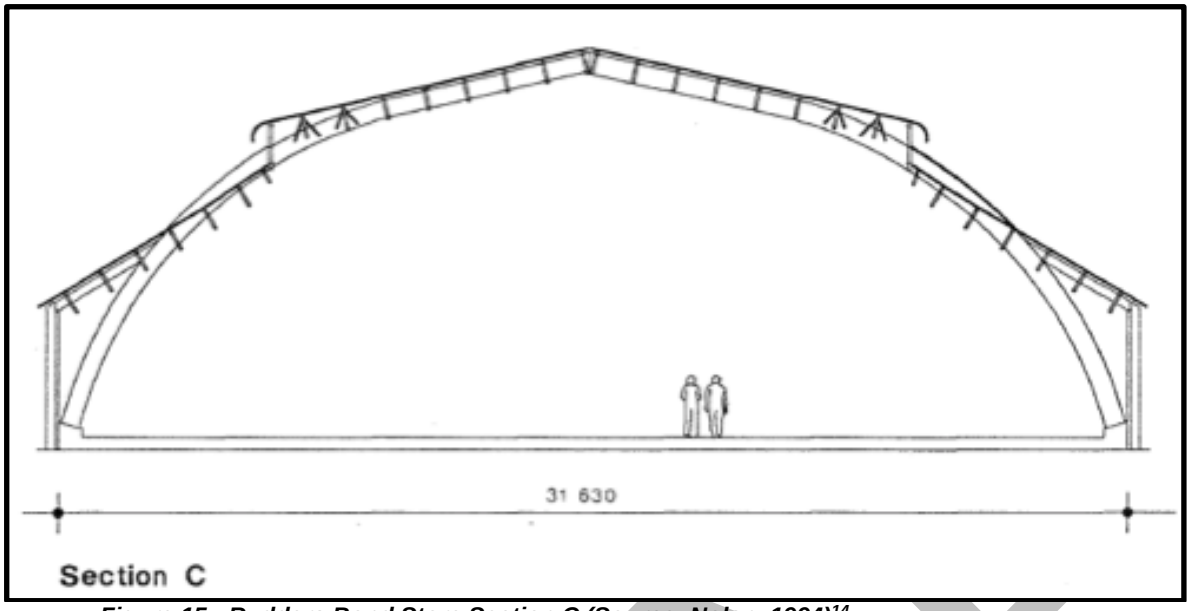

Figure 15 - Rudders Bond Store Section C (Source: Nolan, 1994)[14]

Condition

Overall the building is in good condition. The larger wing (fronting Campbell Street) is constructed of 25 arches, while the truncated building fronting Holland Street now consists of only 15 arches. There are presently 40 arches in total.

Future use of the Rudders Bond Site

At present, it has been approved through local and State planning initiatives, that the site currently occupied by the Rudders Bond Store will be redeveloped over the next 7 years as part the St Peters Interchange of Stage 2 of the Westconnex programme.

[14] Nolan G. (1994) *The Forgotten Long Span Timber Structures of Australia*, *A Thesis for the Degree of Master Of Architecture,* Department of Architecture, University of Tasmania Launceston.

3 CONSERVATION STRATEGY

This conservation strategy refers to the conservation of the laminated timber arches following disassembly and transport to storage. The disassembly and transport methodology is to be done by others, however this strategy does apply principles of materials conservation to which the other stages of work can refer.

3.1 Assumptions

There is some difficulty in formulating conservation strategies and approaches as the full scope of parameters and outcomes have not yet been set. However, based on the above constraints and the various Conditions of Consent set by the Heritage Division, for the purpose of developing some conservation strategies, we have made the following assumptions:

- The retention and conservation of a minimum of ten and a maximum of twenty extant timber arches is adequate to satisfy the condition of conserving “a section”.
- The arches will need to be removed from in situ. Removal will require cutting them into sections for transport.
- Methodology for the removal of the arches will be prepared by others. The work will also be carried out by others. **This conservation strategy will give some guidance on the salvage operation, however will focus mostly on the conservation of the arches after having been removed from in situ.**
- That the condition of conserving “a section” is ambiguous in terms of retaining a section of the building as a whole, or sections of individual arches (i.e. segments). Therefore we prepared conservation strategies that allow both the retention of whole and part arches.
- We have not been provided with financial parameters, therefore we have not considered costs in our strategies and opportunities.
- The client will adequately remove, relocate and house/store the items we have nominated for an indefinite period of up to 10 years, under the controlled environmental conditions specified by a heritage specialist.
- The client will, following negotiations with appropriate stakeholders, undertake the reinstatement of the remnant arches into development at, or in the near vicinity of the Rudders Bond site or other appropriate Inner West industrial location.
- The client will, following negotiations with appropriate stakeholders, commission and implement meaningful interpretation once reinstated.

3.2 Constraints

Preparation of a conservation strategy is limited due to a number of project constraints. The following constraints relate to project time, environmental issues, engineering issues and a general understanding of the building. The following constraints represent risks to the structure but also to the project as a whole:

- Condition 34B is ambiguous in that it does not define or quantify the term “sections”. It is unknown whether the term stands for a group of timber arches, one timber arch, half an arch or elements of an arch.
- Condition 34B provides little in terms of guidance as to the composition of options and the reuse of the timber arches. Any options proposed would need to represent, demonstrate and present:
    - The structural form of the timber arches;
    - The bulk and scale of the timber arches and Rudders Bond; and
    - The construction methodology of the timber arches (how were they put together)

  In order to achieve this, any reinstallation plans will require an area of sufficient size to accommodate a proposal to reinstate the built form.
- Demolition cannot commence until the number of timber arch sections to be salvaged, the method of salvage and reuse options have been considered and accepted by the Heritage Council of NSW. Delays in gaining approval can potentially impact on project timeframes and present a risk.
- Proposed options for reinstallation and future works can only be indicative at this stage as no future site or reinstallation location has been determined at this stage.
- The structural integrity of the timber arches is unknown and there can be no guarantee that dismantling and salvage will be successful. The condition of the material coupled with its original construction methodology will dictate the opportunities available for disassembly, relocation, storage, etc.
- The timber arch construction has not been confirmed. There is evidence that the arch ends are being held in tension by a tensioning rod or strap embedded in the concrete slab. Confirmation of this construction detail will dictate how the arches will be dismantled in a safe manner.
- Adverse environmental conditions throughout the deconstruction, transportation, storage and reinstallation of the timber arches will have an impact on the condition of the material, and its long-term integrity. Special consideration should be made to the radiata pine that the arches are constructed of, where is not an ideal material for external environmental exposure.
- Each laminated timber arch is approximately 30m in width and 15m in height. Safe transportation of whole arches via road transport poses significant challenges and is unlikely achievable.

In discussions with HASSELL who is responsible for the urban design and landscaping work for WestConnex Stage 2, the following additional constraints were identified:

- Majority of the interchange is located on an existing landfill site which will be capped and subject to extremely high settlements over the long term. Constructing any structure over the capped areas requires complex structural solutions, which may not be feasible.
- The area available for large interpretative pieces, including a dedicated interpretation centre is limited. The interchange area includes a significant area of public open space that is not suitable due to landform (batters and mounds), drainage and vast array of utilities associated with the project works.
- The potential scale, form and function of the structure would be best suited to an area of relatively flat, useable parkland, of which space is limited to only a few areas, and also reliant on pending outcomes from other planning conditions.

Furthermore, the following matters have been identified by HASSELL as still to be resolved and as such act as a constraint to the future planning of the interpretation:

- The proposed elevation pedestrian path (potentially to be removed from project scope) that currently divides open space opportunities adjacent to Campbell Road.
- Recreational open space requirements as part of Ministers Condition of Approval B62(b). This includes increased provision for open playing fields and additional car parking. This presents challenges in terms of design integration within the final scheme.
- The requirements and space allocation for the future land bridge link to Sydney Park as part of Ministers Condition of Approval B62(a). This presents challenges in terms of design integration within the final scheme.

3.3 Opportunities

It is seen that there are a number of opportunities related to the reuse of the Rudders Bond timber arches but also with the general protection of heritage related to Rudders Bond and the subject development. The following have been identified as viable opportunities for further consideration:

- The comparative analysis identified another Ralph Symonds factory, Industrial Equity Limited Bennelong, Bridge Road, Homebush which is recognised as the largest timber industrial building in Australia. The building is considered to be of a grander form and greater scale then Rudders Bond and should be further assessed to determine its eligibility of state listing.
- The comparative analysis identified other examples at Alexandria (52 O'Riordan Street), and Enfield which are of similar construction and should also be assessed for state heritage significance.
- The proximity of the St Peters landfill site to Sydney Park, raises the potential for the use of the timber arches to provide a visual connection between the two sites and to represent the industrial history of the entire area. Options include entrance portals, amenities buildings, static in path elements and park furniture or displays.
- Future works must demonstrate the bulk and scale of the original Rudders Bond Store through the integration of structural elements in conjunction with modern technology in the planning of future works and reinstatement. The installation should convey the scale consistent with the bulk and form of Rudders Bond.
- Future works must demonstrate the construction method and form of the Rudders Bond timber arches through static display, modern technology and integration into design elements. Should be represented at a human scale.
- The donation of elements and components of the Rudders Bond timber arch to the Powerhouse Museum allows for the long-term conservation and retention of a significant achievement of Australian industrial engineering within a premier industry and technology museum.

3.4 Potential Conservation Approaches

Remove and Conserve with a view to reinstate as a standing structure

Options

- Reinstate it as a public shade, amenities building, entrance portals, etc.
- Reinstate it as a smaller shelter structures utilising segmented sections of full arches.

Discussion

This outcome would see the most heritage values be retained, demonstrating the building's function as a large industrial structure and the technology used for the construction. In order to achieve this outcome, we would need to consult and utilise the full spectrum of conservation planning, from identifying the material constraints of the existing fabric and addressing the engineering constraints around disassembling the building.

Remove and Conserve with a view to reinstate as an alternative use structure within a new development

Options

- Reinstate it within the Westconnex development – i.e. into highway portals, retaining walls, new buildings, etc.
- Reinstate offsite i.e. at Sydney Park where there is room allowance but also still representative of the industrial history of the area.
- Use sections of the structure as public park furniture.
- Partial reinstatement with interpretive elements that convey the full size and scale of the item.
- Reinstate segments of the arch as part of the design of new interpretation.

Discussion

This outcome would see the most heritage values be retained, demonstrating the building's function as a large industrial structure and the technology used for the construction. In order to achieve this outcome, we would need to consult and utilise the full spectrum of conservation planning, from identifying the material constraints of the existing fabric and addressing the engineering constraints around disassembling the building.

This approach would see a greater deal of interpretation warranted as the results of partial and adaptive reuse installations will not be able to fully convey the technological significance and grand scale of the structures without supporting interpretation.

Remove without reinstating

Options

- Negotiate a potential donation with an appropriate collecting institution with appropriate capacity to conserve, interpret and use for research purposes.
- Negotiate other form of disposal (sale, transfer of ownership, loan) to other agencies and organisations.
- Negotiate conservation works and preparation for State Heritage Register listing to other more significant comparable sites in lieu of removal and not reinstating Rudders Bond.

Discussion

This approach does not meet the Conditions of Consent set out in Condition B34 for the statutory approval for WestConnex Stage 2. This approach would be non-compliant, however this option may need to be considered where any other salvage, retention and reinstallation methodologies are not viable, or where there is no appropriate methodology for conservation.

While this will not achieve the any kind of onsite reinstallation, the approach is still a valid conservation outcome as it suggests donation to other appropriate organisations or institutions with the means and facilities to retain and conserve the items. This item will not see the irreversible destruction of original fabric, but rather disposal of it to other parties for retention and conservation. This option may be more palatable when proposed in conjunction with negotiations to conserve or assist in preparing a State Heritage Register nomination for other more significant sites such as the Ralph Symonds Building, Bennelong Road, Homebush.

4 RECOMMENDATIONS

The following recommendations have been developed based on the known parameters, outcomes and heritage expectations. A condition assessment and fabric analysis has not been undertaken to develop this preliminary Conservation Strategy, therefore the conservation treatments and recommendations are general and high-level to give an idea of possible conservation works for planning purposes. No Scope of Works, approvals, or heritage assessments should be based on this preliminary advice, but rather should highlight areas where further assessment, analysis and information is needed.

Pre-salvage works

Determine the expected heritage outcomes

This would involve consultation with the key stakeholders in the project, namely TNT Rudders, CPB Dragados Samsung Joint Venture, Inner West City Council, the NSW Heritage Division and the local community. In order to firmly develop and prepare a conservation strategy, the expected outcome must be clarified.

Consult with a Materials Engineer

The specialist role of a materials engineer for the project is the ability to understand the properties of a building material, and perhaps manipulate how that material regularly functions in order to make it more versatile or operable.

A materials engineer would identify through a scientific analysis of the fabric what the condition of the fabric is and its potential to be "worked" or changed. This would identify whether the condition of the timber arches has the physical capacity to withstand the stresses of being removed from in situ, transported, conserved, stored and reinstated.

It is recommended that a series of longevity and sustainability testing is undertaken to assess the laminated timber in range of situations for its future usage options.

Discussion with a material's engineer should be the first course of action prior to planning any other work to fabricate customised mounts, disassemble, transport, store and reinstate. The outcomes of this discussion may identify limitations in the potential for undertaking certain works to the fabric, and define the parameters for heritage conservation towards much clearer and achievable outcomes.

The materials engineer would also be the best consultant to identify the ideal conditions for storage to ensure the condition is maintained while it is awaiting reinstatement.

Determine the Salvage Methodology

As mentioned, the salvage works will be devised and prepared for by others. This work will involve any onsite remediation, cutting into segments, reinforcing as necessary both to preserve the condition of the structure and to make good for transport, and finally transport to a storage location.

The salvage methodology should be prepared with consultation from a range of experts and specialists including materials engineers, materials conservators, structural engineers, heritage consultants, industrial fabricators, logistics and lifting specialists.

During the development of the salvage methodology both the materials engineer and the structural engineer should have input into how any temporary accretions needed to facilitate the removal and storage i.e. struts, braces, ties, minor and major fixings, etc. will impact on the physical fabric. They

may be able to devise of ways to negate or minimise the physical impact, or limit the visual impact by making fixings and fixing locations discreet,

Post-salvage works

Materials conservation

Prior to storage, the material will need an opportunity to be condition assessed and treated, remediating the material to a suitable state for its long-term storage. This may involve surface and sub-surface treatments of insects and biological growth, testing and remediation of any present adverse water content levels, consolidation of deteriorating, delaminating and fragmentary timber, corrosion conversion of metal clamp elements. Essentially, the timber will need to be dry and insect-free prior to storage. During storage, the timber material will need to be able to "breathe" throughout the storage period.

Some specialist timber conservation will need to be applied to the timber section ends as the are newly cut and exposed. The exposed outer surfaces have, over the past 70 years, had the opportunity to weather, affecting its colour, texture and its breathability. As the arches are cut into segments, newly exposed section ends that were previously sealed and protected from external environmental conditions will immediately commence reactions with air. Depending on the environmental conditions, this may result in excessive moisture absorption causing warping or excessive drying causing splitting and checking.

Application of a reversible coating of Paraloid B62/B72 which are a non-permeable resin dissolved in white spirit or acetone allow some protection, as well allow the segment to be marked or labelled without impact on the fabric directly. Paraloid coatings can be removed again using the dissolvent added to the medium. Application of Beva, a proprietary conservation adhesive that is also reversible, may be used in conjunction with a waterproof vapour-permeable textile covering like Gore-Tex may also be a solution.

Insect treatment may be achieved through an appropriate quarantine facility that is oxygen-void. There are a number of museum and industrial operations that provide flash-freezer facilities that kill all insect and biological activity. It should be known that the timber needs to be completely dry prior to this treatment, and the storage conditions need to be appropriate following the treatment or the same biological issues will ensue.

Long-term Storage

Laminated timber as a building material, while versatile in its functions and forms, has some critical limitations. As an internal structural material it is quite sufficient and provides solutions for large-span space. However, it is a poor material for external structures. Due to the features of the material, laminated timber deteriorates quite rapidly, particular in external conditions. Typically, the timbers first start to delaminate as water ingresses between laminations dissolving the glue, and then secondly as the timbers are no longer adhered the water penetrates the timber fabric, causing it to become water damaged.

As such, storage of these structures will need to be within an internal facility. The internal climate conditions will need to be specified by a materials conservator and based on the existing condition of the fabric, however generally, ideal storage conditions for these timbers would be similar to museum storage conditions. The facility will need humidity and temperature controls to prevent the onset of algal growth or dryness during storage. The facility should be fitted with appropriate climate monitoring systems in order to track adverse conditions. In order to prevent algal growth on timber, the facility must allow sufficient airflow to facilitate breathing and evaporation of the timber. If possible, the storage apparatus i.e. frame or trolley, should be mobile to allow for occasional exposure to

UV/sunlight. Some consideration towards disaster preparedness should be made to protect against floods and fire. In this regard, the arches should not be stored laying directly on the floor, they should not be stored with the material directly abutting each other but rather with small spaces in between the arches, and the storage facility should not contain flammable materials including fuels or excessive amounts of paper. Finally, the exit portal for the structures should be clear of access at all times.

In regards to a regular inspection and maintenance regimen, the timbers should be inspected for cracking, algal growth, damp conditions and insect activity at least every 3-6 months though perhaps monthly during dryer, cooler or wetter seasons.

Reinstallation

Options for reinstallation are partly dealt with in the *Rudders Bond Heritage Interpretation Strategy* prepared by Extent Heritage as part of this suite of conservation management documents, which deals with options for interpretive installations both of whole arches and segments.

In regards to the installation of the timber, any pre-salvage, salvage and storage temporary accretions need to be removed. If the segments are to be reinstalled as whole arches, the installation methodology should minimise the appearance of the segment joins and fixings.

If the arches are to be installed as external structures, the material will need to be treated for outdoor display. This will most certainly involve application of a non-permeable coating such as a clear epoxy or resin to protect it, making it weatherproof as well as functional. Some permanent coatings may need to be spot-tested prior to application, as most coatings will omit gases that can cause organic materials to discolour. The timber will need to be appropriately dry prior to applying any non-permeable coating, as it may result in the trapping of moisture, with the timber fabric essentially rotting from moisture from the inside, resulting in exacerbated and irreparable timber damage. Similar deleterious results can occur when installing the material into sub-surface interpretive installations like exposed glass-floor viewing decks. The climate conditions within these installations need to be controlled and monitored, similar to the measures taken during the storage process.

Depending on the reinstallation outcome, the interface between new and old materials will need to be specially considered to ensure that the installation supports compatible materials. For example, certain metals will not only facilitate but hasten corrosion when in contact. The new installation should consider how the steel clamp components of the arches physically interface with new fabric.

Ideally, the installation would be supported by some element of cladding (either roofing or wall) to provide some weather protection. Finally, for a good conservation outcome, the installation should be supported by interpretation that further tells the story and significance of the structure.

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