

21 March, 2023

Attention: Department of Transport & Planning

Technical Memo - Proposal to Relocate Nissen Hut Within Maintenance facility

Introduction

As part of the upgrade of the facilities at 61-71 Williamson Road, Maidstone, Victoria, 3012 a Nissen accommodation unit is to be moved to a new location on site. The existing site formed part of the Maribyrnong Ordnance Factory and was used as part of the Pyrotechnic Division for World War II. Fuses, flares, tracers and smoke grenades were produced at the site which occupied 26 hectares and included 150 buildings. Between 1947 and 1951, approximately half a million migrants reached Australia, the migrant hostel on Hampstead Road was officially opened on 21st July 1949. The site has been leased from the Commonwealth and adapted from its former use to accommodation for not only families of workers but also the families of Displaced Persons. The hostel was closed and taken over in 1989 by Victoria University of Technology (formerly Footscray Institute of Technology) as student accommodation. The site is now earmarked to accommodate a tram maintenance facility.

On site there are several Nissen huts that in the past were used to house migrants during. Wikipedia describes the huts as follows including typical dimensions:

A Nissen hut is made from a sheet of metal bent into half a cylinder and planted in the ground with its axis horizontal. The cross-section is not precisely semi-circular, because the bottom of the hut curves out slightly. The exterior is formed from curved corrugated steel sheets 10 feet 6 inches by 2 feet 2 inches (3.2 × 0.7 m), laid with a two-corrugation lap at the side and a 6-inch (15 cm) overlap at the ends. Three sheets cover the arc of the hut. They are attached to five 3 × 2 inch (7.5 × 5 cm) wooden purlins and 3 × 2-inch wooden spiking plates at the ends of the floor joists.

The purlins are attached to eight T-shaped ribs (1¾ × 1¾ × ⅛ inch; 4.5 × 4.5 × 0.5 cm) set at 6 feet 0.5-inch (1.8 m) centres. Each rib consists of three sections bolted together using splice plates, and each end is bolted to the floor at the bearers. With each rib are two straining wires, one on each side, and a straining ratchet (or in some cases a simple fencing wire strainer). The wires are strained during construction. The straining wires do not appear in the original Nissen patent.

The purlins are attached to the ribs using a "hook" bolt, which hooks through a pre-drilled hole in the rib and is secured into the purlin. The hook bolt is a unique feature of the Nissen design.

Interior lining could be horizontal corrugated iron or material like hardboard attached to the ribs. Sometimes corrugated asbestos cement sheeting was used.[1] If required, the space between the lining and the exterior may be used for insulation and services.

As part of the historical heritage, it has been decided to restore and preserve the Nissen Housing unit. This unit is 60 ft x 24 ft x 12 ft high. (18.3m x 7.32 x 3.66m) and comprises a steel frame from T sections at 6 ft (1.8 m) and cladding as described above. The huts are illustrated below.



Figure 1: Nissen Hut Exterior – Side



Figure 1 Nissen Hut Exterior - Front

Structural Description

The Nissen Hut comprises two separate sections, the curved ribbed roof that is fixed to a perimeter bearer beam and a floor structure.

The curved roof is self-supporting due to its structural arch, as seen in the photograph below. The ribs of this arch were made of steel T-sections (50x4 mm) at 6ft (1.8 m) centres. This arch is covered in corrugated sheeting to create the roof which can be seen in the exterior photographs above.



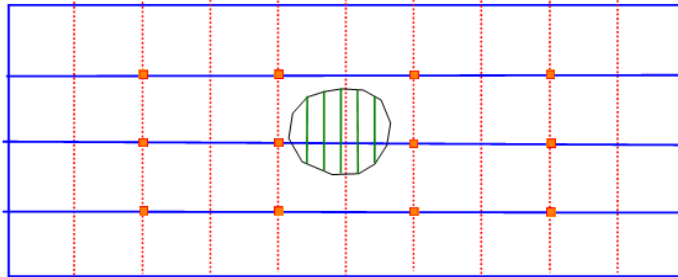
Figure 2 Interior of Structural Arch

To support this frame the arch's T-Beams are fixed to a timber bearer, which in turn is supported by a timber stump. This is shown in Figure 4.



Figure 3 Arch Support System

The floor structure is made from 19 mm thick timber panels which are supported by floor joists at 457 mm centres. These are in turn supported by 100 x 50 mm bearers which are at 1825 mm centres. This floor framing system is supported on stumps, the location of these is shown in the diagram below.







-  stump 100 x 1000
-  JOISTS 70 X 50
-  BEARER 100 X 50
-  FLOOR PANELS
19 MM THK

Figure 4 Floor Plan of Nissen Hut

The floor support system can be seen in the photo below.



Figure 5 Floor Support Structure

The overall weight of the structure was calculated assuming the following unit weights:

- Ribs (5 kg/m)
- Sheeting (15 kg/m)
- Flooring (30 kg/m)

The estimated weight of the whole structure is 7,500 kg or 420 kg/m. This was used to in the design of the of the lifting details.

Condition

HATCH carried out an inspection of the Nissen Hut at its current location. At the time of inspection, the Nissen Hut was in good condition and able to be moved. Please see the photographs in the Details section to see the condition.

Method of transporting

To relocate the hut, it was decided to break into 5 separate pieces. Each piece would coincide with a steel frame. The size was determined based on the width of the access track between its present position and proposed new location. However, the same methodology could be used should the hut be broken down into 4 sections or even 3 sections

The size of the sections is set out in the following table.

No of Transportable Sections	Size of Transferred Module	Weight of Each Module
5	3.65 x 7.4	1514 kg
4	4.5 x 7.4	1868 kg
3	6.1 x 7.4	2532 kg

The method of transport is detailed in Drawing Numbers H361624-6005-STR-DWG-001 and H361624-6005-STR-DWG-002, attached below. The Hut is to be moved in 12 ft (3.7 m) section, coinciding with the ribs of the façade to facilitate easy transport.

During the lifting of each module the following activities will take place:

- Slide main beams below bearers
- Lock two main beams together with the transverse beam
- Clamp the bearers to the main beam
- Provide a temporary stud wall between the rib and floor for additional bracing
- Attach lifting chains to the lifting lug
- Fix spreader bar and gently lift the hut

New Foundations

Each of the modules will be transported from the current location to the new location as indicated in the location below. Before transporting the Hut, the new site must be prepared as follows:

- Strip all organic material from site
- Level the site
- Provide a hardstand /capping layer
- Pour edge beam incorporating spoon drain
- Pour strip footings



Figure 6 Map of Current and Proposed Location of the Hut

At the final location, a new foundation design will be adopted which is detailed in Drawing Numbers H361624-6005-STR-DWG-003. An edge beam will surround the perimeter and will incorporate a spoon drain to collect any runoff draining to an existing drain. A strip footing (750 x 150 mm of FCR) will be placed under the floor frame stumps. The stumps will be connected to a plinth above the strip footing to provide stability to the structure. The structure must have a clearance of 650mm between the floor and the soil to allow for adequate ventilation.

Conclusion

At this stage the hut can be dismantled and readily re assembled as set out in this memo. We suggest that the method be workshopped so that the details can be firmed up and detailed drawings prepared for the next phase of the operation.

Please do not hesitate to contact me should you require further information.

Yours Sincerely,

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APPENDIX A: DRAWING LIST

Drawing Number	Drawing Title
H361624-6005-STR-DWG-001	Lifting Arrangement
H361624-6005-STR-DWG-002	Lifting Details
H361624-6005-STR-DWG-003	New Foundation Design